Documenting Jewish Mobility in Antiquity: Connecting Archaeological, Inscriptional, and Historical Data from around the Mediterranean

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We present Modelling Jewish Migration in Antiquity, a project in which we have created an interactive platform that brings together evidence of Jewish presence in Antiquity as a searchable database and an interactive map, in order to help explain the dynamics of Jewish migration within the Roman Empire and into Europe in a manner that is more quantifiable and transparent than has been possible so far. The database includes nearly two thousand entrees and includes archaeological findings, inscriptions, papyri, and literary evidence that were previously published but never brought together in one place. In this article, we describe how we have created the dataset, we discuss the data model we used to publish the dataset as findable, accessible, interoperable, and reusable (FAIR) data, and we present the search and visualization interface that we created to make the data accessible. The article concludes with a provisional analysis of the materials. We show that the broad patterns in the spread of evidence of Jewish presence in Antiquity from our data can best be understood by contextualizing them within the larger framework of (non-Jewish) Roman history. We furthermore also document that our data suggests that Jewish migration during the time of the Roman Empire developed primarily along the coasts of the Mediterranean, while we find less evidence of Jewish presence in what used to be the German provinces of the Roman Empire.

Keywords: Antiquity, archaeology, Judaism, migration, Roman Empire

1 Background and Goals

1.1 Background

One of the challenges for the study of ancient Jewish history is the fact that while there is plenty archaeological, epigraphic, and papyrological evidence, such data have not generally been digitized in any systematical manner nor is there a single database

that makes all of the available information accessible in one place. It goes without saying that there are many advantages to presenting the relevant primary sources in the form of an interactive database. It is not just that such a database makes evidence that is typically published in specialized journals freely available to anyone with an internet connection. Nor does it just allow for newly discovered data to be added quickly and easily and thus keep the information truly up to date—something that was impossible in the past simply because one always had to work with publications that appeared in print. Perhaps the single most appealing aspect of digitizing the data and making them available via a web-based database is that one is in the position to work with larger datasets, meaning that one can actually begin to try to unravel the larger patterns and, possibly, even the inner dynamics, that shape Jewish historical migration during the period of the Roman Empire.

Because hardly any of the evidence included in our website had ever been digitized, and because none of it had ever been presented in the form of an interactive platform, we sought inspiration from similar such projects that had already materialized and that could provide us with best practices. Important projects included the PEACE Portal (Saar, 2021) and ORBIS, the Stanford Geospatial Network Model of the Roman World (Scheidel, 2013, 2014). The aim of the PEACE Portal is providing academic and general audiences with a 'portal of epigraphy, archaeology, conservation and education of Jewish funerary culture', with special emphasis on funerary inscriptions stretching over a period of more than two millennia and deriving, specifically, from Israel, Roman Palestine, and Germany.[1] The ORBIS project documents travel distance, time and costs in the Roman Empire and thus serves as a tool to study connectivity throughout the Roman Empire.[2]

In our project, the goal was to include different types of primary data, namely archaeological findings, inscriptions, papyri, and literary evidence, in an effort to see what such evidence could possibly tell us about the dynamics of Jewish mobility migration into Europe in Antiquity from the second century BCE (with our earliest evidence attesting to the late sixth century BCE), when such mobility and migration first began to take shape, until the seventh century CE, which is when the (western) Roman world came to an end, and which, interestingly enough, coincides with a very significant drop in Jewish primary data from the area of the former Roman Empire also. While creating a database of Jewish presence in the ancient world based on all the published evidence currently available, our geographical focus was on the lands encompassed by the Roman Empire.[3] So far we have not included rabbinic data not just because for the geographical area we are studying such data are few and far between and require their own methodology if one is to evaluate them historically. In this area there is a separate project underway that has been designed and is being directed by Eyal Ben-Eliyahu. Known as Alma, this project is producing excellent results, which includes discussions between the Alma team and our team to integrate all of our data at a later point in time.[4]

As for the project we are presenting here, it conceptually builds on the work of Rutgers who has tried to explain the dynamics of Jewish migration in the ancient world, and who has argued that 'if you wanted to travel the length and breadth of the Roman Empire in, say, the fourth century CE, you could probably do so by

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1 https://peace.sites.uu.nl/epigraphy/search/

2 https://orbis.stanford.edu/

3 We did not include evidence on Jewish communities from the Parthian, Sasanian and Persian empires as this would require an entirely different study.

