La synthèse des connaissances sur la biodiversité : introduction aux méta-analyses et revues systématiques – 2024

Recherche de littérature : Bases de données & Equation de recherche

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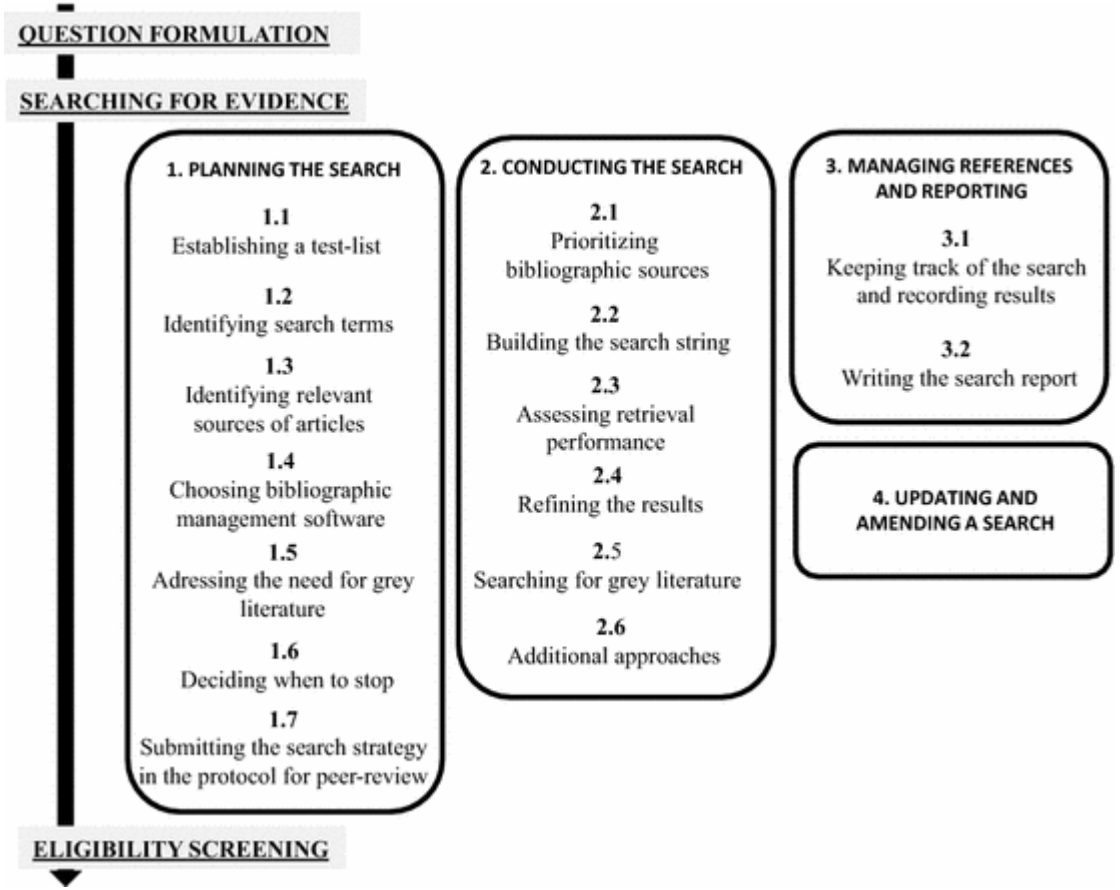
The search strategy

The goal:

Find the relevant bibliographic references !

The search strategy :

1. The search string
2. The bibliographic sources
3. The test-list



A guide to the planning, conduct, management and reporting of the searching phase of systematic reviews and systematic maps (after Livoreil et al. 2017).
https://environmentalevidence.org/information-for-authors/4-conducting-a-search/

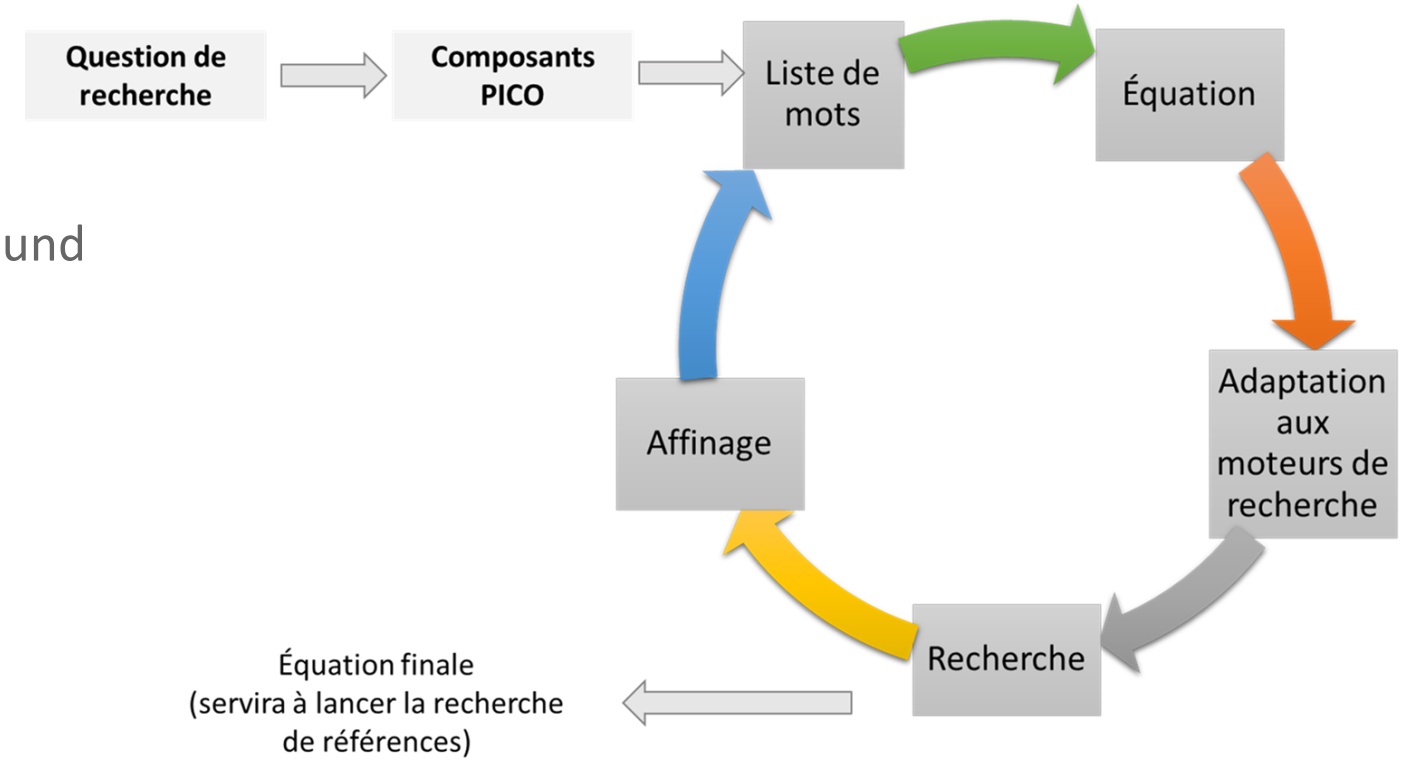
The search strategy

Starting with the research questions

Define the search string

search terms encompasses individual or compound words used in a search to find relevant articles

search string is a combination of search terms combined using Boolean operators



The search string

PICO/PECO elements (Richardson et al. 1995)

