Bibliometric analysis of systematic review (WG 49)
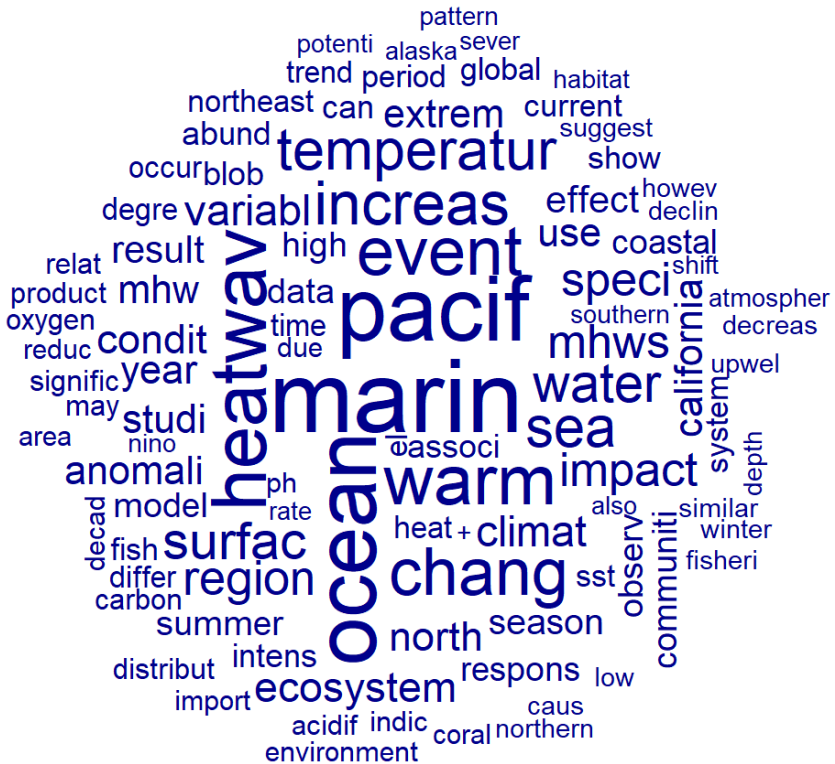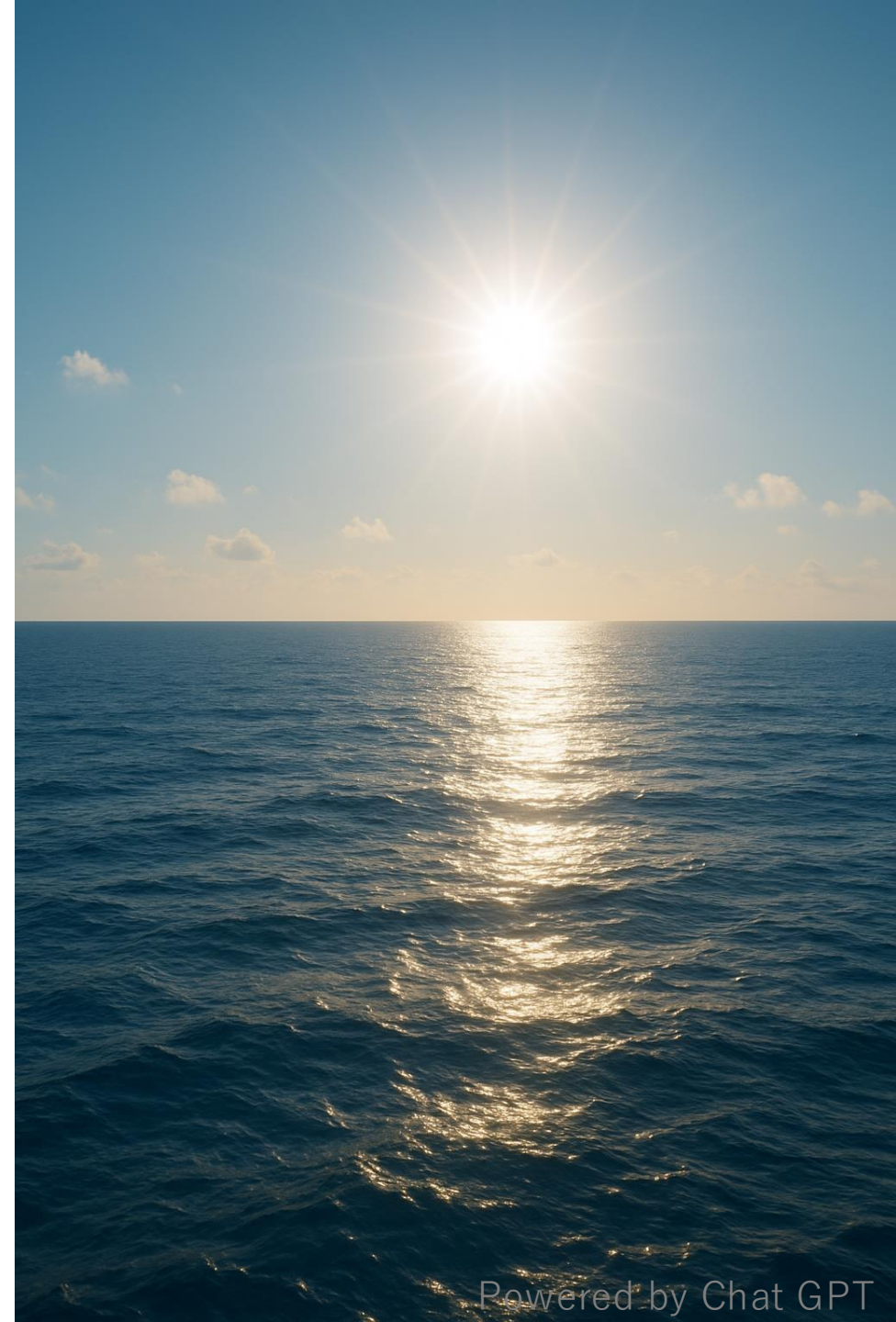
Hiroki Wakamatsu[1], Steven Borgrad[2], Antonietta Capotondi[3], Karen Hunter[4], Chan Joo Jang[5], Sung-Yong Kim[6], Helen Killeen[7], Daniel Lew[2] (deceased), Jian Ma[8], Mackenzie Mazur[4], Shoshiro Minobe[9], Robert Suryan[2], Marysia Szymkowiak[2]