4 https://experience.arcgis.com/experience/5ebdd921862447daa05118ad17b118a1/page/Home/

travelling from one Jewish community to the next, at least for considerable stretches of your journey' (2016). Yet, many questions, for example relating to the demographic reality behind this phenomenon, remain essentially unresolved (Schwartz, 2014). Our platform aims to offer tools for addressing these and various other questions regarding Jewish mobility, migration, and integration into Roman society, making the process more quantifiable, transparent, and methodologically sound than previously possible. That said, it should finally be observed that the database we are presenting here is possible only because of the hard work of the many researchers that preceded us and that published the raw data. These include scores of archaeologists who did the actual archaeological fieldwork in many a location and the scholars who gathered evidence in the form of corpora, including, in particular, Victor Tcherikover and Alexander Fuks, Gert, David Noy, Walter Ameling, and Tal Ilan.

1.2 Process and Goals

The way our project has been shaped can be narrowed down to four distinct phases. During the first phase we realized that managing the existing data would require a database. As we had little previous experience in this area, the projects of Saar (2021), and Houten (2021), as well as their expertise, were used to help shape the project. In order to create a database that makes all the available information accessible in one place, we also had to determine its boundaries. The chronological and geographical boundaries we settled on correspond with the rise and fall of the (western) Roman Empire in both chronological and geographical terms, as this was the time and place that Jewish migration into Europe first occurred.

To flesh this out further, we defined several further goals for our project: 1) to collect all currently known primary data on Jewish presence in the Mediterranean basin and Europe during the first six centuries CE, be this evidence archaeological, inscriptional, papyrological or historical. As stated above, most of these data is currently available only in the form of published books. Once we had localized and collected all of these publications we then proceeded to 2) make the information available in the form of an interactive and searchable database that contained all of of the collected evidence (more on this later). Lastly we 3) began working on an accompanying article how the website and accompanying interactive platform may help to detect mobility of Jews during the time of the Roman Empire. This article is yet to appear.

During the second phase, the project not only used the database as a place where data could be stored, but also as a point of departure that would eventually allow us to visualize the results, as already mentioned. Here the next step was to link this database to an interactive map, as the place where the results of searching through the database in a certain fashion could be visualized. This was also the phase in which the current team was formed and in which we decided to apply for a research grant from Utrecht University's *FAIR Research IT Innovation Fund*, which covered the costs of the research software developers involved in this project.[5]

The third phase included the shaping, the curating and building of our dataset, our database, and our interactive website. This phase was characterized by testing aimed at perfecting the ways in which we were incorporating the data, by reflecting on the way the data could be used, and by thinking about how to locate our project within the larger context of the Digital Humanities. This was also the period during which

[5] https://www.uu.nl/organisatie/it/wat-wij-doen/fair-research-it/oproep-2022-fair-it-innovatiefonds-voor-onderzoek

meetings were held with experts from outside to inform how to move further, such as a meeting with Dr Jonathan Prag on the use of EpiDoc (see also Prag and Chartrand, 2018). Because this phase was centered around testing and perfecting our results we also ran into certain challenges. One of these was the question of which digital format to use for visualizing our data. By reaching out to colleagues in relevant fields, we were able to overcome such challenges (more details on this below).

The last phase is the current phase in which we find ourselves at this moment in time. Most of the work has been done, and we are anticipating the first results.

2 Methods

2.1 Creation of the Dataset

For the compilation of the dataset, we included data culled from various different inscriptional, archaeological and papyrological corpora, as well as other scholarly publications – essentially everything we could lay our hands on, to the extent this information was available to us in published form. The dataset offers the first large-scale integrated and digitized collection of ancient Jewish archaeological, inscriptional, papyrological and literary sources from around the Mediterranean during the time of the Roman Empire (with the exclusion of the area of Roman Palestine, which was the homeland of the Jews whence they migrated).