Population : effect *on what?*

Intervention / Exposure : *effect of what ?*

Comparator : *compared to what? to what reference?*

Outcome : effect *measured by what?*

(Context : *what type of study?*)

Question element	Definition
Population (of subjects)	Unit of study (e.g. ecosystem, species) that should be defined in terms of the statistical populations of subject(s) to which the intervention will be applied.
Intervention/exposure	Proposed management regime, policy, action or the environmental variable to which the subject populations are exposed.
Comparator	Either a control with no intervention/exposure or an alternative intervention or a counterfactual scenario.
Outcome	All relevant outcomes from the proposed intervention or environmental exposure that can be reliably measured

The search string

1 **Define the PICO based on the research question**

PICO/PECO elements (Richardson et al. 1995)

Population : effect *on what?*

Intervention / Exposure : *effect of what ?*

Comparator : *compared to what? to what reference?*

Outcome : effect *measured by what?*

(Context : *what type of study?*)

My PICO

Example with the Agri-TE project:
What is the effect of agricultural practices on biodiversity at the global level?

The search string

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(Context : *what type of study?*)

My PICO

Any unplanned/uncultivated taxon

Any agricultural practice

Agricultural witness or natural environment of ref.

Effect-size representing a biodiv metric.

Meta-analyses only

Example with the Agri-TE project:
What is the effect of agricultural practices on biodiversity at the global level?

The search string

2 **Establish the list of words that will be used to construct the search equation**

My search terms

biodiversity, soil fauna, birds, butterflies

tillage, fertilization, pesticides

croplands, forest

species richness, biomass, Shannon's entertainment

meta-analyses

My PICO

Any unplanned/uncultivated taxon

Any agricultural practice

Agricultural witness or natural environment of ref.

Effect-size representing a biodiv metric.

Meta-analyses only

Example with the Agri-TE project:
What is the effect of agricultural practices on biodiversity at the global level?

The search string

3 **Building the search string by adapting to search engines (eg: WoS)**

My search terms

biodiversity, soil fauna, birds, butterflies

tillage, fertilization, pesticides

croplands, forest

species richness, biomass, Shannon’s diversity

meta-analyses

My search string

TS= ((biodiversity OR soil fauna OR birds OR butterflies)

AND (tillage OR fertilizers **OR** pesticides **)**

AND (croplands OR forest)

AND (species richness OR biomass OR Shannon's diversity)

AND (meta-analyses))

Example with the Agri-TE project:
What is the effect of agricultural practices on biodiversity at the global level?

The search string

My search string

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AND (meta-analyses))

Topic (title, abstract, keywords, keywords plus)

Logical and Boolean Operators

Both depend on the bibliographic sources

Example with the Agri-TE project:
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The search string

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Exact Expression
"soil fauna"

Truncations
pesticide*, pesticide$

Exclusion
NOT (medical science OR economics)

Thematic
soil fauna OR (earthworms OR spiders OR collembola OR springtails)

Beware of database variations in the search equation!!!

- Some use a different language for searching
- For example, $ instead of *.
- Additional options (inside or nearby)
- Help files are useful!
- Check the options
- Seek specialist help if necessary
- SAVE EVERYTHING

The search string

4 **Test the search string**

My search string

TS= ((biodiversity OR soil fauna OR birds OR butterflies)

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AND (croplands OR forest)

AND (species richness OR biomass OR Shannon's diversity)

AND (meta-analyses))

200 results is not enough!
20,000 results is too much!
Refinement needed…

Example with the Agri-TE project:
What is the effect of agricultural practices on biodiversity at the global level?

The search string

5

Refine the search string

My search string

TS= ((biodiversity OR soil fauna OR birds OR butterflies)

AND (tillage OR fertilizers **OR** pesticides **)**

AND (croplands OR forest)

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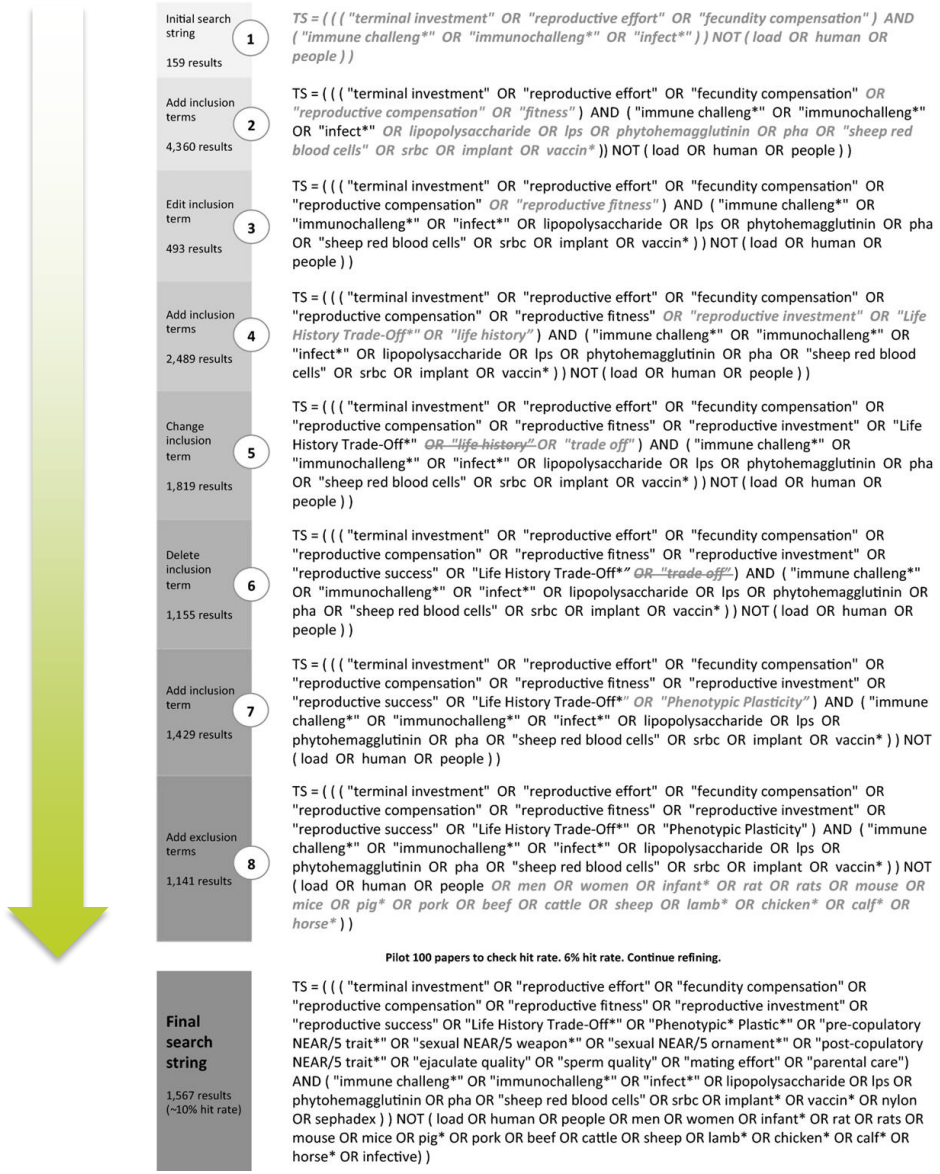
AND (meta-analyses))



