

Citations in Pollux' *Onomasticon*: Annotation, Visualization, Interpretation

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Abstract: In this paper, we explore the usage of citations within Pollux's *Onomasticon* through distant reading methods. Utilizing an annotated digital edition specifically prepared for this study, we evaluate the quantity, accuracy, and dispersion of citations across the ten books comprising the work. The findings enable us to propose hypotheses regarding the differentiation between the books of the *Onomasticon* in terms of their respective usage of citations.

Pollux's *Onomasticon*: an Atticistic onomasiological dictionary from the 2nd century CE

The *Onomasticon* is a Greek dictionary, consisting of ten books, composed and published in the mid to late 2nd century CE.¹ It displays features that clearly place it within the genre of onomasiological dictionaries. Though its macrostructure is not consistent, it generally organizes content by subject matters and takes as starting point notions rather than words. Its microstructure often adopts a format based on parts of speech and the semantic relations of synonymy and antonymy.² The author of the *Onomasticon*, Julius Pollux, was a rhetorician trained in Athens by Hadrianos from Tyros; around 180 CE, shortly after Commodus assumed the role of sole emperor in Rome, Pollux was appointed to the Chair of Rhetoric in Athens.³ Pollux is part of the Atticistic movement, which sought to impose the model of Attic language of the 5th and 4th centuries BCE on contemporary language use, and his *Onomasticon* serves in general the purpose of this movement.

The ten books of the *Onomasticon* were published at various times within an unknown long period. 177 CE is a *terminus post quem* for the publication of Book 3; the early years of 180's CE is a termi-

1 S. Chronopoulos and D. Spöri collaborated on this article: D. Spöri authored the XSLT script *pollux-sources-ds.xml*, while the XSLT script *pollux-titles.xml* was created by S. Chronopoulos in conjunction with GPT4.0. S. Chronopoulos designed the research, carried out the annotation of the digital edition, created the diagrams, and wrote the article. A preliminary version of the article has been presented by S. Chronopoulos in the Ringvorlesung *Klassikstudien im digitalen Zeitalter* at the University of Regensburg, organized by Sergiusz Kazmierski, to whom we owe valuable comments and remarks.

2 On the main structural features of the *Onomasticon*, see Tosi (2007); the onomasiological tradition in Greek lexicography is discussed thoroughly in Tolkieln (1933), 2437–2440 and 2448–2455; for *Onomasticon* as part of this tradition, see Matthaios (2020), 369–371. On the general features of (modern) onomasiological dictionaries see Schmidt-Wiegand (2002), 738–752, Hüllen (2004), 331–347, and Alexander / Kay (2015); see also Chronopoulos (2016) §1.1–1.4 for the main features the *Onomasticon* shares with modern onomasiological dictionaries.

3 For the chronology of Pollux's carrier see Matthaios (2013), 67–68 and 70–72, who following Avotins (1975) revises the Naechsters hypothesis that Phrynichus' *Eclogae* is partly a critical reaction to *Onomasticon* 1–7 and that *Onomasticon* 10 is a response to Phrynichus' critique.

nus *post quem* for the publication of Book 8.⁴ Thus we may assume the following approximate publication dates:

Books	Publication date
Books 1 and 2	prior to 177 CE
Books 3 to 7	between 177 and the early years of 180's CE
Books 8, 9, and 10	later than the early years of the 180's

Tab. 1: Approximate publication dates for the books of the *Onomasticon*.

Each book of the *Onomasticon* is relatively autonomous, furnished with a prologue in the form of an epistle addressed to Commodus. Despite Pollux not initially envisioning the *Onomasticon* as such a massive work and a cohesive whole, there are indications in the form of backward and forward cross-references from Book 3 onward suggesting the development of such a concept.⁵

All books of the *Onomasticon* share a fundamental characteristic: each is organized by the onomasiological principle. However, they substantially diverge in two aspects:

1. Respectively the variety of their content: There are books with minimal diversity/maximum coherence, listing vocabulary from only one or two related broad onomasiological fields; this type includes Book 2 (age stages of humans and parts of the human body), Book 4 (arts and sciences), Book 7 (trades and craft professions), Book 8 (court and political institutions), and Book 10 (everyday utensils). On the other hand, there are books with a high degree of diversity, listing vocabulary from several, not necessarily related, onomasiological fields; this type includes Books 1, 3, and 9. Finally, there are books that primarily consist of one broad onomasiological field but also contain a number of various small fields and other word lists that do not follow the onomasiological principle; this type includes Book 5 (hunting and varia) and 6 (symposium and varia).⁶

Books	Content coherence
Books 2, 4, 7, 8, 10	1–2 related broad fields
Books 1, 3, 9	several fields
Books 5, 6	1 broad field + varia

Tab. 2: Categorization of the books of the *Onomasticon* according to the coherence of their content.

2. Respectively the density of citations of sources in which specific linguistic elements are attested: One of the *Onomasticon*'s goals, as outlined in the prologues of Books 3 and 6, is to provide references to specific authors and their works, to document infrequently used terms and usages. It also aims to offer support for those terms whose acceptance according to Atticistic criteria is uncertain. Additionally, Pollux uses citations of individual authors, genre indications, dialectal adherence of linguistic elements, and attributions to specific speaker groups in two ways: they serve either as a caution to

4 See Matthaïos (2013), 71–72.

5 First backward cross-reference Poll. 3,96: ἃ δὲ τούτοις πρόσφορα τὸ πρὸ τούτου βιβλίον ἐν τοῖς ἱππασίμοις χωρίοις περιέχει pointing back to Poll. 1,189. First forward cross-reference Poll. 3,145: τὰ μὲν οὖν τῶν μουσικῶν ὀνόματα ἐν τοῖς περὶ μουσικῆς εἰρήσεται pointing to the next book, Poll. 4,56 sqq. In later books there are even some cases of targeted additions to earlier books, as for instance in Poll. 9,44 with cross-reference to Book 4,121: προσαρτιμητέον δὲ τοῖς δημοσίοις θέατρον, καὶ θεάτρον μέρος πρὸς τοῖς προειρημένοις κερκίδα (One must also add to the public places the *theatron*, and as part of the theater additionally to the part of the theater mentioned before the *kerkis*).

6 See Bethe (1913), 776–777 for a brief summary of the contents of each book; Bethe's edition includes at the end of the second volume a detailed list of the contents of each book.

readers to view these elements as potentially problematic by Atticistic standards or as descriptive and explanatory means. Simply reading through the *Onomasticon* leaves a clear impression of the uneven distribution of these citations, both between different books and within sections of the same book.

The transmitted form of the *Onomasticon* can be traced back to an edition by Arethas in the 10th century. This edition was, to some extent, an epitomized version of the source text it was based on, but it also included several additions.⁷ The process of epitomization affected the citations used by Pollux, and based on the trends observed in the extant manuscripts of the *Onomasticon*, it may have taken three forms: complete elimination of a citation, reduction of a citation that includes the author's name and the title of the cited work, or replacement of an individual author's citation with a citation of a genre-based group of authors. For example, the citation of Aristophanes' *Gerytades* in 7,7 is transmitted by manuscripts F, S, and A but is completely omitted by B and C.⁸ The citation of Pherecrates' *Mermykanthropoi* in 7,17 is fully transmitted by manuscripts F, S, and A, whereas manuscripts B and C omit the title. The citation of Amphis in 2,33 is transmitted by manuscripts F, S, and A (παρακόμους δὲ τοὺς κομῶντας Ἄμφις εἴρηκεν ὁ κωμικός), while manuscripts B and C simplify it to a citation of the group "comic poets" (παρακ. δὲ τοὺς κομ. ἔλεγον οἱ κωμικοί).⁹ Bethe's edition aims to reconstruct Arethas' edition by combining the readings of the manuscripts with the goal of attaining the most detailed reading in each case. Given this, it is difficult to arrive at any definitive conclusions about the original *Onomasticon* of Pollux. Nonetheless, the books of the *Onomasticon* present a highly diversified picture, and it seems plausible to assume that this diversity stems from the characteristics of each book in its original form.

The primary goal of this article is to quantify and accurately visualize the uneven distribution of citations across the books of the *Onomasticon* and, thus, allow for a better understanding of a key aspect that distinguishes the different books of this work and separate parts of the same book.

For this purpose, we have created a TEI/XML digital edition of Pollux's *Onomasticon*, based on Bethe's print edition, and have annotated it for structural parts and citations. We then processed the annotated edition to compile a list of cited sources, along with the references to the book and section in which each citation appears. We utilized Tableau Public to visualize the results, producing a bar chart for each book in the *Onomasticon*. The following three sections will discuss this process in detail and present the results. In the fourth section, we will identify and discuss four key insights derived from these visualizations.