Currently containing 1966 data entries, our database includes records representing Jewish inscriptions, papyrological documents referring to Jewish matters, further non-Jewish textual materials that refer to Jews or Jewish communities, as well as various types of archaeological evidence that is identifiable as Jewish because of the decoration it contains, because of architectural features or because of the larger archaeological context from which such archaeological finds derive. Estimated time periods accompany each and every data-entree, as does further information regarding specific symbols, materials used, the location of the materials, and, where appropriate, a translation in English.

The types of evidence that we included in our data are very dissimilar and can differ a lot from each other. The evidence can broadly be subdivided into two groups: inscriptional and papyrological evidence deals with written text, found on either marble tablets, papyrus scrolls, or even subterranean walls. This makes it a relatively homogeneous group. The archaeological records, however, are more difficult to analyze as one group, for it not only include Jewish mosaics, but also entire synagogues or necropoleis. In order to overcome this challenge, we had to come up with a method for standardization of all the records so as to make all the different types of evidence comparable to each other. Moreover, to properly curate all these different aspects we came up with a four-pronged approach. This process was the same for all the different types of evidence that we included in our dataset.

The starting point for every data entry was its geographical information. Whenever possible, we enriched information on locations with geo-coordinates, using the Pleiades gazetteer of ancient place names where available,[6] or by adding coordinates manually. The geographical coordinates are essential if one wants to visualize and study the diffusion of our evidence, and in return possible migration patterns.

As a next step we assessed the chronological information, and added this for each individual piece of evidence. Indicating the moment in time a particular piece of

[6] https://pleiades.stoa.org/

evidence was either used or produced, it is evident that chronological indicators are a particularly useful category if one is to determine larger migratory patterns relating. Thus, a peak in the evidence might tell us something about a potential increase of the Jewish population at a given site or in a given region, which in turn might be ascribed to increased mobility. The inclusion of chronological information also proves its usefulness when contextualized against the general historical information available for a given period. For example, after the second century CE, the evidence that originates from Egypt and North Africa decreases rapidly. If one compares this to historical events from that time period, it becomes clear that there may be a causal connection with the Jewish revolts in that area in the beginning of the second century CE, when the Jewish population was decimated, to say the least (Ben Zeev, 2005; Le Bohec, 1981; Lüderitz, 1983; Tcherikover and Fuks, 1960).

Once the geographical and chronological information had been included, we also added linguistic information, particularly where it concerned inscriptional evidence. When studied comprehensively such information allows one to reflect on language usage of a population that finds itself in a Diasporic situation. What emerges from this is the importance of Greek for the Jewish communities of the Roman-period Diaspora. More than half of the Jewish inscriptions in our database turned out to have been written in Greek. Being the second most important language in the Roman empire, this was apparently also the language in which many Jewish communities communicated, amongst themselves and with one another. Such a fact is obviously a function of the integration of these Diasporic communities in the Hellenistic Greek culture that permeated the eastern half of the Roman Empire all the way down to Late Antiquity and beyond.

To determine whether the various Jewish communities were similar to one another in political, socio-economic, cultural and religious make-up, we added yet another category, using the content preserved in and provided by the primary sources themselves. This meant identifying references to jobs people had as well as religious titles and further markers such as religious symbols. These kind of cultural markers provide us with new insights in how individual Jews, groups, and even entire Jewish communities defined themselves within the Diasporic context in which they lived. Importantly the gender of the people that dedicated an inscription or were mentioned in the evidence was also included. By including this marker in our dataset as well, we wanted to try to determine what sort of cultural habits inform Jewish epigraphic practice insofar as it relates to issues of gender. Again, the results of this can be compared, in a later step, to what is known about Roman inscriptional practices in this area, once again in an effort to see whether the Jewish communities of the Roman Diaspora followed general customs or their own.

The idea to build our dataset in this way was majorly informed by projects such as the above-mentioned ORBIS project directed by Walter Scheidel, which shows the importance of being able to study evidence from a temporal and geographical perspective while keeping in mind the networks identified by Scheidel and his collaborators (Meeks, 2015; Scheidel, 2013, 2014). Scheidel's work inspired us to plot data-points on a map in the hope that various patterns might emerge that one would never be able to identify if one merely works with the data individually. The projects of Houten (Houten, 2021) and Prag (Prag and Chartrand, 2018)[7] provided us with further inspiration on the inclusion of datasets that underlie these visualizations. These projects rely heavily on a data-driven approach, that takes as its point of departure a substantial

[7] https://isicily.org/

underlying dataset. The main take-away from these projects is that if one is to look for overarching patterns, a data-driven approach based on digitized data is the only way forward.