Iterative process that can (must?) be long

Ex: Foo et al. (2021)

The search string

5

Refine the search string

My search string

TS= ((biodiversity OR soil fauna OR birds OR butterflies)

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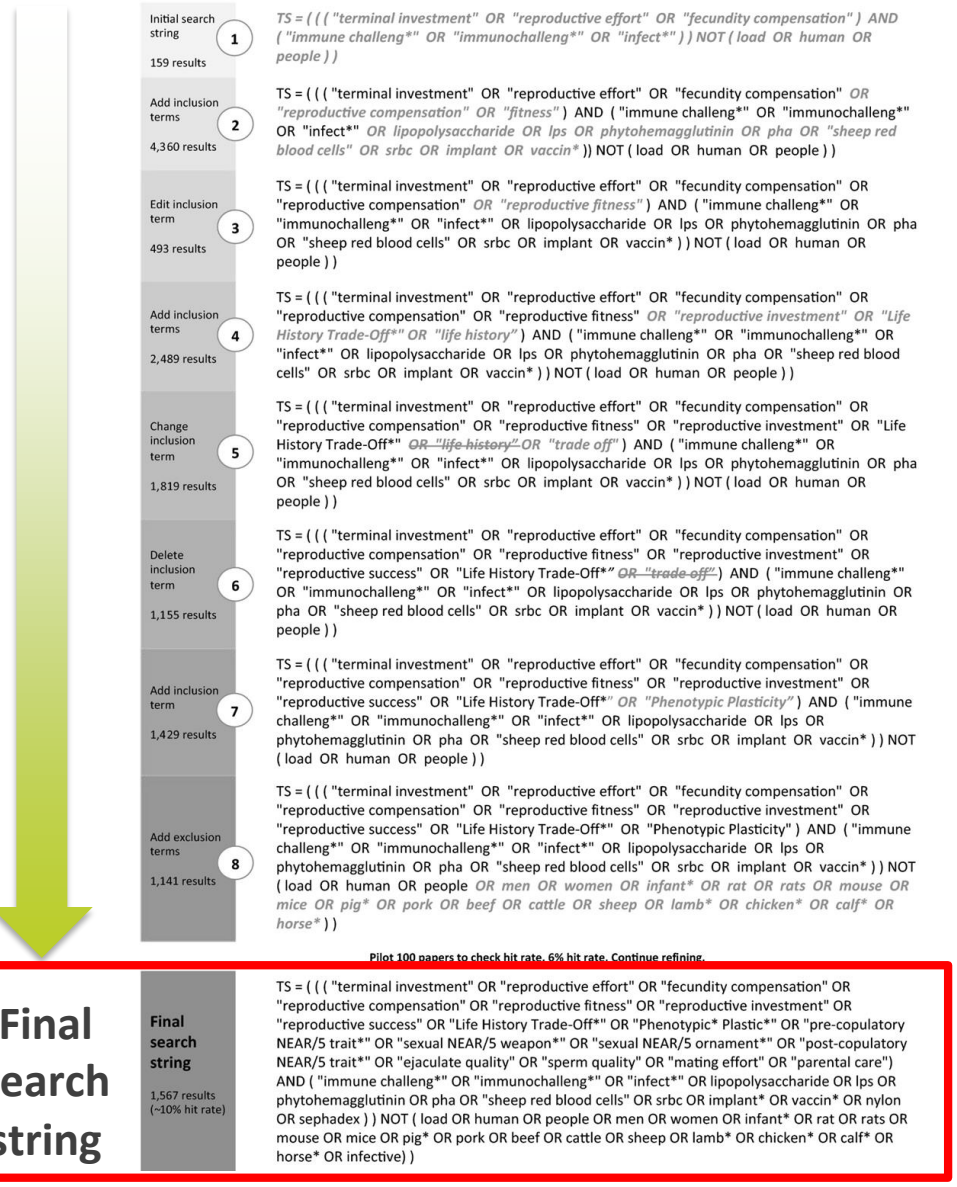
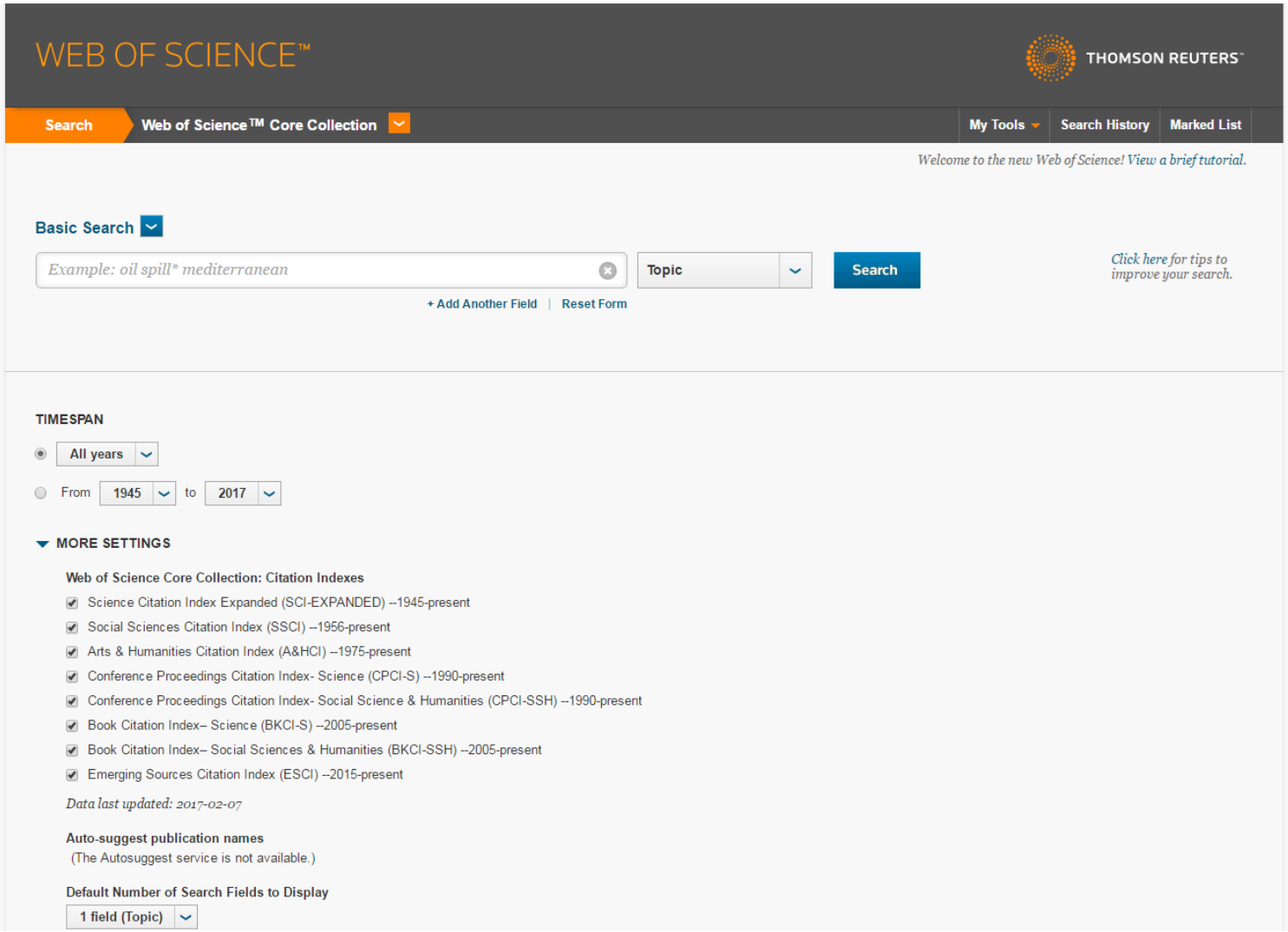