[1]Ministry of Agriculture, Forestry and Fisheries, Tokyo, Japan, [2]NOAA Fisheries, Seattle, WA, USA, [3]University of Colorado, Boulder, CO, USA, [4]Fisheries and Oceans Canada, Victoria, BC, Canada, [5]Korea Institute of Ocean Science and Technology, Busan, Korea, [6]Korea Advanced Institute of Science and Technology, Daejeon, Korea, [7]California Department of Fish and Wildlife, Santa Rosa, CA, USA, [8]Shanghai Jiao Tong University, [9]Hokkaido University, Sapporo, Japan

Background

- Increased risk of frequent severe Pacific extreme events
- Eastern North Pacific MHWs caused major impacts
  - Algal bloom led to shellfish harvest losses
  - Marine mammal deaths impacted coastal communities
  - Western North Pacific Oyashio MHW 2010–2016
  - Fish species shifts affected Japanese local fisheries
- Need to understand physical drivers and predictability
- Need solutions to vulnerable Pacific coastal communities

WG-49: CLIMATE EXTREMES AND COASTAL IMPACTS IN THE PACIFIC

Terms of Reference

1. Develop a census of historical climate extreme events around the Pacific Rim to describe their characteristics, identify potential climate and ocean drivers, and catalog the ecological and socioeconomic consequences.

2. Focus on case studies (e.g., MHWs) for full exploration: drivers, predictability, ecological and societal impacts, and dissemination of information for actionable solutions.

3. Assess the predictability of climate extremes and establish leading indicators to mitigate impacts on coastal communities.

4. Develop models to predict how existing ecosystem services may be affected by climate extremes and what effects those would have on different human communities.

5. Identify a set of social, economic, and cultural indicators that account for the suite of human dimension impacts from climate extremes.

6. Work with experts in science communications and participants in the UN Decade of Ocean Science (e.g., SMARTNET) to develop and disseminate information and products related to the drivers, predictability and impacts of climate extremes.

7. Identify and engage partners in the prioritization of activities and deliverables.

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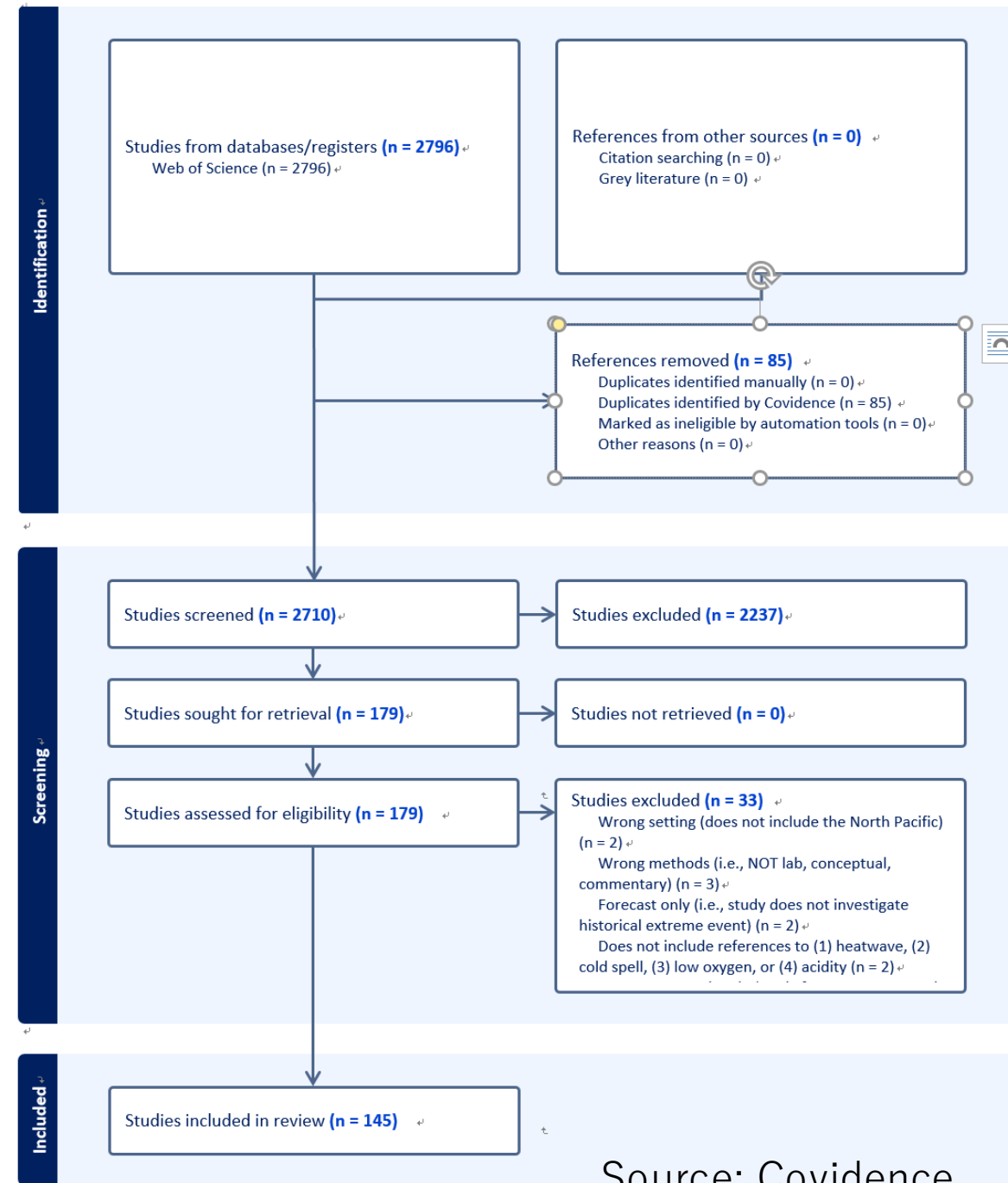
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Project Objective