2.2 Data Model

As we collected and curated data in the way and for the purposes described in the previous section, one of our main concerns was to create a dataset that meets the requirements of FAIR data.[8] This implied that it was imperative that the data should be published under a free license, but also that its data format is not only open but ideally also commonly used in the field, so that the data can be reused by others and to provide interoperability with other applications. At the same time, however, it was equally important to design an editing tool where the data could be updated in an efficient and user-friendly way, and this limited our choices in data formats.

As we worked through this process, we considered three different formats. Since a large part of the primary data in our dataset concerns epigraphical data, we first considered EpiDoc, which is a widely used and well-defined open standard.[9]. EpiDoc is based on the Text Encoding Initiative format (TEI), which in itself is based on XML. Its most important strength is the detailed way in which it encodes the text of epigraphical materials with all its subtleties, such as whether parts of the text are located on the *recto* or *verso* sides, words that wrap from one line to another, abbreviations and illegible but reconstructed parts of the text. In EpiDoc, these features are encoded using XML tags and attributes, but using tools such as XSLT it is possible to convert EpiDoc documents into human-readable or even interactive formats.

For our purposes, however, EpiDoc presented us with some difficulties. While EpiDoc is strong in encoding the actual text of epigraphical materials, in our dataset the focus is not on the text itself but rather on the metadata. Even though we do record the full text and translation in our data entries where available, we are not using the EpiDoc features in encoding these texts, since the details of these texts are not our main concern. While EpiDoc allows the inclusion of metadata, it does not prescribe a standard way of doing so, and in fact we see large differences between datasets in the way they encode metadata. This means that the advantages of EpiDoc in terms of interoperability are limited for our dataset. In addition, the fact that EpiDoc is usually created by hand did not fit well with our needs to have a user-friendly and efficient editing interface. Also, the fact that EpiDoc is document-based (each inscription is represented by a separate XML file) was not a perfect match with our goal to create a database where metadata was the most important part.

As an alternative we began exploring the possibility of creating and storing the data as linked data in RDF format. Because our dataset uses parts of other datasets that are themselves available as linked open data – most prominently the Pleiades gazetteer of ancient place names (see also above) – there are obvious advantages for our dataset to be published as linked open data as well. However, the technical support of linked data is not yet at the same level as that of more traditional approaches, including relational databases. The most important consideration here was that for creating our dataset as linked open data, we would have to spend a lot of work creating an editing interface.

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[8] FAIR data is findable, accessible, interoperable and reusable. See the *GO FAIR* website for more information: `https://www.go-fair.org/`.

[9] `https://epidoc.stoa.org/`

In a discussion with Dr Jonathan Prag, who as co-PI of the Fair Epigraphy project[10] has done pioneering work on epigraphical data as linked open data, we discussed with him the advantages that this data format would bring to our project. We agreed that the fact that there is currently no widely adopted linked data ontology for epigraphical data greatly limits the usability of any new dataset that does not tackle this problem (see also Prag and Chartrand, 2018: 248–249). In addition, our dataset follows a relatively simple and stable structure, which means that another advantage of linked open data – flexibility in the data model – would not apply here.

Because of the difficulties that data storage in linked open data would come with and the lack of advantages for our purposes, we decided to store the data natively as a relational database using the Django framework for web applications.[11] This resulted in a user-friendly editing tool to update the database, which is a standard feature of Django. We added features to automatically retrieve information from external databases such as Pleiades for location data, links to which are also preserved in the database.[12] Every entry in the database carries a unique, persistent identifier and a URI, which allow external datasets to refer to our data. Whenever needed, our project team members or any potential outside collaborators can edit the data and insert new entries. The fact that our dataset is natively stored as a relational database does not close the door to linked open data: a conversion to linked open data is trivial[13] and if at any time a standard ontology for epigraphical data gets established we will be very happy to provide a data conversion scheme.