Annotation of the digital edition

The text of the *Onomasticon* used for the digital edition is the text E. Bethe prints in his edition (1st volume: Books 1–5, 1900; 2nd volume: Books 6–9, 1931)¹⁰ without any critical marks or critical apparatus. The text, encoded in TEI/XML format, has been provided by the project *Open Greek and Latin* led by Gregory Crane. After further corrections we annotated this text to represent its structural units and the citations.¹¹

7 For the manuscript tradition of the *Onomasticon* see Bethe (1895) and Bethe (1900), II–XIX.

8 F = Parisinus Gr. 2646, S = Salmanticensis Hispan., both of the 15th century, A = Parisinus Gr. 2670 of the 15th century, C = Palatinus Heidelbergensis 375 of the 12th century and B = Parisinus Gr. 2647 of the 13th century.

9 See the apparatus in Bethe's edition and the citation text in K.-A.: Aristophanes fr. 190, Pherecrates fr. 130, and Amphis fr. 49.

10 At <https://archive.org/details/pollucisonomasti01polluoft> (1st vol.), <https://archive.org/details/pollucisonomasti02polluoft> (2nd vol.) (last access 13.06.2023).

11 At https://github.com/s8stchro/pollux-citations-dco/blob/main/diged_pollux_bethe-NamedEntities-for-dco.xml (last access 13.06.2023) the digital edition prepared for this article is available. A digitized text of Bethe's edition of the *Ono-*

Annotating the structural units of Pollux's *Onomasticon*

The division of the *Onomasticon* in ten books originates from Pollux himself. Modern editions employ three types of structural units beneath this level: title-bearing and enumerated chapters and sub-chapters, paragraphs, and enumerated columns or segments. Chapters and sub-chapters following the practice of the medieval manuscripts of *Onomasticon* contain material with a relatively high degree of cohesion. Paragraphs, like chapters, serve as a means of structuring the content according to the text's content. Enumerated columns or segments are units that either emerge from the printed typesetting of the *Onomasticon* or result from a segmentation of its text. This segmentation, although it generally follows the text's logical organization at the microlevel, is arbitrary and is performed to create smaller, citable units.¹²

Bethe's edition uses paragraphs (marked typographically either by an indentation of the first line or by a large space on the same line) and segment numbers printed in the margin to denote the beginning of a new segment somewhere in the line, adjacent to which the number is printed. The segmentation that Bethe adopts can be traced back to the edition of the *Onomasticon* by Lederlin / Hemsterhuis (Amsterdam, 1706);¹³ in that edition, the beginning of each segment, mainly at points in the text after punctuation, is clearly marked by a unique symbol. The collation between the Lederlin / Hemsterhuis and Bethe editions reveals that the latter contains some typos in the segment marking, and in some instances, the precise beginning of a segment is unclear.¹⁴

In the digital edition we prepared, we annotated the book level using a <div3> element, which bears an @n attribute, and we separated each book's prologue from its main body using additional <div4> elements. Inside each of these <div4> elements, we used the <ab> element to annotate the typographically marked paragraphs in Bethe's edition. We annotated the segments using a <milestone> element, which carries an @n and an @unit attribute. The @n attribute represents the number of each section, while @unit consistently carries the value *section*.

In cases of divergence concerning the starting point of a segment between the editions of Bethe and Lederlin / Hemsterhuis, we inserted two distinct <milestone> elements. The one marking the segment's beginning according to Lederlin / Hemsterhuis carries the additional attribute @edRef="#lh1706" and the one that represents the markings in Bethe's edition the attribute @edRef="#b1900" or @edRef="#b1931". In cases of uncertainty about the exact starting point of a segment according to Bethe we decided to place the <milestone>-element at the earliest logically plausible point or, if such a point exists now, before the first word of the line. For the purposes of the extraction of data from the TEI/XML file, the Lederlin / Hemsterhuis <milestone>s are ignored.

masticon without the critical sigla and the apparatus is now available at the site *poesialatina* (HTML): http://www.poesialatina.it/_ns/Greek/testi/Julius_Pollux/Onomasticon.html (last access 10.06.2023) and in the library of Max Plank Institut (XML): https://it-dev.mpiwg-berlin.mpg.de/svn/mpdl-project-content/trunk/texts/eXist/archimedes/el/pollu_onoma_091_el_1900.xml (last access 13.06.2023).

12 A characteristic case exemplifying the arbitrariness of this type of segmentation is the division of the long citation from Aristophanes' *Thesmophoriazusae* b (= fr. 332 K.-A.) in Book 7 in two segments, 7,95 and 7,96.

13 Available in digitized form at <https://mdz-nbn-resolving.de/urn:nbn:de:bvb:12-bsb11054287-8> (last access 13.06.2023).

14 Typos, e.g., in Poll. 2,61 where the text reads: ὡς ἐπὶ τὸ πολὺ γὰρ τὴν πῆρωσιν μετὰ προσθήκης τῶν ὀφθαλμῶν λέγουσιν, ὡς ἄνευ προσθήκης ἄδηλον ὃν ποίου μέρους ἢ πῆρωσίς ἐστιν. ἀνάπηρος δ' ἐστὶν ὁ πᾶν τὸ σῶμα πεπηρωμένος, ὡς Ἰσαῖος ἐν τῷ κατὰ Ἀρεσαίχμου «κατέλιπεν ἐν τῷ χωρίῳ γέροντας καὶ ἀναπήρους». ; Lederlin / Hemsterhuis mark the beginning of section 61 at the word ἀνάπηρος, Bethe prints the number 61 in the margin beside the line σῶμα πεπηρωμένος [...] κατὰ Ἀρεσαίχμου which does not seem to make much sense since it is difficult to find a point of logical pause; the same is true for the next section, Poll. 2,62. It is impossible to figure out with certainty the exact starting point of the section, e.g., Poll. 1,187; 1,206 (where the text printed by Bethe differs considerably from the one in Lederlin / Hemsterhuis' edition).

It must be noted that Bethe's enumeration of segments displays some gaps. Between the prologue of each book and the first segment of its main text, Lederlin / Hemsterhuis print an analytical table of contents of the book, based on indications of the manuscripts; these tables of contents were also included in the segment enumeration. Bethe follows Bekker (1846) and omits this table of contents from this point. Hence, in Bethe's version, in each book the prologue covers segments 1 and occasionally 2, and the first segment of the main text is numbered between 5 and 10, depending on the length of the table of contents in the Lederlin / Hemsterhuis edition. There are additional gaps where Bethe's text-critical decisions produce a text that diverges from older editions.¹⁵ For example, in segments 2,114–117, Bethe omits segments 115 and 116 as later additions, following manuscript B. Consequently, the text he prints jumps from segment 114 to 117. In rare cases, there are gaps in the segment enumeration due, obviously to typos, as, for instance in 6,191–193, where 6,192 has been omitted. These gaps mean that the final segment number in each book does not accurately reflect the actual number of segments the book contains.

Annotating citations in Pollux's *Onomasticon*

The annotation of the citations in the *Onomasticon* requires an exact definition of the elements to be annotated and a comprehensive understanding of the different forms in which these elements may appear.

We have divided the citations into two levels: the first level contains a general identification of the source, be it, for example, the name of an author, the identification of an author group, or the name of a collection of inscriptions. The second level contains a more precise identification of the specific work in which a linguistic element is to be found. This division is implied by Pollux himself in the prologue to Book 6, where he presents a hierarchy of citation information. It starts from the most general level, οἱ μάρτυρες (the witnesses), progressing to a more specific level, τὸ χωρίον ἐν ᾧ τοῦνομα (the reference to the passage in which the word appears), and ultimately ends at the level of the quotation of the passage itself (τὴν λέξιν αὐτήν).¹⁶

Annotating individual authors and groups of authors/speakers

On the first level, the most general identification of a source, we find different citation types that fall into two distinct categories:

1. Citation of individual authors.
2. Citation of groups of authors or speakers and citation of genres or collections of texts not connected with specific authors.

All individual authors mentioned in the *Onomasticon* are included in a <listPerson> (list of persons), all groups of authors/speakers and the genres and collections of texts are included in a <listOrg> (list of organizations). Both lists are placed in the <sourceDesc> within the file's header.