To **generate a database** of scientific and media publications focused on ECEs to support a **systematic and bibliometric exploration of ECE** drivers, pressures/impacts and indicators relevant to marine ecosystems, coastal areas, and human populations

Method

- Follow Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Method
  - Identification (search)
  - Screening (Title/Abstract screening)
  - Eligibility (Full-text review)
  - Included (Final papers to review)
- Powered by Covidence
- At the moment, Full-text review is ongoing …

Identification

Studies from databases/registers **(n = 2796)**
Web of Science (n = 2796)

References from other sources **(n = 0)**
Citation searching (n = 0)
Grey literature (n = 0)

References removed **(n = 85)**
Duplicates identified manually (n = 0)
Duplicates identified by Covidence (n = 85)
Marked as ineligible by automation tools (n = 0)
Other reasons (n = 0)

Screening

Studies screened **(n = 2710)**

Studies excluded **(n = 2237)**

Studies sought for retrieval **(n = 179)**

Studies not retrieved **(n = 0)**

Studies assessed for eligibility **(n = 179)**

Studies excluded **(n = 33)**
Wrong setting (does not include the North Pacific) (n = 2)
Wrong methods (i.e., NOT lab, conceptual, commentary) (n = 3)
Forecast only (i.e., study does not investigate historical extreme event) (n = 2)
Does not include references to (1) heatwave, (2) cold spell, (3) low oxygen, or (4) acidity (n = 2)

Included

Studies included in review **(n = 145)**
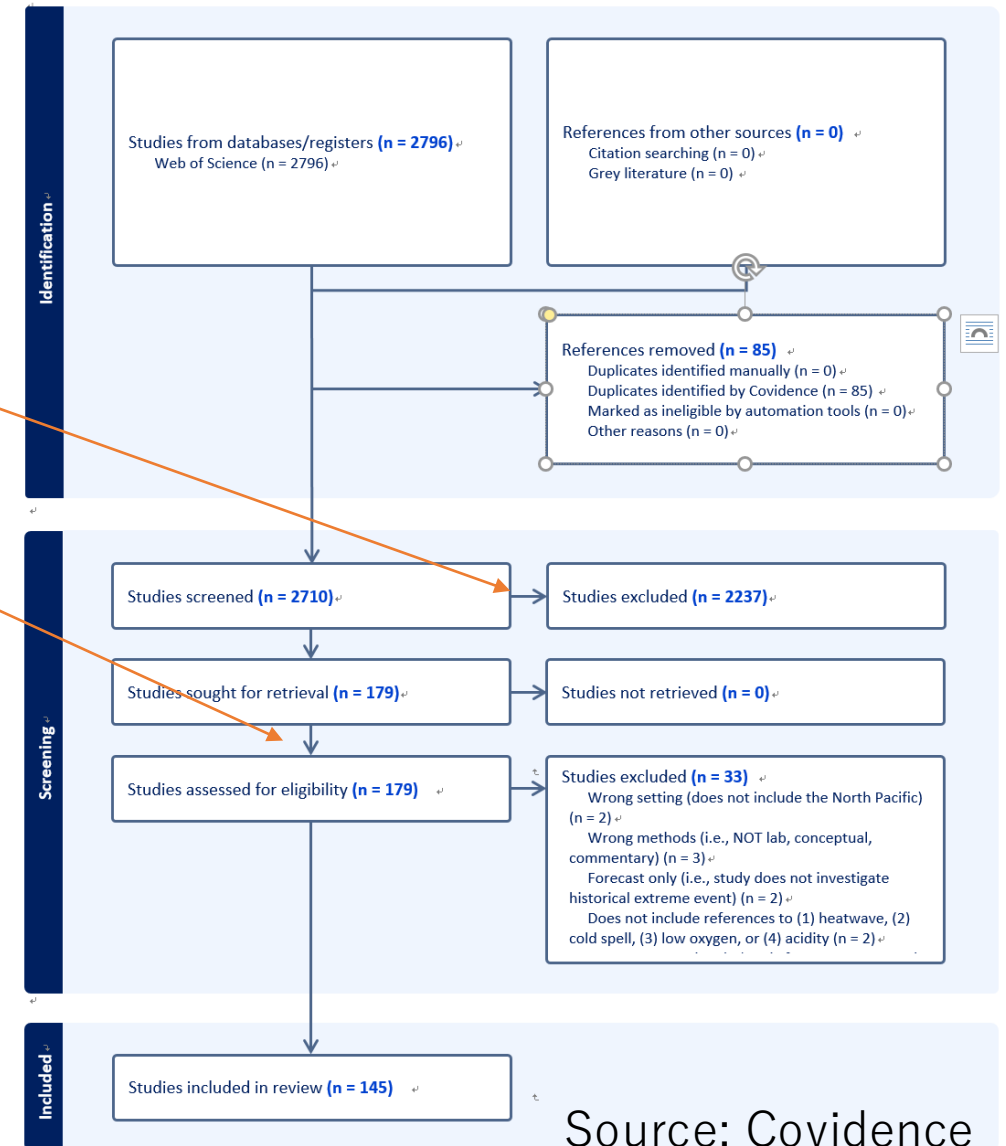
Source: Covidence