The bibliographic sources

Bibliographic databases

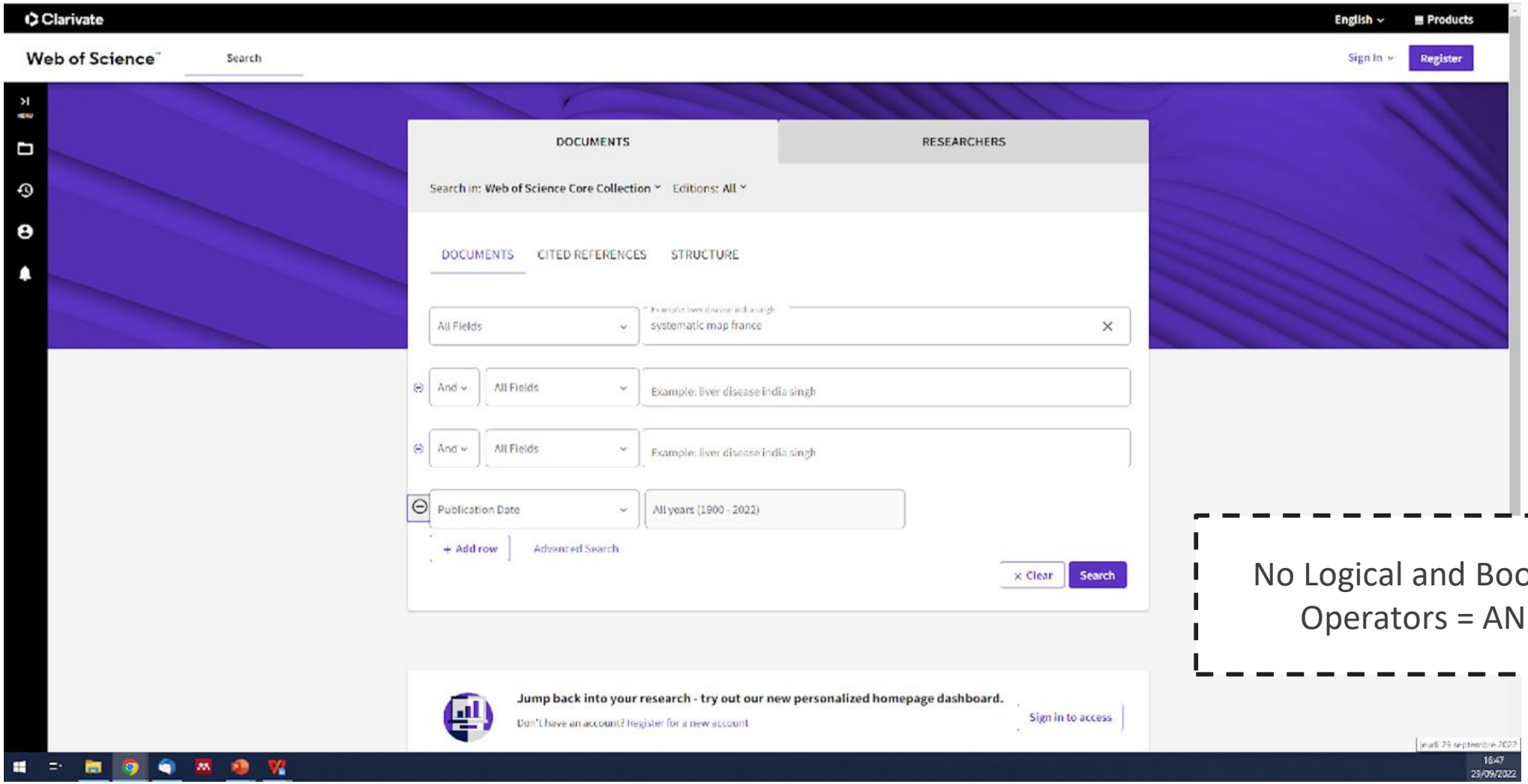
- Web of Science
- Scopus
- Agricola
- AGRIS (FAO)
- Academic Search Premier
- Biological Abstracts
- CAB Abstracts
- etc.