Each <person> entry within the <listPerson> possesses an @xml:id to reference individual authors in the file and a unique identifier. The identifier points to the author's CTS identifier provided by the Perseus Catalog. If no such identifier exists because the author is not included in the Perseus catalog, it points to the identifier provided by *wikiData*. In rare cases where no *wikiData* identifier exists, the identifier provided by the *Digital Athenaeus project* is used. For Sophocles Amphikleidou Sounieus, the proposer of a decree, we use the identifier provided by the database of the *Lexicon of Greek Personal Names (LGPN)*; for Pantoleon (mentioned among other authors of cookbooks in Poll. 6,71) we

15 Cf. the transposition of segments 149–150 just after segment 145 in Book 6, realized already in Bekker's edition.

16 For this hierarchy ("scala crescente di precisione") in the prologue to Book 6 of the *Onomasticon* see Tribulato (2018), 263–264.

use as identifier the URL pointing to the article of RE devoted to him.¹⁷ Identification problems arise for authors named Plato (in Poll. 1,42; 6,196; 6,200; 8,30 [2x]; 9,26; 9,139), Antiochos (Poll. 6,100), and Theodoros (Poll. 10,188). To document these problems in the file, at the points where the names of these persons appear, we include in the <listPerson> entries all possible identification candidates.

```
<person xml:id="theodoros_phok" sameAs="https://www.wikidata.org/wiki/Q65956732">
  <persName nymRef="Theodoros">
    <forename>Θεόδωρος</forename>
    <addName>ὁ Φωκαεύς</addName>
  </persName>
</person>
<person xml:id="theodoros_sam" sameAs="https://www.wikidata.org/wiki/Q3286634">
  <persName nymRef="Theodoros">
    <forename>Θεόδωρος</forename>
    <addName>ὁ Σάμιος</addName>
  </persName>
</person>
```

The <org>-entries in the <listOrg> include citations of genres or collections of texts not connected with specific authors, examples include as *παροιμία* (the proverb) and *Δημιόπρατα* or *Ἀττικαὶ στήλαι* (group of inscriptions documenting goods seized by public authority, and put up for sale);¹⁸ citations of authors or speakers grouped together on the basis of the genre of their works (e.g., οἱ ποιηταί), their chronology (e.g., οἱ παλαιοί, οἱ νῦν), their dialects (e.g., Δωριεῖς) or their adherence to the approved authors by Atticistic criteria (e.g., οἱ δόκιμοι); and adjectives that characterize a linguistic element as belonging particularly to a specific genre or a specific linguistic register, such as *διθυραμβῶδες* (characteristic for the *dithyramb*), *κωμικότερον* (suited for comedy and not for standard usage), or *ιδιωτικόν* (suited for non-formal speech).¹⁹

Each entry includes an @xml:id that is used to reference instances of authors, speaker groups, genres, or text corpora. The values of this @xml:id are determined based on a standardized vocabulary list, created using the material provided by the *Onomasticon*. This list is categorized into four basic groups (*undefined*, *Atticistic criteria/register*, *language/dialect*, *genre*), with an additional mixed category (*genre & dialect*). Entries in each category can either be simple, consisting solely of a term (e.g., *poetry*), or composite, consisting of a main term and subterms in hierarchical order, separated by a period (e.g., *poetry*, *poetry.comedy*, *poetry.comedy.new*). The vocabulary for these categories is presented in the table below.

undefined	Attic. criteria / register	Language / dialect	Genre (except inscriptions)	Genre & dialect	Inscriptions
undefined	canonical-authors	greek	poetry	poetry.comedy.sicilian	attic-decrees
	palaioi	latin	poetry.tragedy	poetry.doric	Demioprata/ attic stelae

17 *Perseus* Catalog: <https://catalog.perseus.org/> (last access 13.06.2023); *wikiData*: <https://www.wikidata.org> (last access 13.06.2023); *Catalog of Digital Athenaeus Project*: <https://www.digitalatheneus.org/tools/Catalog/> (last access 13.06.2023); *Lexicon of Greek Personal Names Database*: <http://clas-igpn2.classics.ox.ac.uk/> (last access 13.06.2023); *Paulys Realencyclopädie der classischen Altertumswissenschaft* digitized in *Wikisource*: https://de.wikisource.org/wiki/Paulys_Realencyclopädie_der_classischen_Altertumswissenschaft (last access 13.06.2023).

18 For these inscriptions as cited and used in *Onomasticon* see Pippin (1956).

19 Matthaios (2013) treats in detail the following groups of this category: οἱ νῦν (p. 81–95), οἱ πολλοί (p. 93 and 95–105), οἱ ἰδιῶται (p. 105–114), οἱ ποιηταί (p. 114–117) and οἱ παλαιοί (p. 117–124).

Digital Classics Online

	neoi	thracian	poetry.comedy	poetry.hymns. attic	Olympic-stele/ olymp- apographe
	hoi-nyn	mariandynian	poetry.comedy. old	prose.ionic	attic-law
	hoi-polloi	aethiopian	poetry.comedy. middle	prose.aeolic	law-of-king
	idiotes	ionic	poetry.comedy. new	prose.attic	attic-decrees
	women	byzantine	poetry.dithyramb		
		attic	poetry.orphica		
		attic.ancient	poetry.epigram		
		doric	prose		
		laconian	prose.oratory		
		tarantinian	prose.philoso- phy.stoa		
		doric.italic-si- cialian	prose.medicine		
		doric.sicilian	prose.medicine. old		
		sicilian	prose.platonic- corresp		
		cretan	proverb		
		aeolic	game		
		boeotian	prose.oratory		
		theban	prose.philosophy. stoa		
		thessalian	prose.medicine		
		argive	pros- e.medicine.old		
		sikyonian	prose.platonic- corresp		
		aegyptian	proverb		
			game		

Tab. 3: Normed vocabulary used for the @xml:id's values within <orgName>.

Authors who are cited in the *Onomasticon* as sources of linguistic or encyclopedic information are referenced in five different forms, for which we use the following annotation patterns:

Citation form	Annotation
1. Citations by name (e.g., Πλάτων).	<persName> and within it <forename>
2. Citations by name and an additional descriptor (e.g., Πλάτων ὁ κωμικός, ὁ Σολεὺς Κλέαρχος).	<persName> and within it <forename> and <addName>
3. Citations solely by a descriptor (e.g. ὁ Ἀθηναῖος σοφιστής, for Isocrates in Poll. 2,95).	<persName> and within it <addName>
4. Citations by an adjective formed from their name, such as ὀμηρικόν (Poll. 4,171; 6,97; 6,125; 9,52) and ξενοφώντειον (Poll. 1,112).	<persName> and within it <forename>
5. Citations by a referential phrase like “the same as mentioned before” (ὁ αὐτός) or a combination consisting of such a phrase and a descriptor (e.g., ὁ αὐτὸς ποιητῆς [the same poet as mentioned before] in Poll. 10,104). ²⁰	<persName> and within it <rs>

Tab. 4: Citation forms and annotation patterns for individual authors.

With regard to the descriptors involved in the second and third citation forms, it is crucial to note that they belong to different categories and serve distinct purposes. In addition to the descriptors typically used to identify individuals and distinguish between homonyms, such as genre descriptors and *ethnika*, the *Onomasticon* occasionally uses descriptors to signify that a particular author’s language use is influenced by the genre of their work or the dialect they employ. Consequently, this serves to alert users of the lexicon, either explicitly or implicitly. A case in point is the descriptor Ἴων καὶ ποιητῆς ἀνὴρ affixed to the name of the lyric poet Anacreon in Poll. 3,98. Anacreon is cited 13 times in the *Onomasticon*; in twelve of these citations, Pollux uses only his name, which indicates that the name alone is enough to identify the poet unmistakably. The descriptor in Poll. 3,98 is added in order to underscore the information that the form ἦσε (of the verb ἦδω/ἦδομαι) attested by Anacreon is a poetic and Ionic form not to be used by speakers who want to observe the Atticistic criteria.

For the purposes of the annotation, these distinct purposes are not taken into account; all descriptors used to apply some characteristic to an author or to refer to them are annotated by <addName> within the <persName> element.

In cases in which the content of an <rs> or <addName> element is discontinuous, we use the @prev, @next attributes. For example in:

<rs xml:id="ho-10-15" next="#au-10-15">ὁ</rs> δ' <rs xml:id="au-10-15" prev="#ho-10-15">αὐτὸς ῥήτωρ</rs>

In these cases as well as in cases in which <forename> and <addName> do not follow each other continuously in the text, we use the <join> element nested within the <persName>-element. This ensures that we annotate all elements used to cite an author and prevents the same citation from being read as two different citations. For instance:

²⁰ In two cases Pollux uses a citation consisting of the pronoun phrase ὁ αὐτός and the name of an author to indicate that he refers to the author also mentioned just previously (7,50: ὁ δ' αὐτὸς Ξενοφῶν and 7,160: ὁ δ' αὐτὸς Δείναρχος); in these cases we annotate only the name of the author.