Actual Flow of bibliometric analysis

1. Set keywords to search and search in WoS

2. Import the search results to Covidence
   → 2,796 papers

3. Screen (title/abstract) to 463 papers

4. Full-text Screening
   → 33 excluded so far (on-going)

**In this Presentation,

- Using screened 473 papers, we do some bibliometric analysis ("bibliometix" and "quantada" in R)
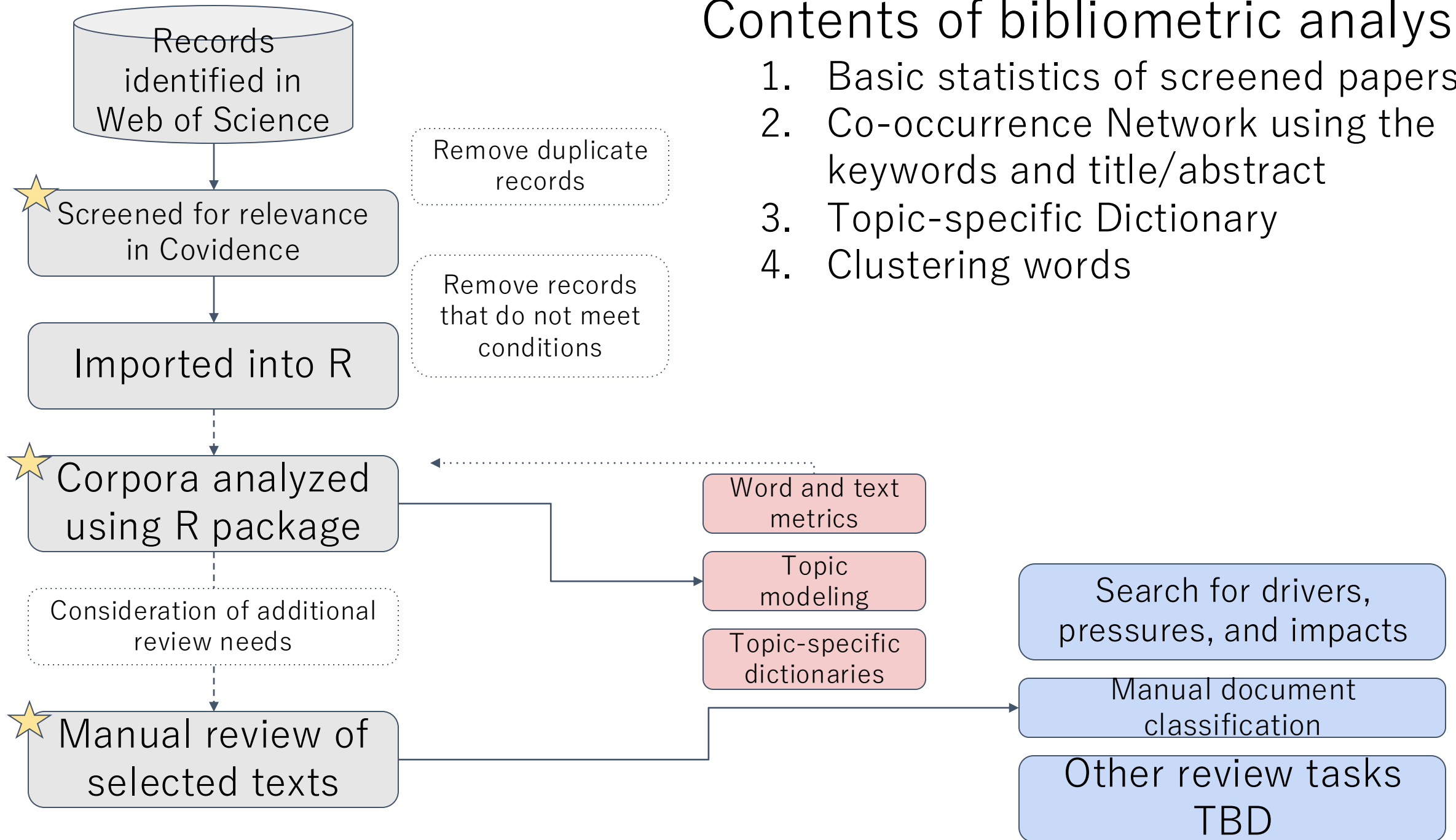