Example with web of science



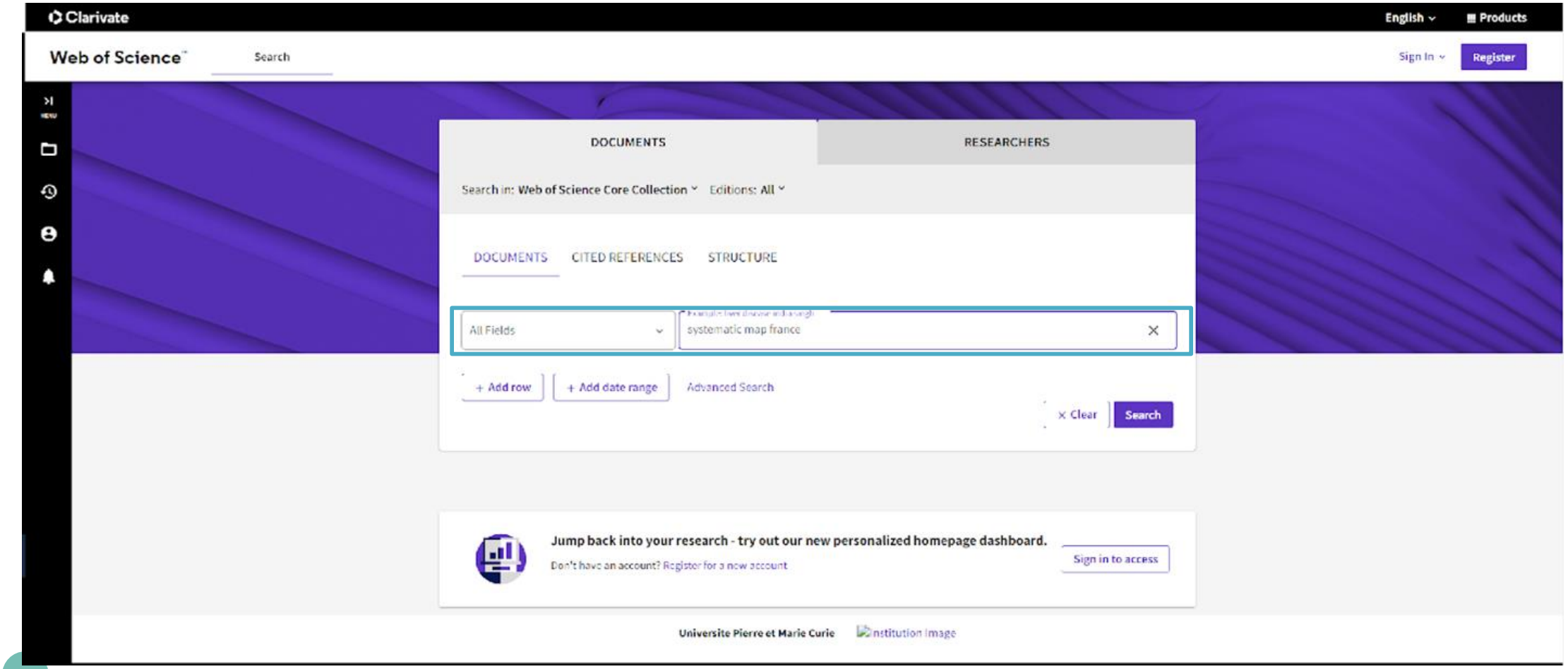
Example with web of science

https://www.webofscience.com/wos/woscc/basic-search

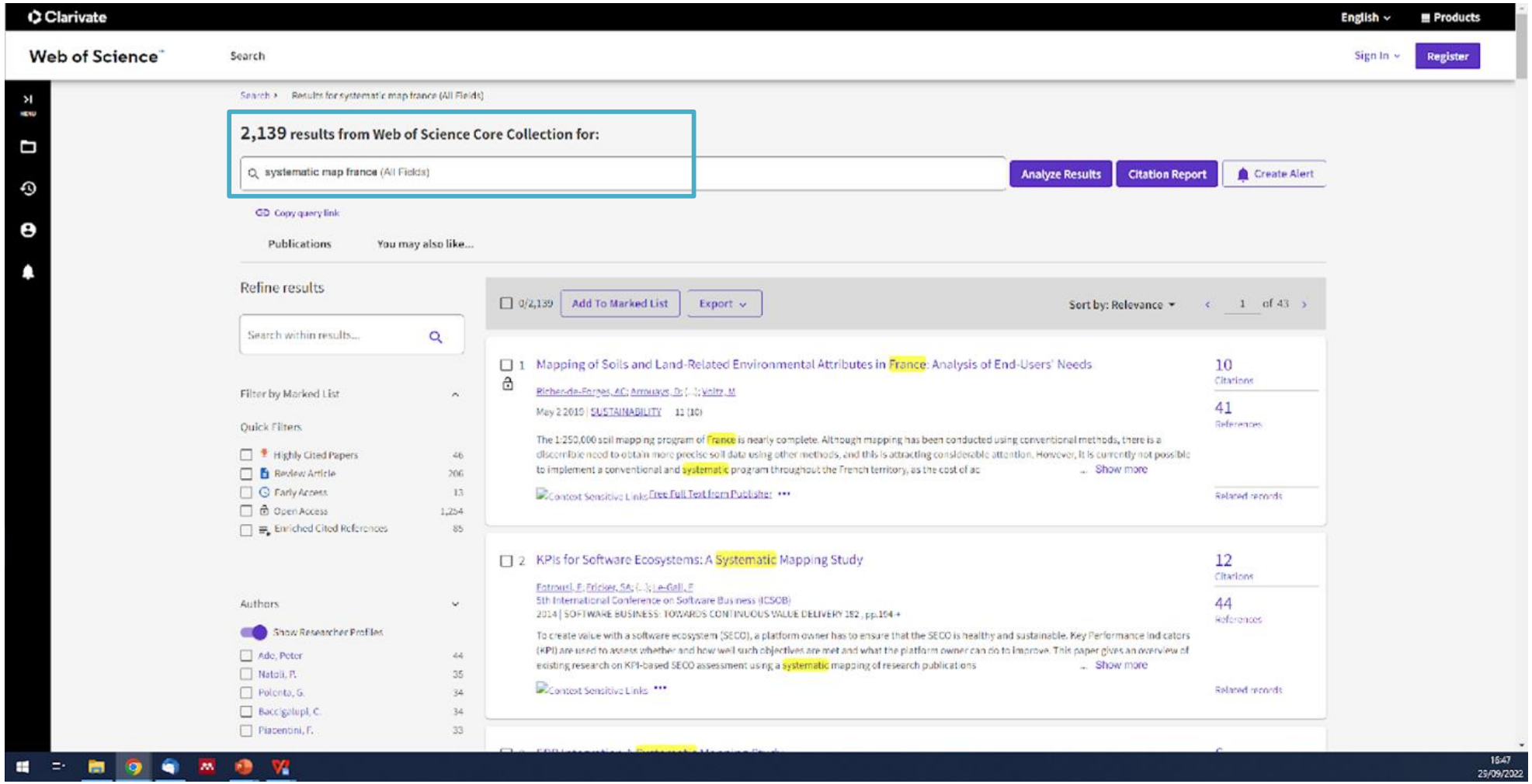