Poll. 10,15: <rs xml:id="ho-10-15" next="#au-10-15">ὁ</rs> δ' <rs xml:id="au-10-15" prev="#ho-10-15">αὐτὸς ῥήτωρ</rs><persName ref="#isaios"><join target="#ho-10-15 #au-10-15"/></persName>

Poll. 10,11: <forename xml:id="pl-10-11">Πλάτων</forename> ἐν τῇ Ἑλλάδι εἴρηκεν <addName xml:id="ko-10-11">ὁ κωμικός</addName><persName ref="#platon_com"><join target="#pl-10-11 #ko-10-11"/></persName>

In cases of uncertain identification of an author, we provide the <persName> with two space-separated values in @ref, as for instance for Theodoros in Poll. 10,188:

ἐν γοῦν τῇ τοῦ νεὸ ποιήσει, ἦν ἢ <persName ref="#philon"><forename>Φίλων</forename></persName> ἢ <persName ref="#theodoros_sam #theodoros_phok"><forename>Θεόδωρος</forename></persName><note resp="bethe">(?)</note> συνέθηκε

For a proper understanding and evaluation of the quantitative results based on this annotation, it is important to note that in the *Onomasticon*, depending on the formulation, there is no 1:1 equivalence between a cited source and a linguistic element.

In several cases, the name of an author is cited only once, even though they are the source of more than one term or usage. For instance, in Poll. 5,96, Aristophanes is cited as the source both for *strophion* and *opisthosphendone* (καὶ πυλεῶνας παρὰ Καλλιμάχου καὶ κάλυκας παρ' Ὀμήρου καὶ Ἀνακρέοντος καὶ στρόφιον καὶ ὀπισθοσφενδόνην παρ' Ἀριστοφάνους = Ar. fr. 332,4 and fr. 664,1 K.-A.).

Conversely, there are also cases where the cited author is mentioned twice in a formulation that presents them as the source of only one linguistic element. For instance, in Poll. 10,41, for the reference to the same linguistic element – the usage of the word *knephallon* to denote the material used for stuffing cushions or pillows (see LSJ, s.v. κνέφαλλον) – Pollux cites the comedy *Pantaleon* attributed to Theopompus the comic poet and refers to the poet in two instances (= fr. 46 K.-A.), using in the first one his name (ἐν Πανταλέοντι Θεοπόμπου) and in the second one a descriptor (ὁ ποιητής). A characteristic instance of the same phenomenon appears in Poll. 1,78–79, where Menander is mentioned two times, once by his name and once by the pronoun αὐτοῦ:

τῶν δὲ οἰκιῶν πρόδομος καὶ δῶμα καὶ δωμάτιον καὶ κοιτῶν· εἰ γὰρ καὶ Μένανδρος αὐτὸ βαρβαρικὸν οἶεται, ἀλλ' Ἀριστοφάνης ὁ κωμωδοδιδάσκαλος τὰ τοιαῦτα πιστότερος αὐτοῦ, εἰπὼν ἐν Αἰολοσίκωνι «κοιτῶν ἀπάσαις εἰς, πύελος μί' ἀρκέσει».

In some cases, a citation of a group of authors annotated by <orgName> and an author citation annotated by <persName> are the cited sources of one and the same linguistic element. For instance, in Poll. 6,125, Aristophanes is cited as the source of the word *thymagroikos*, which is characterized as κωμικότερον (“more suitable for comedy rather than typical use”). In this case, Aristophanes’ name is annotated by <persName> and the characterization κωμικότερον by <orgName>.

A similar but not identical situation is the citation of a group of authors as the source for a linguistic element, followed by the citation of individual authors belonging to this group as sources for passages exemplifying the usage of the element in question. For instance, in Poll. 10,11–12, the source for the usage of the word *μαλακά* to denote household utensils in general (see LSJ s.v. μαλακός I.2) is cited as the group of the *neoterói* (here meaning: comic poets belonging to the period of Middle and New comedy);²¹ to document this information, Pollux cites Menander and Diphilus and quotes a passage from each, demonstrating the usage of the word in question.

²¹ See Nesselrath (1990), 80–81.

Finally, there is a small number of cases, in which either the author of a work is contested or it is not certain if the linguistic element under discussion appears in the work of a certain author or the work of another author bearing the same title. In some of these cases Pollux cites both authors using a formulation to express the identification problem. For instance, in 10,85 Pollux cites the poem Κεραμεῖς which is to be attributed either to an anonymous poet (τοῦ ποιήσαντος τοὺς Κεραμέας) or, according to some scholars, to Hesiod (οὓς τινες Ἡσιόδῳ προσνέμουσιν); in Poll. 10,170 he cites a work entitled Φυσικά, which may be either the *Physics* attributed to Aristoteles or the *Physics* attributed to Theophrastus (καὶ ἐν Ἀριστοτέλους δὲ ἢ Θεοφράστου Φυσικοῖς).

Annotating “titles” of works

On the second level of identification, we have citation types that can be considered as *titles*. These titles are references to specific sources without quotation marks. They include general references to an author’s works (e.g., 4,174: Σόφρων ἐν τοῖς γυναικείοις μίμοις), titles, such as drama titles or titles of platonic dialogues (e.g., 6,187: παρ’ Εὐριπίδῃ ἐν Ὁρέστη, 7,109: Σοφοκλῆς ἐν Ἡρακλεῖσκῳ σατυρικῷ; 7,63: Κράτης δ’ ἐν Σαμίοις; 10,48: ἐν Εὐθυδήμῳ Πλάτωνος), titles of rhetorical speeches (e.g., 2,152: Ὑπερείδης δ’ ἐν τῷ ὑπὲρ Λυκόφρονος), descriptive references to works (e.g., 7,34: Αἰσχίνης Τιμάρχου κατηγορῶν), references to book numbers (e.g., παρ’ Ἀλκαίῳ ἐν δευτέρῳ τῶν μελῶν), or references to specific parts of a work (e.g., 10,182: Θουκυδίδου εἰπόντος ἐν τῇ Πλαταϊκῇ πολιορκίᾳ).²²

In addition to these title citations, the *Onomasticon* sometimes cites works using a word or phrase that refers back to a previously cited title; for example τῷ αὐτῷ δράματι (Poll. 9,67) or ἐκεῖ (10,69).

All the titles mentioned in the *Onomasticon* are included in a <listBibl> (list of bibliography) within the <sourceDesc> section of the file’s header. Each title has a separate <bibl> element in this list, which contains an <author> and a <title> element. In the case of references to specific books or parts of a work, separate title entries are created. Each <title> entry includes an @xml:id that is used to reference instances of titles. Each <author> entry includes an @ref pointing to the @xml:id of the <person> within the <listPerson>.

The list of titles includes four special cases: Pollux cites four epigrams in 4,92, 4,102, 5,46, and 8,131. For one of these, the epigram for Hippaimon, we know the author, Peisandros of Rhodos, from other sources.²³ We have included the author in the <listPerson> and we refer to him in the annotation of the title, although Pollux does not mention him:

οὐ μὴν οὐδ’ ὁ Μάγνης κύων, τὸ Ἴππαιμόνος κτῆμα, ὁ Λήθαργος ἀνώνυμος, ὃς τῷ δεσπότη
 συντέθειται, καθάπερ μνηύει <title ref="#peisandros-hippaimon-epigr">τοῦπίγραμμα</
 title><note resp="bethe">(A P VII 304)</note>· <milestone n="47" unit="segment"/
 ><q><l>ἀνδρὶ μὲν Ἴππαιμών ὄνομ’ ἦν, ἵππῳ δὲ Πόδαργος</l><l>καὶ κυνὶ Λήθαργος καὶ
 θεράποντι Βάβης</l></q>

In the other three cases the authors of the epigrams are not known. We have created entries in the <listPerson> representing this fact, as, for instance:

```
<person xml:id="anonymus-anthem-epigr">
  <persName nymRef="Anonymus.Athemion-epigram">
    <forename>Anonymus</forename>
    <addName>author of the <title ref="#anthemion-epigr">"Anthemion epigram"</
  title></addName>
```

22 For the forms of the titles of classical works in antiquity see Lohan (1890) and Jacob (2000).

23 See the entry in Anth. Gr. 7,304: <https://anthologiagraeca.org/passages/urn:cts:greekLit:tlg7000.tlg001.ag:7.304/> (last access 13.06.2023). For the other three epigrams see: De Ste Croix (2004), 70–72 for the *Anthemion epigram* in 8,131; Della Bona (2017), 144–147 for the *Archias epigram*, and Reisch (1897), 391 for the *Bibasis epigram*.

```
</persName>  
</person>
```

In the `<bibl>` entry within the `<listBibl>` we refer to these entries, as for example:

```
<bibl xml:id="anthemion-epigr">  
<author ref="#anonymus-anthem-epigr"/>  
<title>ἐπίγραμμα</title>  
<note>Cited also by [Aristoteles] Athenaion Politeia 7.4.</note>  
</bibl>
```

Results and visualization

Our aim is to use the annotated edition to achieve an exact quantification and visualization of the uneven distribution of citations between the books and the sections of each book of the *Onomasticon*; on the basis of this quantification and visualization we attempt to formulate some interpretative hypotheses related to the composition of the *Onomasticon*.