Source: Covidence

Search Query

- ECEs + "Pacific"
- 4 ECEs
  - Marine heat waves
    - "Marine heatwave*" OR "Ocean* heatwave*" OR "Sea heatwave*" OR "Marine thermal anomal*" OR "Ocean* heat event*" OR "Marine warm spell*" OR "Sea temperature spike*" OR "Marine hot spell*" OR "Ocean* thermal anomal*" "Marine temperature surge*" OR "Ocean* warm period*" OR "sea surface temperature anomal*" "warm water anomal*" "marine warm spell*" OR Blob
  - Marine cold spell
    - "marine cold spell*" OR "ocean* cold event*" OR "marine cold anomal*" OR "cold water upwelling" OR "cold snap*" OR "subsurface cold anomal*" OR "negative sea surface temperature anomal*"
  - Ocean acidification
    - "ocean* acidification*" or "marine acidification*" or "seawater acidification*" or "CO2-induced acidification" or (("Decreas* pH" or "Increas* pH") and (Ocean* or Marine)) or "Carbon dioxide enrichment"
  - Ocean hypoxia
    - "ocean* hypoxi*" or "marine hypoxi*" or "seawater hypoxi*" or "deoxygenation"
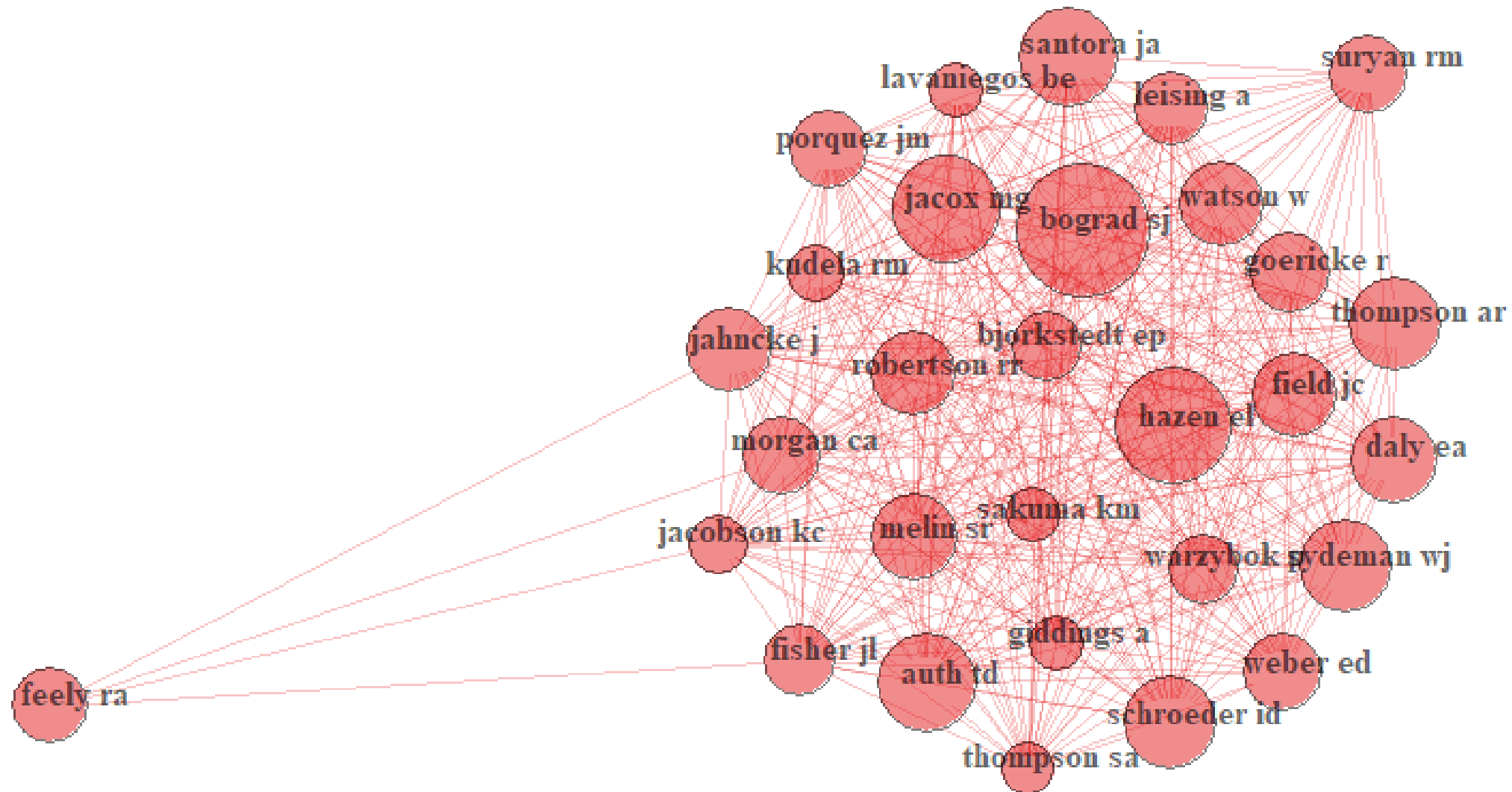
Contents of bibliometric analysis