No Logical and Boolean Operators = AND

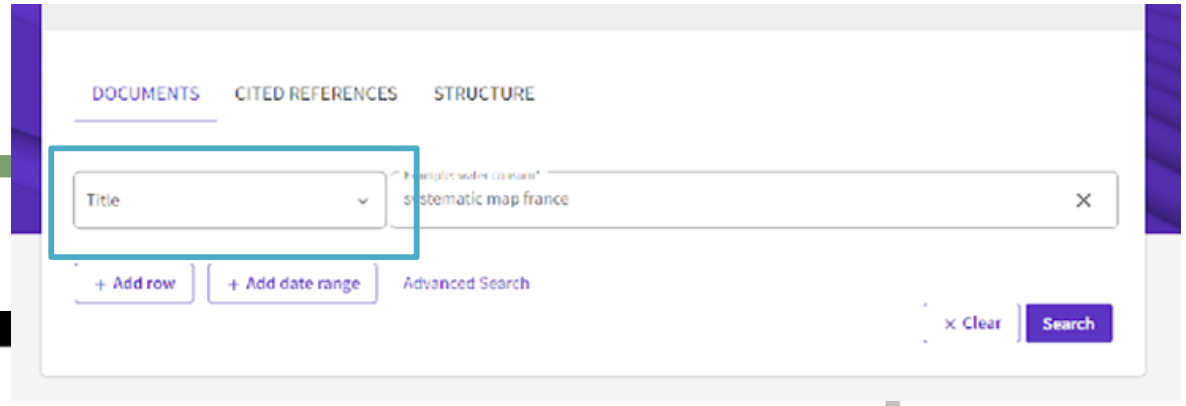
Example with web of science

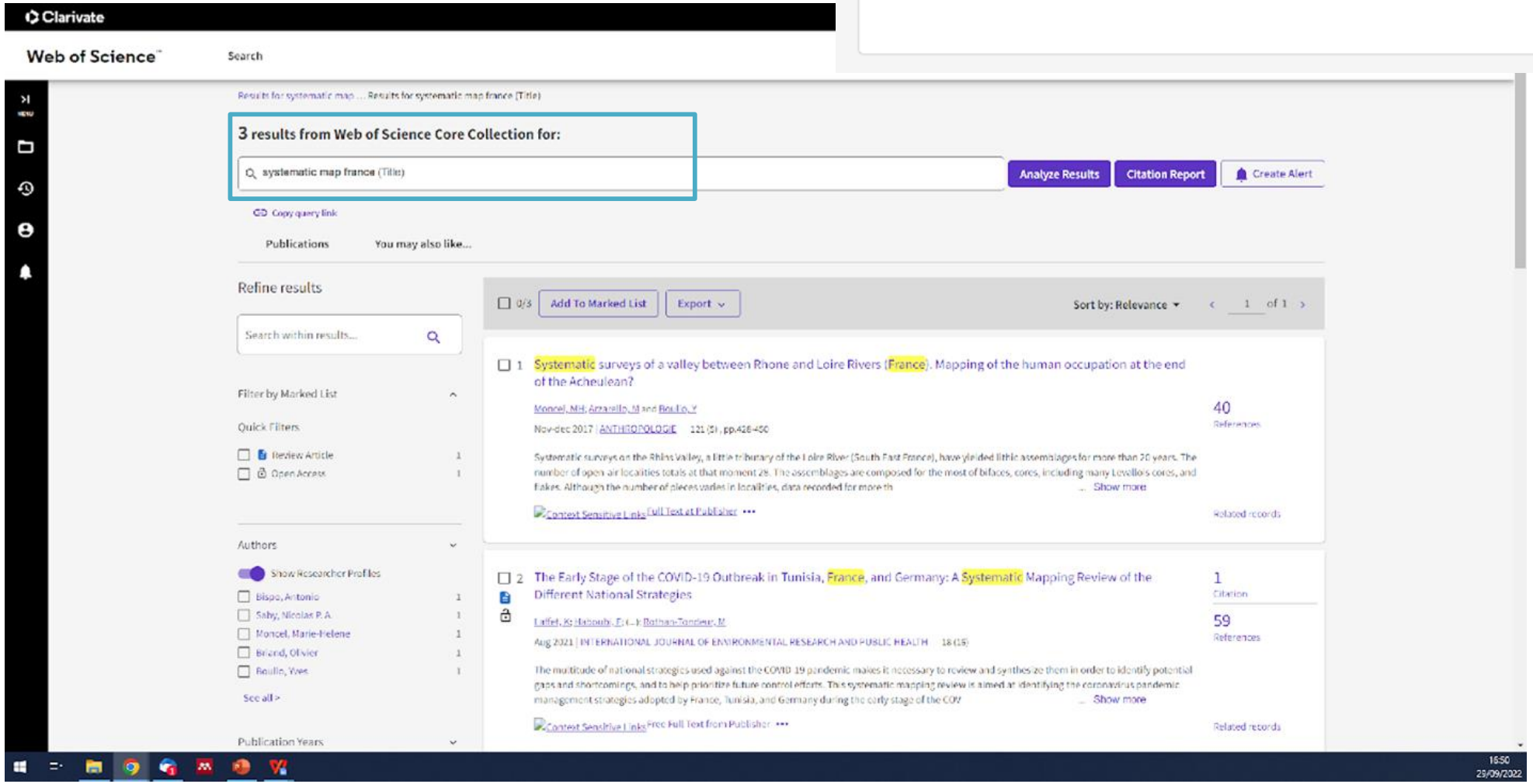


Example with web of science

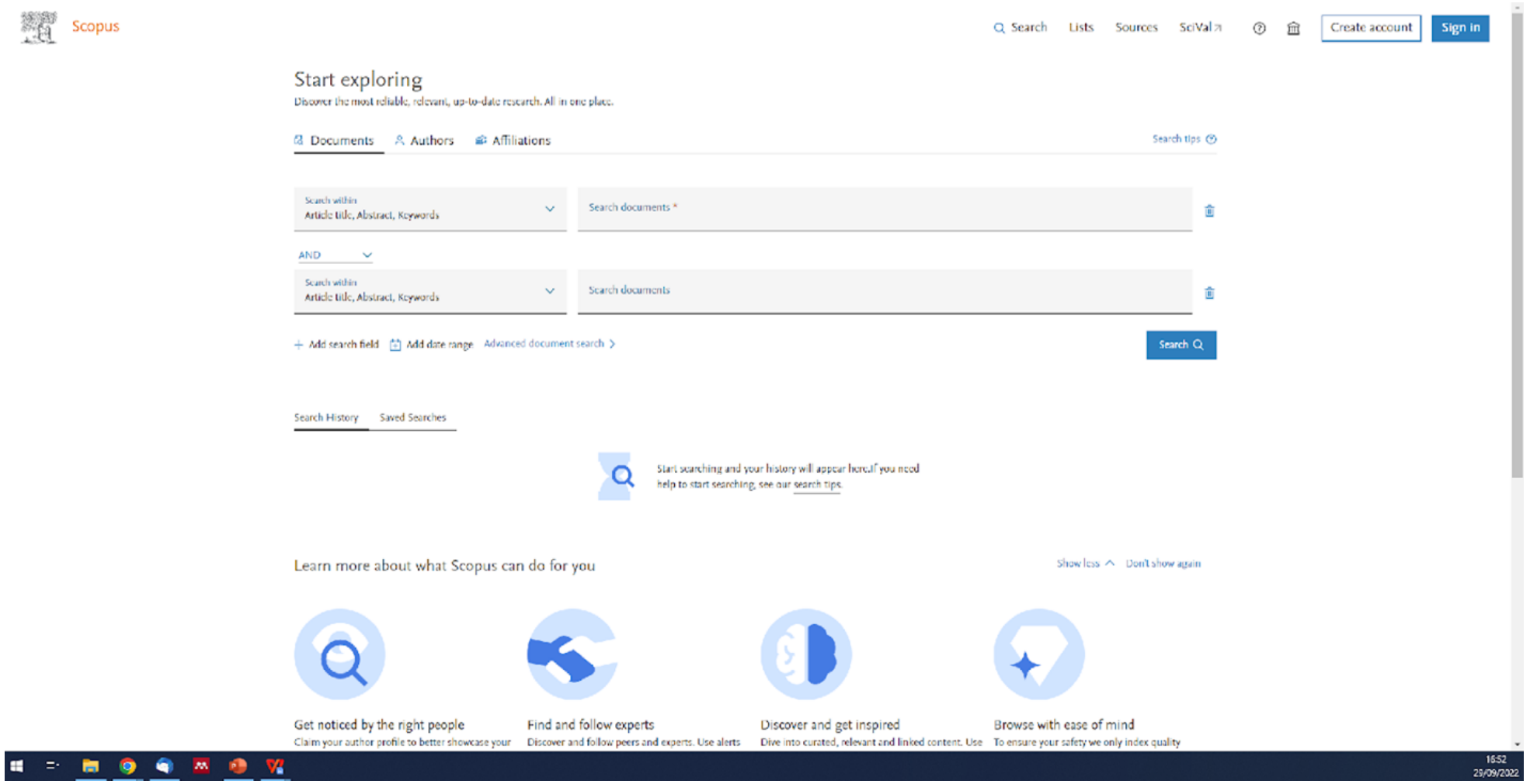