The process of quantification and visualization consists of two distinct steps:

1. The preparation of the XSLT scripts to get CSV files with lists of citations in the *Onomasticon*.²⁴
2. The preparation of different visualizations based on the CSV files.

As a result of two XSLT scripts we get two CSV files with the following structure:

the file `pollux-sources.csv`, with the columns: *source*, *type*, *section-nr*, *book-nr*. The *source* column contains the value/values of the `@ref` of the `<persName>`s and the `<orgNames>`, the *type* column contains the values *individual* for `<presNames>` and *group* for `<orgNames>`, the following two columns locate the citation in segment and book. The script exports entries not only for each `<persName>` and `<orgName>` but also for each `<milestone>`, in which case, the columns *source* and *type* are empty.

the file `pollux-titles.csv`, with the columns: *title-ref*, *title-text*, *author*, *section-nr*, *book-nr*. The *title-ref* column contains the value/values of the `@ref` of the `<title>`s, the *title-text* column contains the title as it appears in its standard form in the entry within the `<listBibl>`, the *author* column contains the name/names of the author(s), and the two last columns locate the cited title in segment and book. The script exports entries not only for each `<title>` element but also for each `<milestone>`, in which case, the columns *title-ref*, *title-text*, and *author* are empty.²⁵

For the visualization of the data based on these two CSV files we used *Tableau Public*. The results are accessible under <https://public.tableau.com/app/profile/stylianos.chronopoulos/viz/pollux-distribution-sources-dco> (last access 13.06.2023). The method used for each diagram is discussed in the next section.

24 The XSLT scripts are available at: <https://github.com/s8stchro/pollux-citations-dco/blob/main/pollux-sources-ds.xsl> (last access 13.06.2023) and <https://github.com/s8stchro/pollux-citations-dco/blob/main/pollux-titles.xsl> (last access 13.06.2023).

25 The CSV files are available at: <https://github.com/s8stchro/pollux-citations-dco/blob/main/pollux-sources.csv> (last access 13.06.2023) and <https://github.com/s8stchro/pollux-citations-dco/blob/main/pollux-titles.csv> (last access 13.06.2023).

Visualizing and evaluating the uneven distribution of citations

The primary objective of the first two diagrams is to test the initial impression a reader might derive from the *Onomasticon* – the notably uneven distribution of citations across different books and within sections of the same book. The first diagram is a heatmap that displays the absolute number of citations in each segment across all ten books, providing a comprehensive and precise view of how each book differs from the others in terms of citation distribution. The second diagram consists of a series of stacked charts, one for each book of the *Onomasticon*. These charts detail the distribution of citations within segments and can even be used as starting points for close reading interpretations.

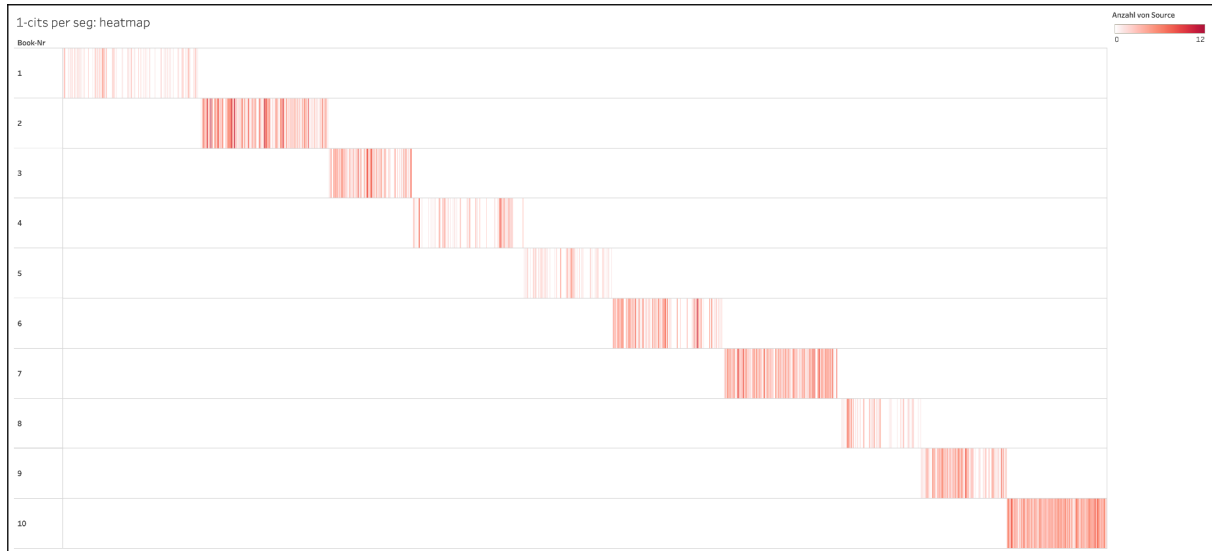


Fig. 1: Diagram 1, citations per segment in the ten books of the *Onomasticon*.

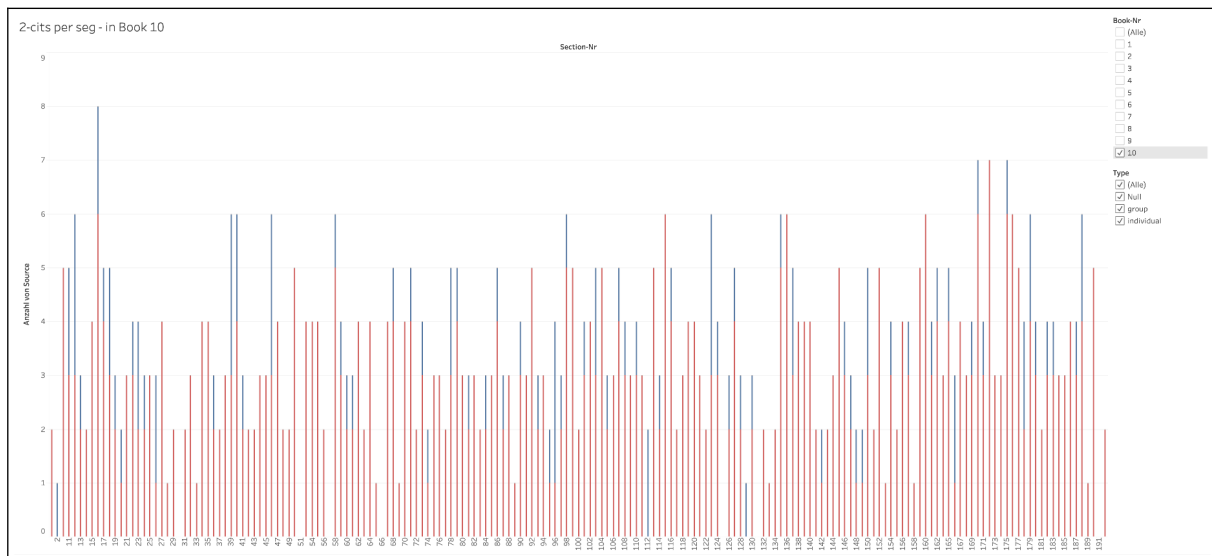


Fig. 2: Diagram 2, citations per segment in each book of the *Onomasticon* (here, e.g. the diagram of Book 10).