Apart from a searchable public interface (see below), we make the dataset available for others using a JSON REST API, as well as a downloadable JSON dump, which is uploaded to Zenodo whenever significant updates are made.[14]

2.3 Search

To make the data accessible for researchers at large, but also to facilitate our own research, we are in the process of making it available for exploration through the web application I-Analyzer (Janssen et al., 2023). This makes it possible to perform full-text search and filter data, including, especially, inscriptions.

I-Analyzer uses Elasticsearch for full-text search. Elasticsearch is based on Apache Lucene, a NoSQL query engine. To prepare the data of the inscriptions for fast search and filtering of metadata, it needs to be indexed. I-Analyzer has formats for defining the fields which should be added to an index, and how to populate those fields from source data. It can read a wide range of formats, such as XML, CSV and HTML, but also JSON. We built in a mechanism to directly download and index the data from the JSON REST API, so that if a user of our editing tool modifies metadata, or adds new inscriptions, these changes can easily be picked up in the search interface of I-Analyzer.

I-Analyzer's search interface consists of three tabs: the first tab can be used to filter inscriptions and explore the results; the second tab shows visualizations (see 2.4 for details), the third tab allows users to download selections of data for further offline processing.

To study the spread of the Jewish diaspora as reflected by inscriptions, we can for

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10 `https://www.csad.ox.ac.uk/fair-epigraphy`

11 For Django, see `https://www.djangoproject.com/`.

12 The source code for the resulting web application can be found here: `https://github.com/CentreForDigitalHumanities/jewish-historical-migration`

13 For example, a conversion to JSON-LD format is as simple as adding a @CONTEXT property.

14 `https://jewishmigration.sites.uu.nl`

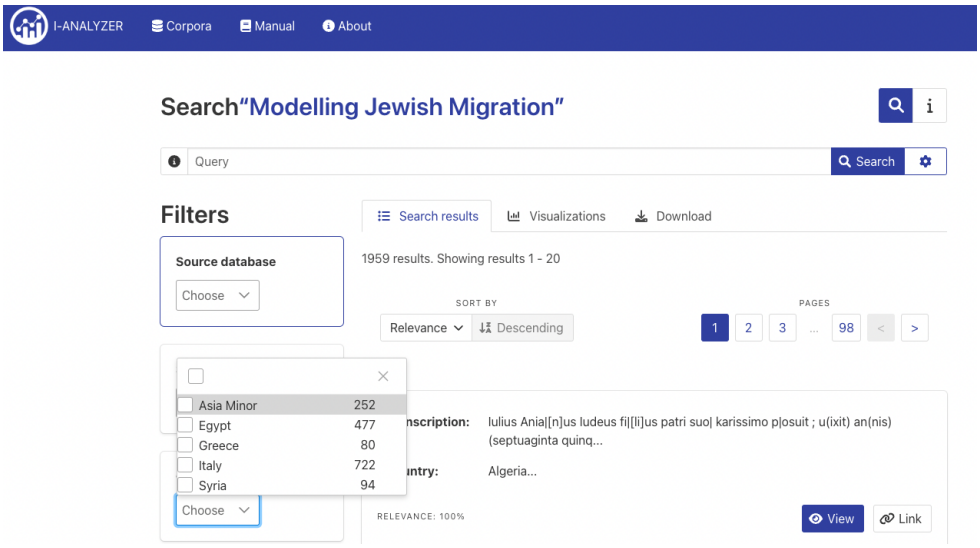

Figure 1: The search pane of I-Analyzer, showing filtering according to the region in which an inscription was found.

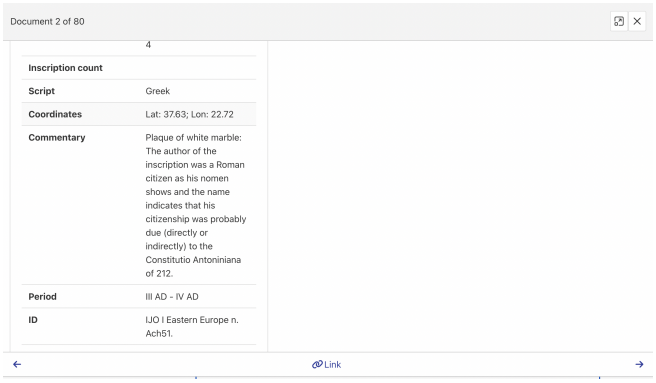

Figure 2: An inscription and its metadata, viewed in I-Analyzer.

instance filter the data according to region, as shown in Figure 1, or alternatively, by aspects including century or language of the inscriptions.