Example with web of science





Example with Scopus



The bibliographic sources

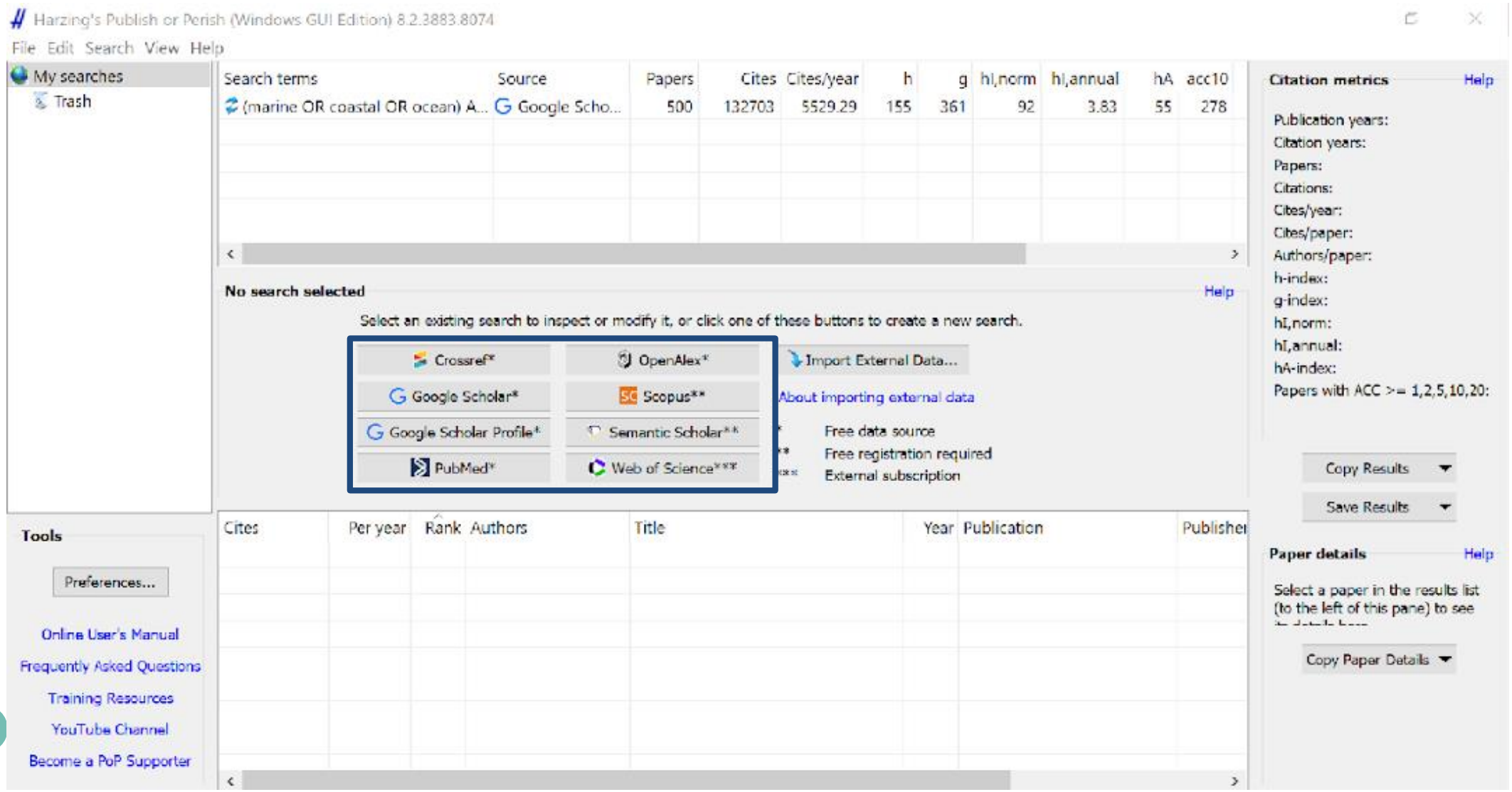
Web search tools

- Google
- Ecosia
- Bing
- DuckDuck Go

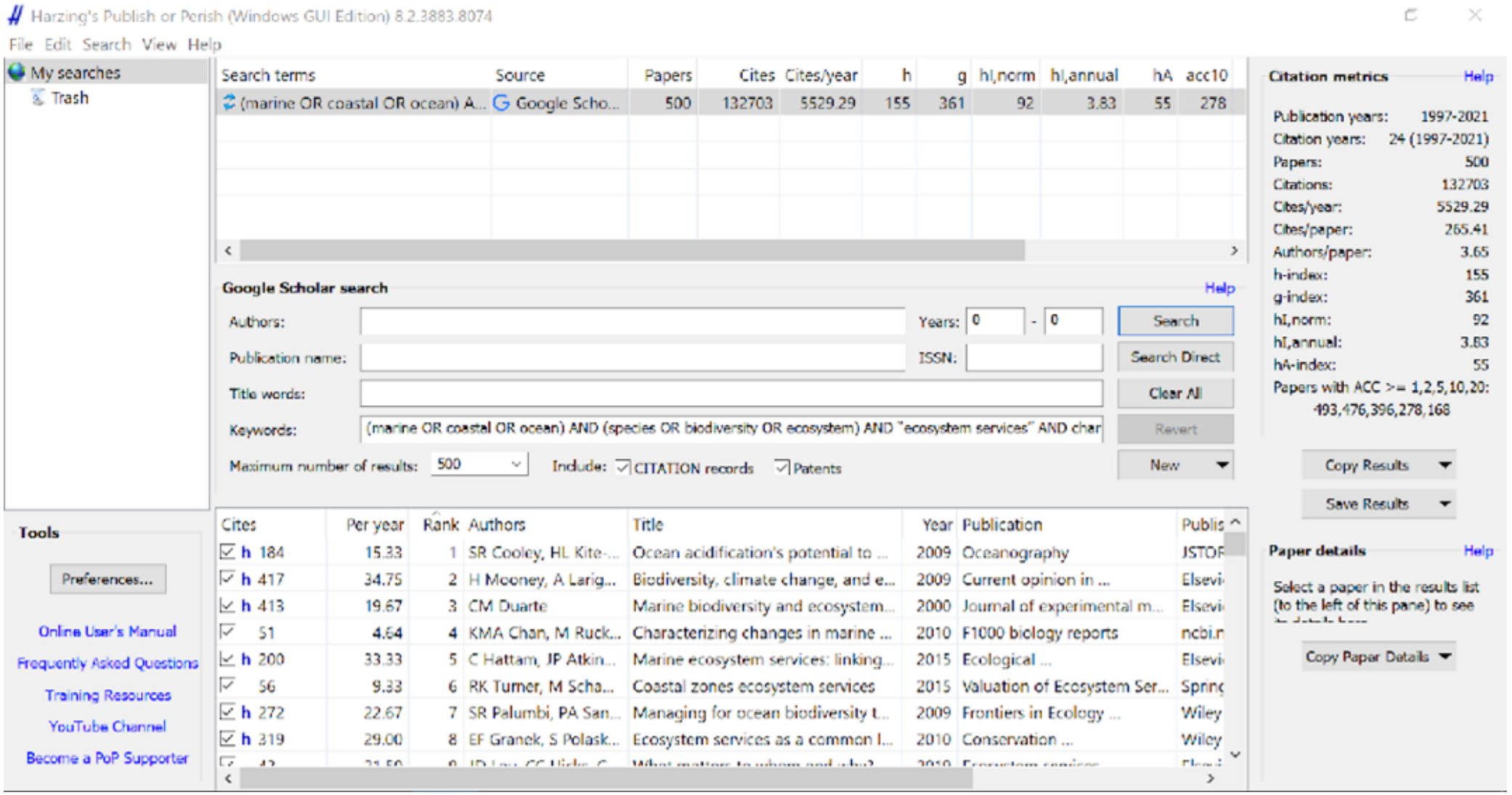
....