In addition to confirming the general impression of uneven citation distribution, these two diagrams suggest a classification for the books of the *Onomasticon* based on this criterion. Firstly, Books 1, 4, 5, and 8 display fewer citations and have a few, narrow clusters of segments with a relatively higher number of citations. Conversely, Books 2, 7, and 10 exhibit a noticeably higher number of citations with very few windows without any citations and a few windows with a higher citation number. Books 3 and 9 display a similar image, in which, though, the distribution seems to leave larger windows with no or few citations. Lastly, Book 6 presents a split image: its first part closely resembles the books of

the second group with a high number of citations and very few segments without citations, whereas its latter half mirrors the characteristics of the first group with fewer citations and large areas without citations.

Books	Number of citations – distribution
Books 1, 4, 5, 8	few citations, many and large areas without citations
Books 2, 7, 10	plenty of citations, but few areas without citations
Books 3 and 9	plenty of citations, more areas without distribution
Book 6	split image

Tab. 5: General impression of the number of citations and their distribution in the books of the *Onomasticon*.

The split image of Book 6 can be directly correlated to its mixed content (see above, Tab. 2); the first part, dedicated to the onomasiological field *symposium*, displays a relatively higher number of citations and a relatively even distribution. The second part, in contrast, displays the converse trend. The diagram indicates that the transition between the two parts occurs around segment 106. Indeed, the section on the *symposium* actually ends at segment 112.

It appears impossible to draw such a correlation for the other books. For example, Book 2 and Book 8 fall into the same category concerning their content coherence (1–2 broad onomasiological fields), yet they belong to opposite categories with respect to the number of citations and the evenness of their distribution. However, the differentiation of Books 3 and 9 from Books 2, 7, and 10 may be partially attributed to their content diversity. While the former possess a high degree of coherence, the latter present a more varied content.

The third diagram is a box-and-whisker plot, which factors in the number of segments in each book to calculate the average number of citations per segment. Given the variable lengths of the books, this calculation provides a more accurate picture than the raw number of citations per book.

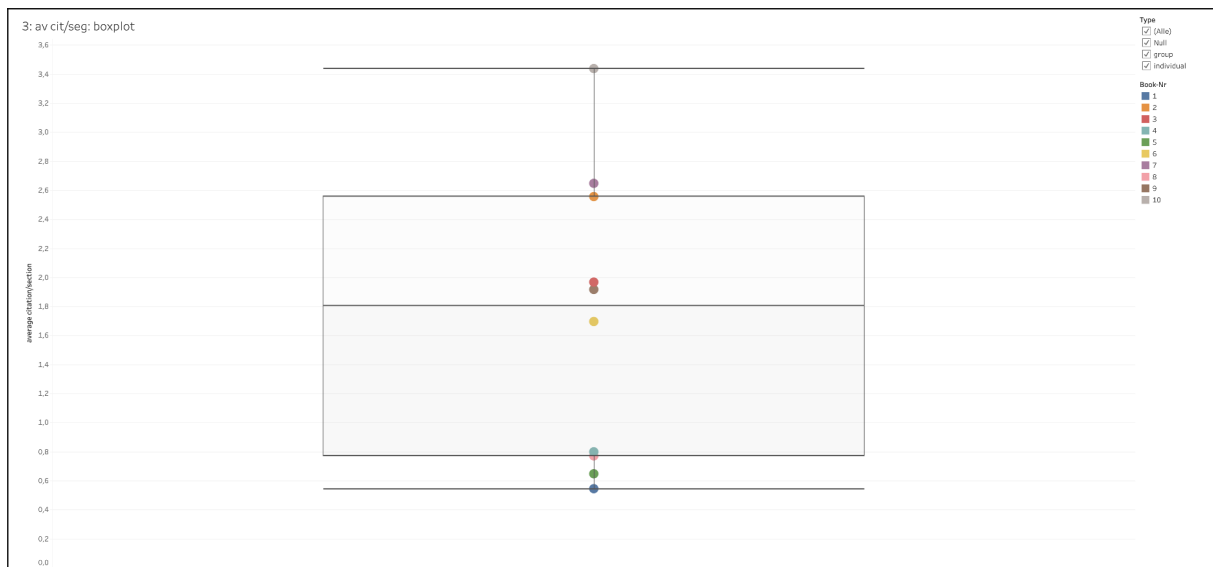


Fig. 3: Diagram 3, average citations per segment in the ten books of the *Onomasticon*.

This diagram reinforces the impressions gained from the previous two and offers further precision. Books 10, 7, and 2 are situated in the upper whisker: Book 10, with an average of 3.42 citations per segment, stands out as a clear outlier, while Books 7 and 2 are situated near each other, either outside or on the edge of the interquartile range. In contrast, at the lower end of the chart, Books 4, 8, 5, and 1

can be found near each other, again either outside or on the edge of the interquartile range. Lastly, within the interquartile range are Books 3, 9, and 6, situated near the median line; Books 3 and 9 are very close to each other above the median, whereas Book 6 stands alone,²⁶ slightly below the median.

The general image described above regarding the properties of each book, particularly the number and distribution of citations, undergoes a slight shift when considering the diversity of the cited authors and groups. The fourth diagram contrasts the previous box-and-whisker plot with a new one, which calculates and visualizes the average number of unique citations per segment.

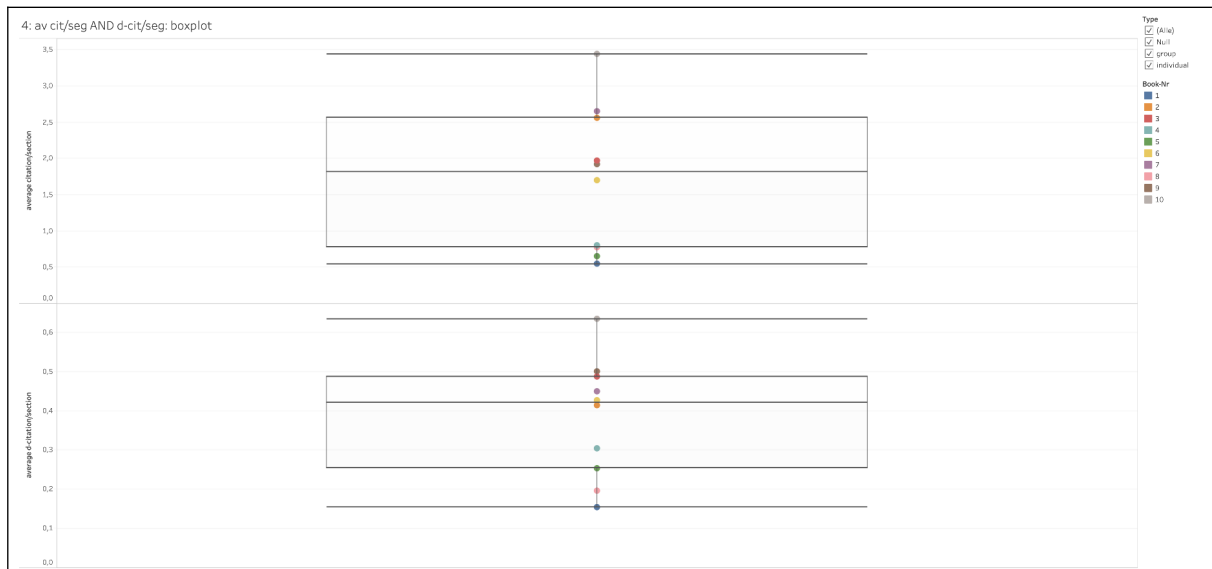


Fig. 4: Diagram 4, average citations per segment in comparison to average unique citations per segment in the ten books of the *Onomasticon*.

In this comparison, Book 10 and Book 1 notably stand out as outliers at the top and bottom of the plot, respectively: Book 10 exhibits the greatest variety, while Book 1 exhibits the least. Books 4, 5, 8, and 1 are more closely grouped. The noticeable shift is in the position of Books 2, 7 and 9. Book 9 and Book 3 are close to or on the edge of the interquartile range; conversely, Books 7 and 2 are placed close to the median line. Book 6 moves slightly above the median line, almost overlapping with Book 2.

To summarize thus far: concerning the number of citations, distribution, and variety, the first and last books of the *Onomasticon* sit at the two extremes. Book 2 features a high number of citations, which are distributed fairly evenly across the entire book. However, it often cites the same sources multiple times, with its variety of citations aligning with the median. Similarly, Book 7 possesses an equally high number of citations but a lesser degree of variety. Books 3 and 9 display similar characteristics to each other: a count of citations near the median line and a relatively high degree of variety, especially for Book 9. Generally, Books 4, 5, and 8 present relatively low citation counts and a limited degree of variety. Finally, for both measures, Book 6 remains very close to the median line.