Clicking "view" on one of the inscriptions in the search results will show all the metadata of the given inscription, as well as the transcription, if present. The arrow links can be used to navigate to the detail view of the previous or next inscription in the result set, and it is possible to use permanent links to inscriptions, to be shared in publications (see Figure 2).

2.4 Visualization

I-Analyzer includes a number of visualizations to explore text and metadata in a quantitative way. Some of I-Analyzer's visualizations, such as term frequency and neighboring words of a search term, are not applicable to this corpus, which does not focus so much on the text of an inscription as on the locations and circumstances in which inscriptions were found.

Further visualizations are possible using the categories into which we have placed

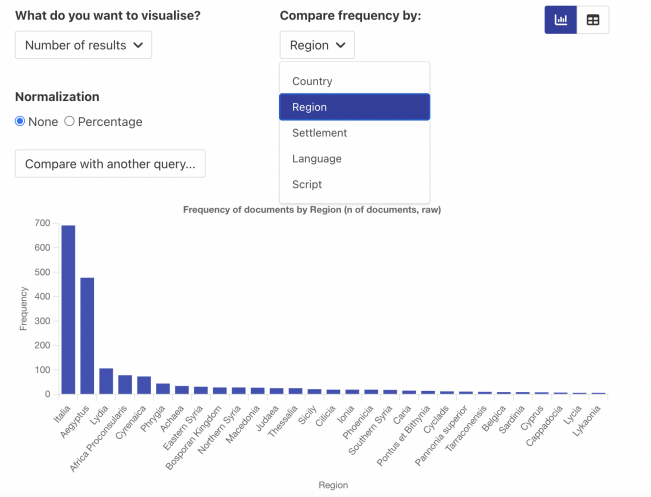

Figure 3: A histogram of the number of descriptions per region, as displayed in I-Analyzer.

the data. Thus it becomes possible to not only investigate how many inscriptions were found per region or settlement, but to visualize the results, as evidenced by the histogram visualizations included here as Figure 3.

However, because histograms do not provide one with good representations of the geographical distribution of inscriptions, we also proceeded to visualize the various locations in which the evidence contained in our database has been found on an interactive map (Figure 4). This online map uses the Vega[15] visualization grammar and displays places on a neutral background map. A very simple map with only land mass as background was chosen. This is preferable over a more detailed map with the boundaries of either modern states or even a map containing the provinces of the Roman Empire as these were also subject to change over time (if the locations need to be visualized in context with geographic or cultural layers appropriate to the time period, we suggest downloading the records and loading them in a dedicated Geographic Information System). The online map is zoomable, so the location details for dense clusters can be made legible by zooming in. Clicking a location opens the document view.

3 Results

We are currently implementing the interactive map and completing the dataset compilation. For now, despite anticipating the first results, we can already see a variety of very interesting patterns emerge from the dataset, patterns that were only speculative until now. These largely confirm the provisional results produced and discussed by Dingemans (2024). They indicate various things: an increase in the number of sources throughout the centuries, followed by a rapid drop towards the end of Antiquity. But also differing levels of dispersion – *Diasporic Hubs* – throughout the Mediterranean basin which document historically significant ups-and-downs in Jewish mobility during the time of the Roman Empire.

While noting a steady increased that peaked in the fourth century, followed by a rapid decline of evidence from the fifth century CE onwards, the following aspects

15 `https://vega.github.io/vega/`

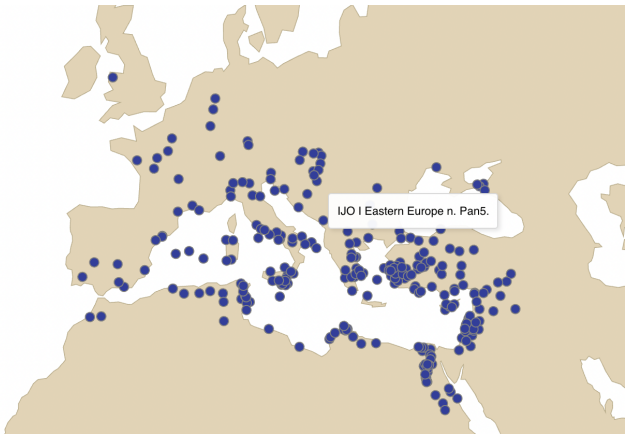

Figure 4: A map showing the geographical distribution of inscriptions, as displayed in I-Analyzer. Hovering will show in which source the inscription was documented; clicking will open the document view.