!!! Depend of connection parameters!!!!

Example with Publish or Perish



Example with Publish or Perish



Example of search strings depending on the bibliographic sources

	Name	Search field	Search string	Search hits	Date of search (DD/MM/YYYY)
LITERATURE DATABASES	**Web of science**	TS	((marine OR coast* OR ocean OR sea OR littoral OR maritime) AND (species OR biodiversity OR ecosystem OR ecological) AND ("ecosystem service$" OR "contribution to people" OR "ecosystem function$" OR "ecosystem process" OR "landscape service$" OR disservice$ OR "provisioning service$" OR ((provision OR production OR exploitation) AND (food OR fisher* OR macroalgae$ OR molecules)) OR "biomass for nutrition" OR "biomass for materials" OR "genetic materials" OR "raw materials" OR "maintain* food webs" OR "life cycle maintenance and habitat protection" OR "habitat provision" OR "nursery function" OR "regulation service$" OR "climate regulation" OR "carbon sequestration" OR "weather regulation" OR "atmospheric composition and conditions" OR "air quality regulation" OR "coastal protection" OR "water retention" OR "nutrient regulation" OR "nutrient cycling" OR "pathogen regulation" OR "pest and disease control" OR "mediation of waste" OR "mediation of mass" OR "cultural service$" OR "intellectual interaction" OR "physical interaction" OR "experiential interaction$" OR tourism OR recreation OR amenity OR aesthetic OR heritage OR symbolic OR "cognitive effect$" OR "knowledge production" OR education) AND (dynamic$ OR impact$ OR effect$ OR variation$ OR interaction$ OR evolution OR change$)).	17329	20/07/2021
	Scopus	TITLE-ABS-KEY		24051	20/07/2021
ONLINE SEARCH ENGINE	**Google Scholar**	keywords	(marine OR coastal OR ocean) AND (species OR biodiversity OR ecosystem) AND “ecosystem services” AND change	300	22/07/2021
ORGANIZATIONAL WEBSITES	**FAO**	Language: "English"	fishery	50	27/08/2021
	UNESCO	Filter: language: "English" - source: "UNESCO" - AuthoCorporate-en-s: "Intergovernmental Oceanographic Commission" - nature of content: "guide" AND "manuals and handbooks"	marine ecosystem service	50	19/08/2021
	UNEP	Filters: "Reports and publications" AND "Publication" AND "Report", "Ecosystems and biodiversity" AND "oceans and seas"	marine ecosystem service	50	19/08/2021
	US NOAA		ecosystem service	15	19/08/2021
	EEA		marine ecosystem service	7	19/08/2021
	IUCN		ecosystem service	32	27/08/2021

Ex: Campagne et al. (2023)

The test list

<u>Test-list</u> : studies that you wish to include in your systematic review and which you know meet the inclusion criteria.

→ Discuss the list (involve partners/co-authors/colleagues) to construct it and then consolidate it

→ Extract metadata

→ Order of magnitude, ca. 30 items

<u>Interest</u> : verify the capacity of a research equation to capture studies corresponding to the aim of our systematic review.

→ Calculate the miss rate = the % of items belonging to the test list not captured by the equation

It must be minimized, ie the equation must approach 100% of the captured test-list… Refinement possible.

The test list

Example of test list

Campagne et al. (2023)

DOI	References			Retrieved by WOS	Retrieved by Scopus	Retrieved by google scholar
10.3389/fevc	Belgrano et a	Mapping and evaluating marine p	1	oui		
10.3389/fma	Cavanagh et	Future risk for Southern Ocean E	2	oui		
10.3354/mep	Cheung, W.V	Application of macroecological th	3	oui		
10.1093/ices	Cheung, W.V	Integrating ecophysiology and pl	4	non	oui	
10.1016/j.glc	Cinner et al.	Vulnerability of coastal communi	5	oui		
10.1016/j.ecc	Cook et al. (2	Towards marine ecosystem based	6	oui		
10.5670/oce	Cooley et al.	Ocean acidification's potential to	7	oui		
10.1088/174	Cooley, S.R. a	Anticipating ocean acidification's	8	oui		
10.1111/gcb.	Fernandes, J.	Modelling the effects of climate c	9	oui		
10.1007/978	Marcos et al.	Reviewing the ecosystem service	10	oui		
10.1002/lno.	Orcutt et al.	Impacts of deep-sea mining on m	11	oui		
10.1890/070	Palumbi, S.R.	Managing for ocean biodiversity t	12	oui		
10.1007/s11	Roessig et al.	Effects of global climate change c	13	non	non	non
10.1016/j.jnc	Roncin, N., A	Uses of ecosystem services provi	14	oui		
10.1126/scie	Worm B., E.B	Impacts of biodiversity loss on oc	15	oui		
10.1016/j.oc	Kermagoret,	How does eutrophication impact	16	oui		
10.17159/saj	Arabi, S., Nah	Impacts of marine plastic on ecos	17	oui		
10.2307/234	Depellegrin,	Integrating ecosystem service val	18	oui		
10.1016/j.ecc	Broszeit, S., E	What can indicators of good envi	19	oui		
10.1371/jour	Pendleton, L.	Estimating global "Blue Carbon" e	20	oui		
10.1042/ETL	Hall-Spencer,	Ocean acidification impacts on cc	21	oui		
10.1016/j.ma	Potts, T., Bur	Do marine protected areas delive	22	oui		
10.1016/j.jer	Lemasson, A.	Linking the biological impacts of c	23	oui		
10.3389/fma	Pouso, S., Bo	An Interdisciplinary Approach for	24	oui		
10.1016/j.oc	Song, J., Zhar	Changes in ecosystem services va	25	oui		
10.1016/j.en	Yim, J., Kwor	Analysis of forty years long chang	26	oui		
http://www.	Hicks, C.C., M	Trade-offs in values assigned to e	27	oui		
10.1016/B97	Leenhardt, P	The Role of Marine Protected Are	28	NOT in WoS	non	oui
10.1007/s10	Selim, S.A., B	Direct and indirect effects of clim	29	NOT in WoS	oui	
10.3391/ai.2(	Katsanevakis	Impacts of invasive alien species c	30	NOT in WoS	oui	
				25 out of 30	28 out of 30	29 out of 30
				83,3%	93,3%	96,7%
				Only in WOS		
				25 out of 27		
				92,6%		

The search strategy

Complementary measures of the efficiency of the equation

- ***Miss-rate*** : thanks to the test-list, must be minimized

- ***Hit-rate*** : Percentage of relevant articles, calculated on a sample
  (for example, on 100 randomly selected results)
  → aim **for at least 10%**

- ***Number of results*** : Aim for between 1000 and 3000.

  Adapt depending on the search engine used and/or the strategy employed.

Thank you for your attention !!!

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