Visualizing and evaluating the relation between citations of individuals and groups

The distinction between individual authors and collective sources introduces an additional metric: the group-to-individual ratio. This metric could provide further insights about variations in citation use across the *Onomasticon*'s books. In terms of group citations, genre groups make up a significant majority in Books 1–5,²⁷ and a notable portion in the remaining books (see Diagram 5 below). Often, these group citations provide a broad source identification instead of a specific one. In this context,

²⁶ For a close reading study of Book 6 signaling its special place in the corpus of the *Onomasticon* see Venuti (2000).

group citations represent, to a considerable extent, a trend towards generalization, while individual author citations imply a trend towards specificity.

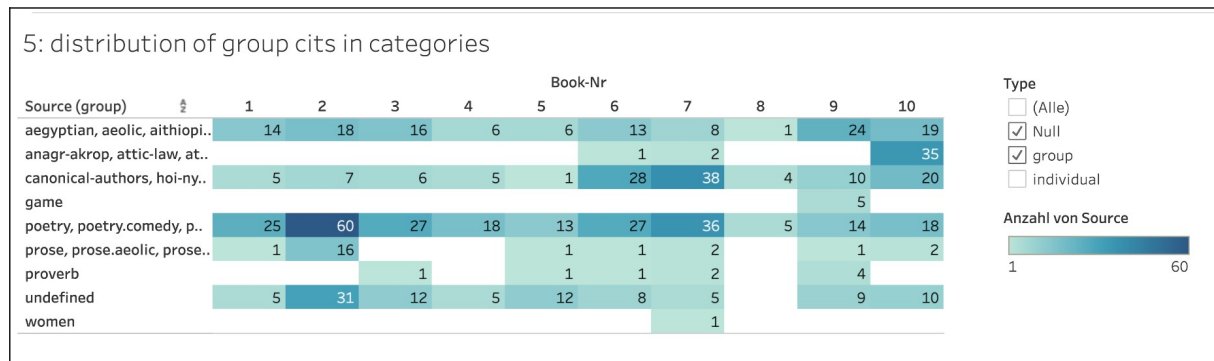


Fig. 5: Diagram 5, distribution of the citations of groups in the ten books of the *Onomasticon*.

The sixth diagram presents the absolute number of group and individual citations per book via a stacked chart. The seventh diagram is a highlight table displaying the books according to the group sources to individual sources ratio in descending order.²⁸

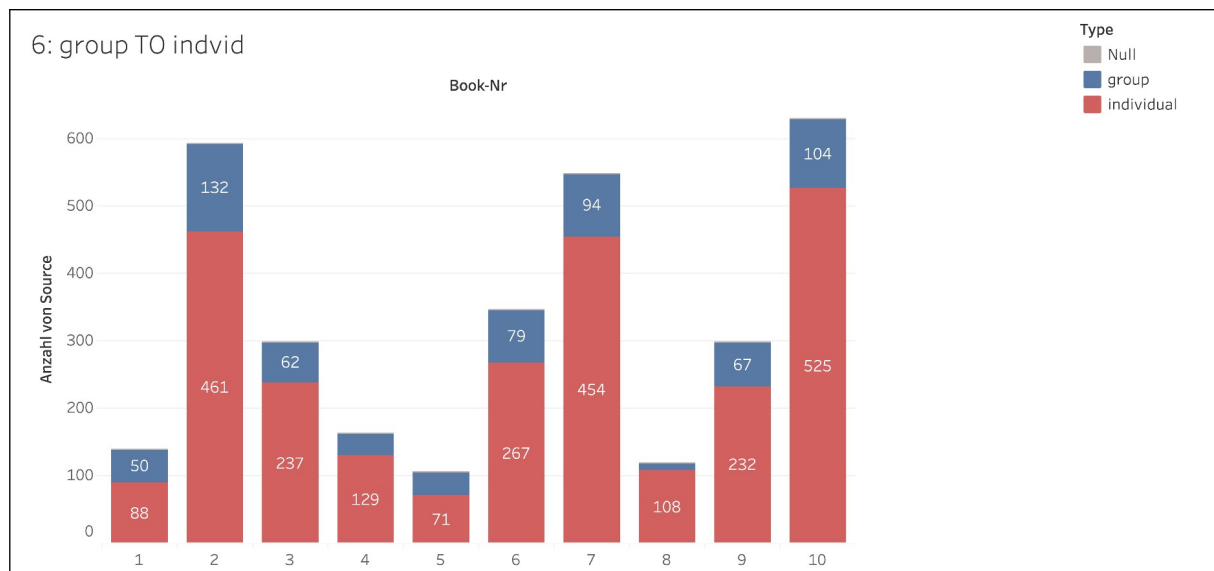


Fig. 6: Diagram 6, group citations in comparison to individual citations in each book of the *Onomasticon*.

27 In Book 2 most of the cases of *undefined speakers* refer actually to some medicine writers or representatives of a specific medical school.

28 We have preferred here this type of chart and not the box-and-whisker plot because several values overlap and the visualization would not be clear.

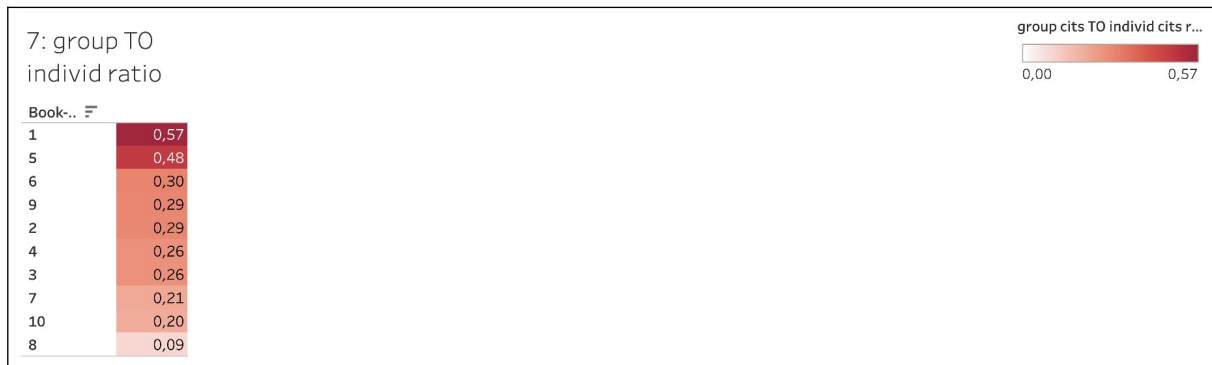


Fig. 7: Diagram 7, average group citation to individual citation ratio in each book of the *Onomasticon*.

The results do not align with the tendencies suggested by the previous measures concerning the clustering of the books. Book 1, with its fewer citations, displays a relatively large number of group citations in comparison to its total citation count and emerges as an upper outlier in the plot. Conversely, in contrast, Book 8, which also has a minimal number of citations, seems to avoid group citations and stands out as a lower outlier. Books 2–4 and 6–10 display a noticeable similarity with respect to this metric, falling within the interquartile range or very close to it. Finally, Book 5 is more closely aligned with Book 1 than any other book; its placement in the plot can be explained similarly to that of Book 1.

It must be noted that in each of the Books 2–4 and 6–10 the group-to-individual ratio is due to different reasons. For example, in Book 2 besides a considerable portion of genre-based groups we observe also a high number of undefined speakers. On the other hand, in Book 10 the frequent citation of inscriptions contributes significantly to the relatively high ratio.

Visualizing and evaluating the relation between citations of individuals/groups and citations of titles

The final metric we introduce is based on the citations of titles in the *Onomasticon*. We calculate the average number of titles cited in a book, divide this number by the average number of individual authors cited (excluding group citations), and plot the ratio of these measures in a box-and-whisker plot.

The diagram provides a clear picture: the median line is positioned near the bottom of the plot, and the difference between the outlier Book 1 and Books 2, 3, 5, and 8 is notably small. Book 6 is also close to this group, positioned just above the median line. Book 4 appears to be a special case, located at the hinge marking the upper half of the interquartile box. Books 7, 9, and 10 are situated at the upper hinge of the interquartile box, within the first third of the upper whisker, and at the upper extreme of the plot, respectively. It seems that starting from Book 7 – with the exception of the citation-poor Book 8 – the *Onomasticon* progressively uses more titles, perhaps in pursuit of greater precision.