1. Basic statistics of screened papers
2. Co-occurrence Network using the keywords and title/abstract
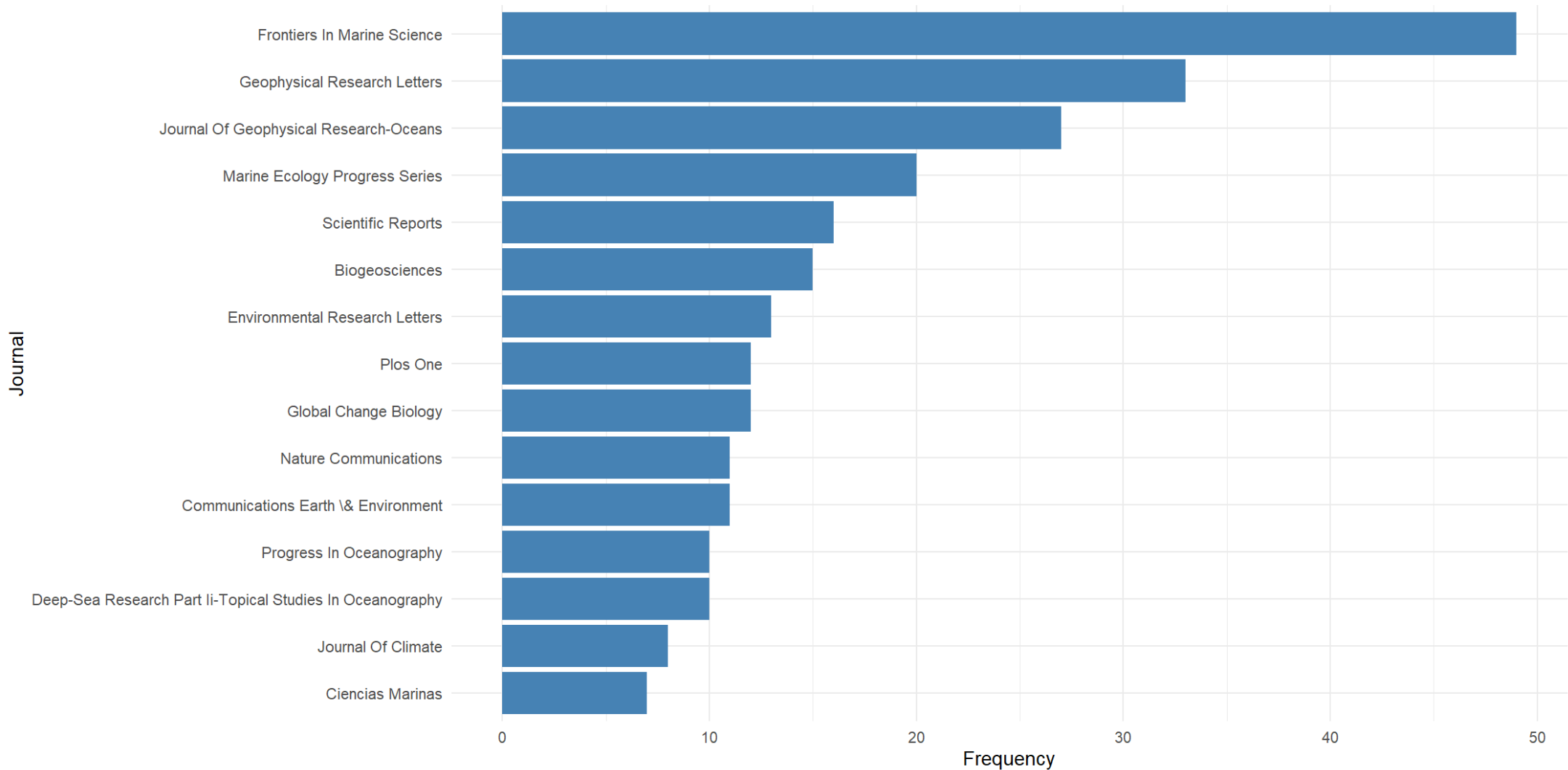