became clear: firstly, there is a significant increase in the amount of evidence during the fourth century CE which, not surprisingly but still significantly, goes hand in hand with an increase in the number of regions where Jewish evidence appears. In the first century CE, only five regions (Asia Minor, the Crimea, Egypt, Greece and Libya) are known to have contained evidence that was indicative of Jewish presence. In the fourth century this has changed significantly: now no less than twelve regions can be shown to contain Jewish evidence. Then, in the fifth century, we see a dramatic decline in Jewish evidence, which not only coincided with, but was most probably also caused by the social, political, environmental, economic, and cultural unrest that occurred during the fifth century CE (Fuks, 2017; Jones, 1973; Safrai, 1998). Not surprisingly, the number of regions where there is evidence for a Jewish presence drops dramatically from twelve in the fourth to a mere six in the sixth century. Also this drop was not just quantitative in nature. The quality of the evidence (expensive inscriptions, large buildings and so forth) also experiences a serious decline.

As for other patterns that emerge out of our database, we noticed that Asia Minor and Italy contributed very significant proportions of the evidence, making them the *Diasporic Hubs* in the Diasporic network, for nearly half of all the evidence was attributable to these two regions. That Jews moved to Rome constantly, is not difficult to explain. Rome, after al, was the *Caput Mundi* that attracted migrants from all over the Roman Empire, as indicated by historical scholarship, and, most recently, by genetic (aDNA) studies as well. Asia Minor, on the other hand, was heavily urbanized and had long been home to Jews, starting in the Hellenistic era. For Jews Asia Minor was clearly a land of opportunity. Further contributing factors here were no doubt the fact that Aisa Minor was geographically near and connected to Judaea via the extensive Roman road network, as well as the sea routes from the port of Caesarea Maritima in Judaea (Hezsner, 2011).

Rome, on the other hand, was not necessarily close, housing one of the largest Diaspora communities and it inevitably kept attracting Jews from elsewhere, simply because migrants are known to travel to places where a migrant community is already in place. It is conceivable, therefore, that these two regions served as hubs: once established, they kept attracting more and more Jews that originated from the Jewish homeland and even from other places in the Jewish Diaspora during the Roman period.

The final version of the dataset will offer the user an even more complete picture than we can currently offer. In all of this we will not only provide an interface that both academic and popular public can use to inspect the data for the purposes of their own research, but we also anticipate having enough evidence ourselves to come up with a sensible reconstruction aimed at explaining the mechanisms and underlying structures of Jewish mobility and migration into ancient Europe by using the interactive map. Our publication will be part of a field that has gained popularity in recent years: Ancient migration (Bloch, 2022; Collar, 2013; Gruen, 2002; Hezsner, 2011; Horden and Purcell, 2000; Lampinen and Ferrándiz, 2022; Rutgers et al., 2019; Scheidel, 2013; Tacoma, 2016).

4 Conclusion

From the discussion presented above it follows that approaching the phenomenon of Jewish historical migration by way of an interactive platform of the kind described here offers many opportunities for future research. First of all, presenting the evidence in the way we propose here means that at any time we can easily integrate new data so that the evidence on which one bases one's conclusions is not just as comprehensive as it should be, but also always up to date. Second, because all the available data have been digitized, one can look for larger patterns and have sustained discussions on what such patterns could possibly mean (which ought to include discussion about statistical significance). Third, our project is a good point of departure for discussions about the methodology of how epigraphical (meta)data currently available in academic texts can be made more generally available according to the principles of FAIR data and software. And fourth and final, because of these principles and because our data are freely available to all, this project embraces the notion that work in this area is a collective effort where anyone interested in these materials and in the questions they raise has free access to them at any moment in time.

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