The placement of Book 4 can serve as an illustrative example of how these measures should be combined with a close reading to draw conclusions. Book 4 features relatively few citations (as evidenced by its placement in diagram 3). The subsequent diagram, which depicts the distribution of title citations across the book, reveals a notably high concentration in the segments around 110 and 174. In the former case, titles of dramas are cited in a section presenting vocabulary related to dramatic choruses, offering specific examples of particular theatrical phenomena. In the latter case, within a section about measures and weights (4,166–175), it's evident that the book exhibits a high concentration of citations in general, including the citation of titles (especially in the section about weights, 4,171–176). It is plausible to suggest that Pollux employs a secondary source here that strongly documents its material.

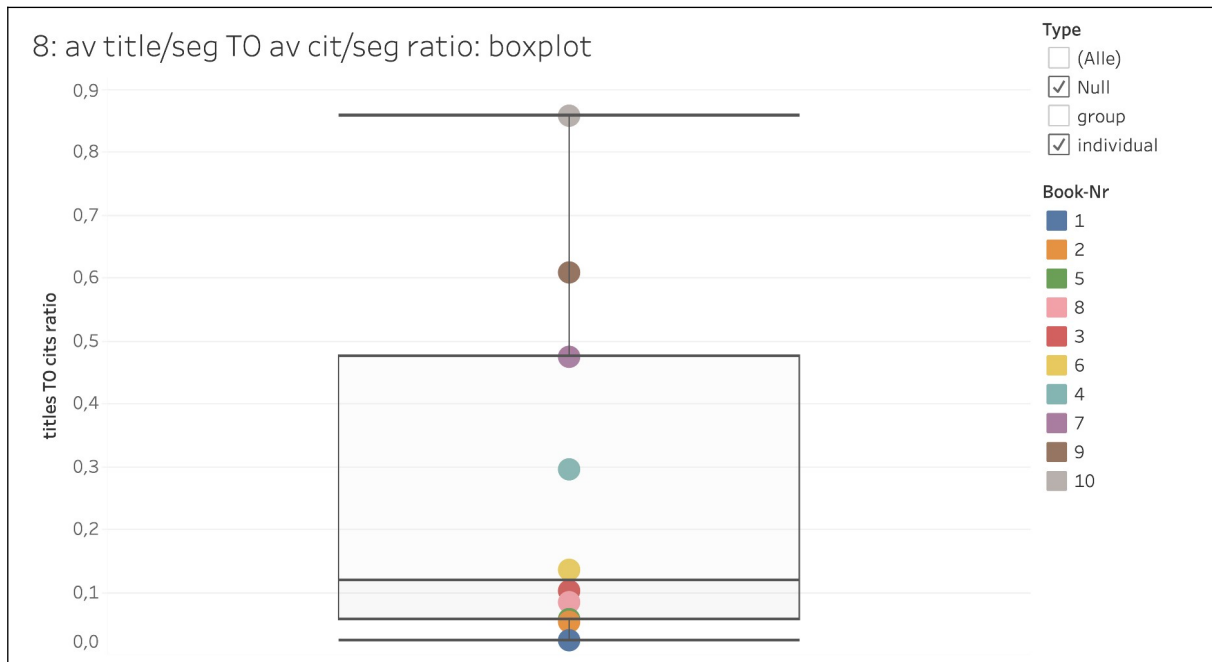


Fig. 8: Diagram 8, average title per segment to citation per segment ratio in each book of the *Onomasticon*.

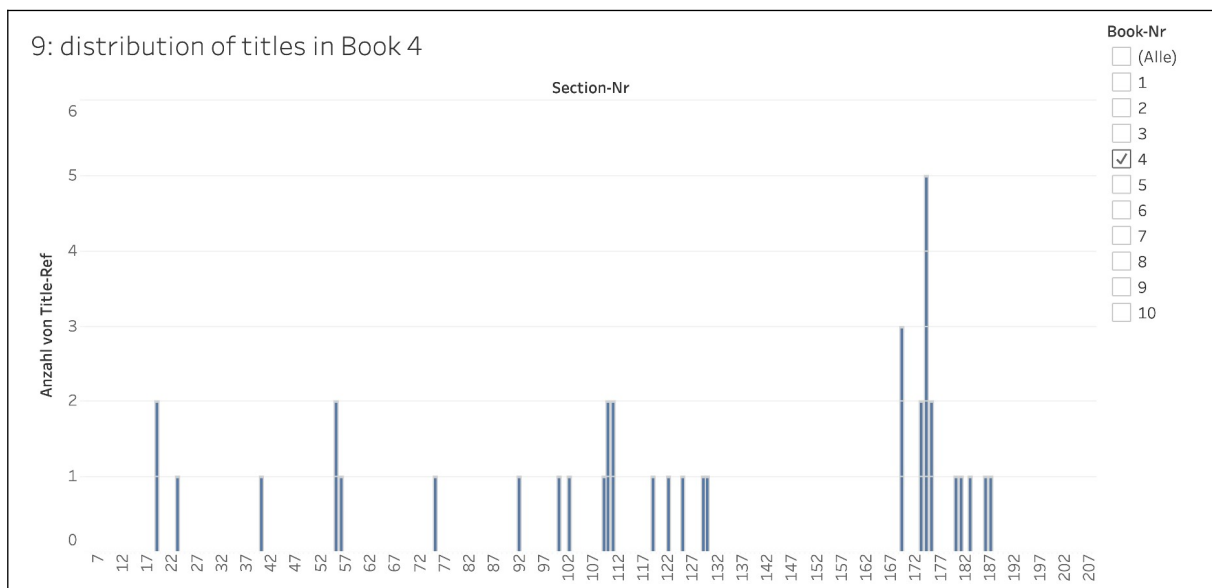


Fig. 9: Diagram 9, distribution of titles in Book 4 of the *Onomasticon*.

Concluding remarks

In this article, we sought to comprehend a particular phenomenon in the ten books of the *Onomasticon*, namely, the citation of sources. We employed distant reading methods; however, the production of the results we present in diagrams required an intensive close reading of the *Onomasticon* to accurately annotate the cited sources. Based on these results and the preceding discussion, we propose the following conclusions:

1. The first and the last book of the *Onomasticon* represent two extremes in terms of content coherence (Book 1 discusses various fields – Book 10 addresses only one broad field), number of citations and precision of citations (Book 1 has very few and imprecise citations – Book 10 displays the opposite).

2. Book 2 aligns closely with Book 10 in these aspects and diverges significantly from Book 1. It seems that after Book 1 (and its success?), Pollux genuinely began to conceptualize the project of a multi-volume onomasiological dictionary with a higher level of precision and documentation. Consequently, he re-evaluated his approach to dealing with primary and secondary sources, aiming for better documentation.

3. Beginning with Book 6, and especially in Books 7, 9, and 10, we observe a consistent progression towards more citations and greater precision. Book 8 is an outlier in this progression; it is noteworthy that Pollux admits in the prologue of this book that he did not have adequate time to prepare it properly.²⁹

4. The split picture of Book 6 can be used as an indication of a general tendency in the *Onomasticon*: large and coherent onomasiological fields display more citations than smaller or very small fields. It is interesting to attempt further to prove if this correlation exists systematically.

29 For the prologue of Book 8 see Tribulato (2018), 276–277; Tribulato remarks that Pollux’s statement he did not produce a work of the quality he desired due to lack of time is a *topos*; on the other hand, the differentiation between this book and Books 6 and 7 concerning the use of citations indicates that the *topos* is actually used to present rhetorically a real fact.

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Fig. 1: Diagram 1, citations per segment in the ten books of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/1-citspersegheatmap> (last access 13.06.2023).

Fig. 2: Diagram 2, citations per segment in each book of the *Onomasticon* (here, e.g. the diagram of Book 10), <https://public.tableau.com/views/pollux-distribution-sources-dco/2-citsperseg> (last access 13.06.2023).

Fig. 3: Diagram 3, average citations per segment in the ten books of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/3avcitsegboxplot> (last access 13.06.2023).

Fig. 4: Diagram 4, average citations per segment in comparison to average unique citations per segment in the ten books of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/4avcitsegANDd-citsegboxplot> (last access 13.06.2023).

Fig. 5: Diagram 5, distribution of the citations of groups in the ten books of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/5distributionofgroupcitsincategories> (last access 13.06.2023).

Fig. 6: Diagram 6, group citations in comparison to individual citations in each book of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/6groupTOindvid> (last access 13.06.2023).

Fig. 7: Diagram 7, average group citation to individual citation ratio in each book of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/7groupTOindvidratio> (last access 13.06.2023).

Fig. 8: Diagram 8, average title per segment to citation per segment ratio in each book of the *Onomasticon*, <https://public.tableau.com/views/pollux-distribution-sources-dco/8avtitlesegTOavcitsegratioboxplot> (last access 13.06.2023).

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