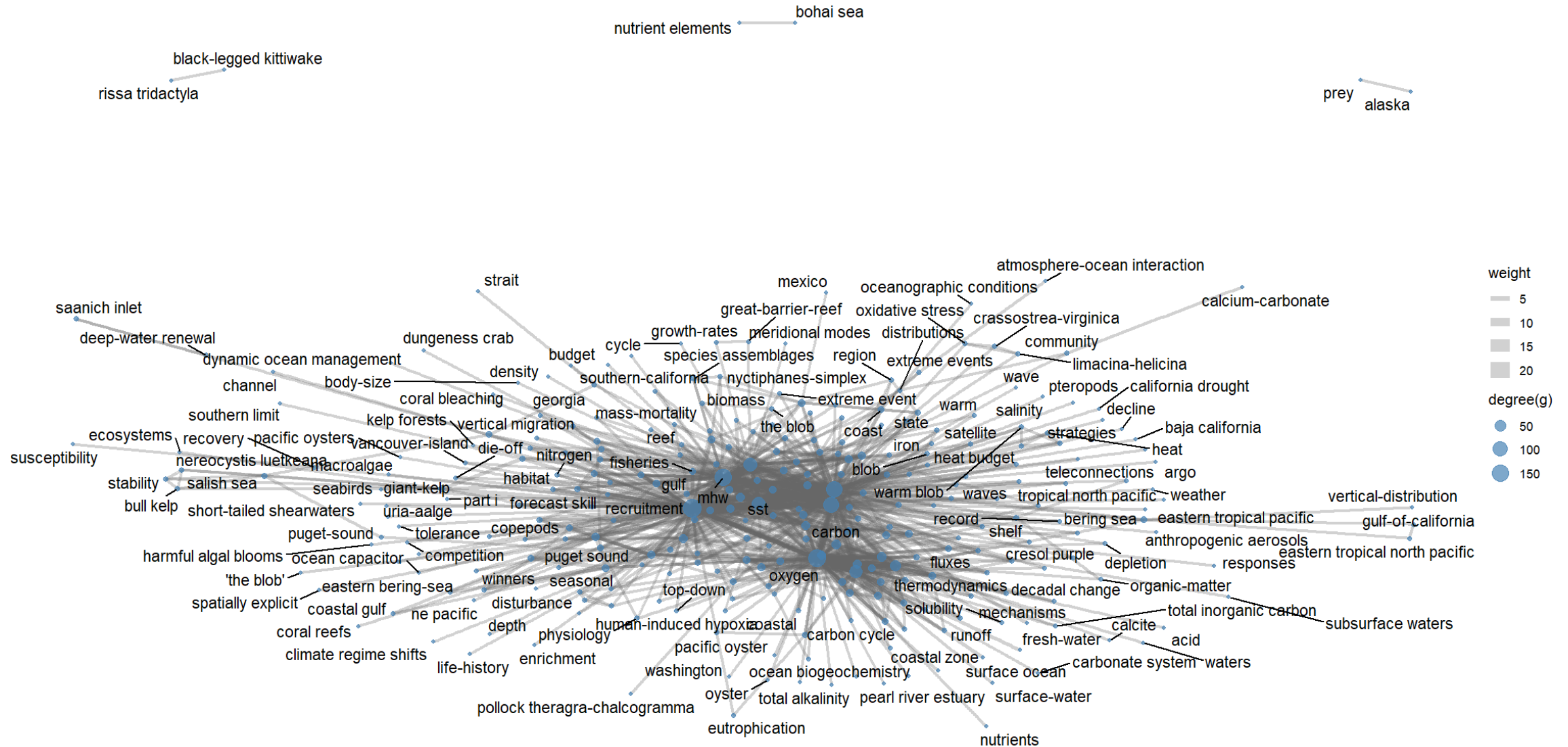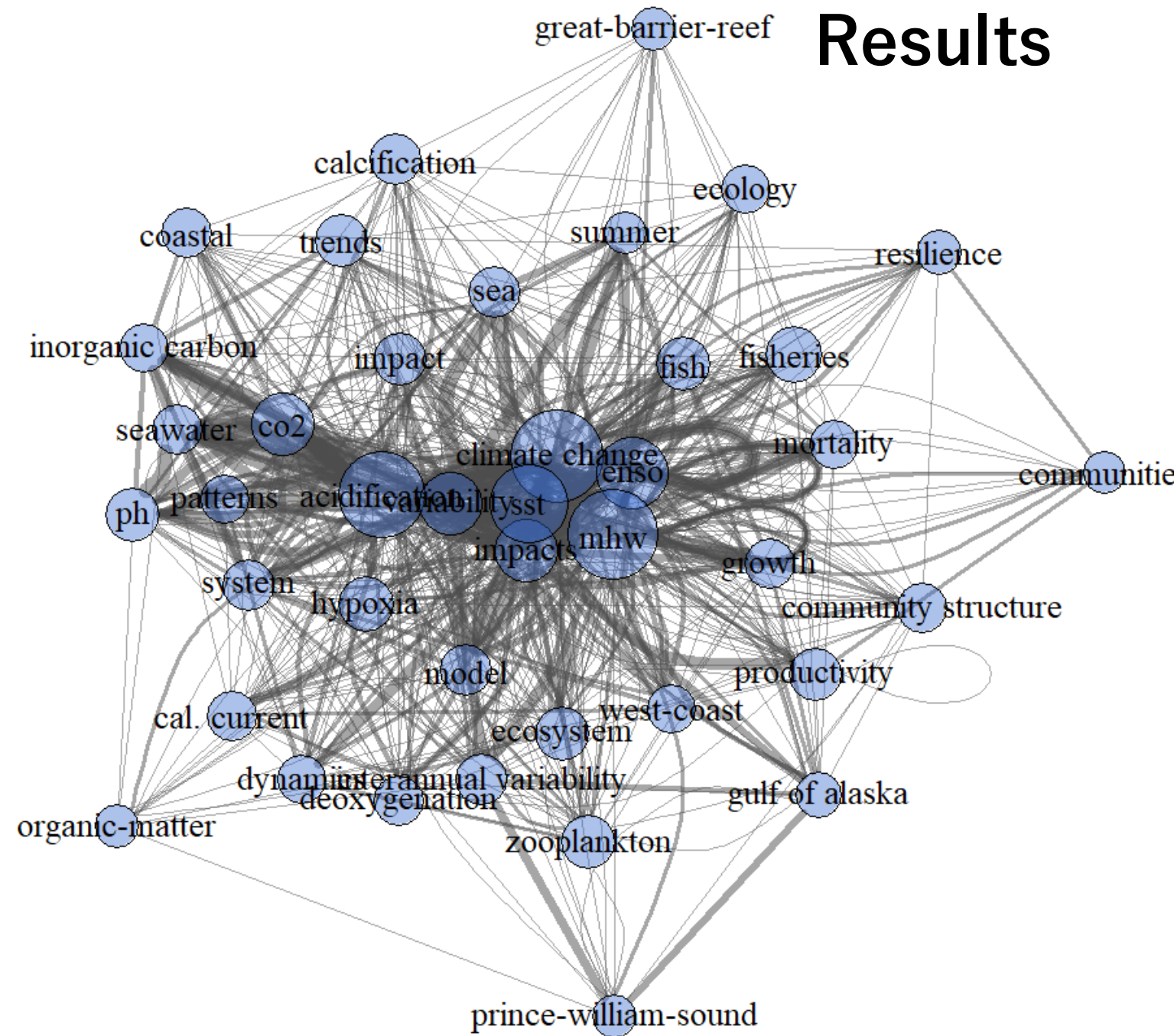3. Topic-specific Dictionary
4. Clustering words

Records identified in Web of Science

Screened for relevance in Covidence

Remove duplicate records

Imported into R

Remove records that do not meet conditions

Corpora analyzed using R package

Consideration of additional review needs

Manual review of selected texts

Word and text metrics

Topic modeling

Topic-specific dictionaries

Search for drivers, pressures, and impacts

Manual document classification

Other review tasks TBD

Collaboration Network

Co-occurrence Network (Keywords set by authors)

Results

Co-occurrence
Network Keywords
(set by authors)

Topic-specific Dictionary
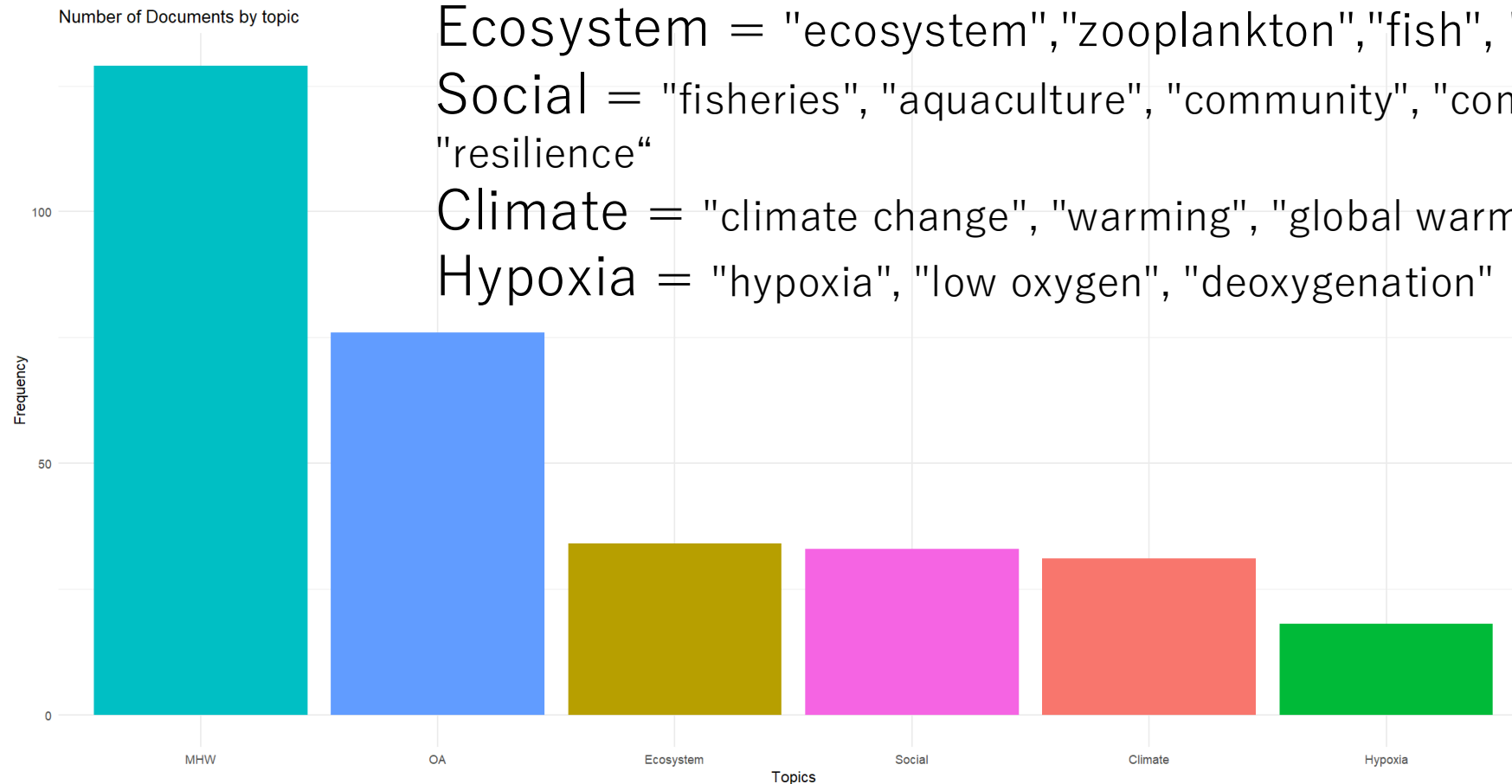
MHW = "marine heatwave", "ENSO", "el-nino"

OA = "ocean acidification", "ph", "calcification", "california current", "co2"

Ecosystem = "ecosystem","zooplankton","fish", "mortality"

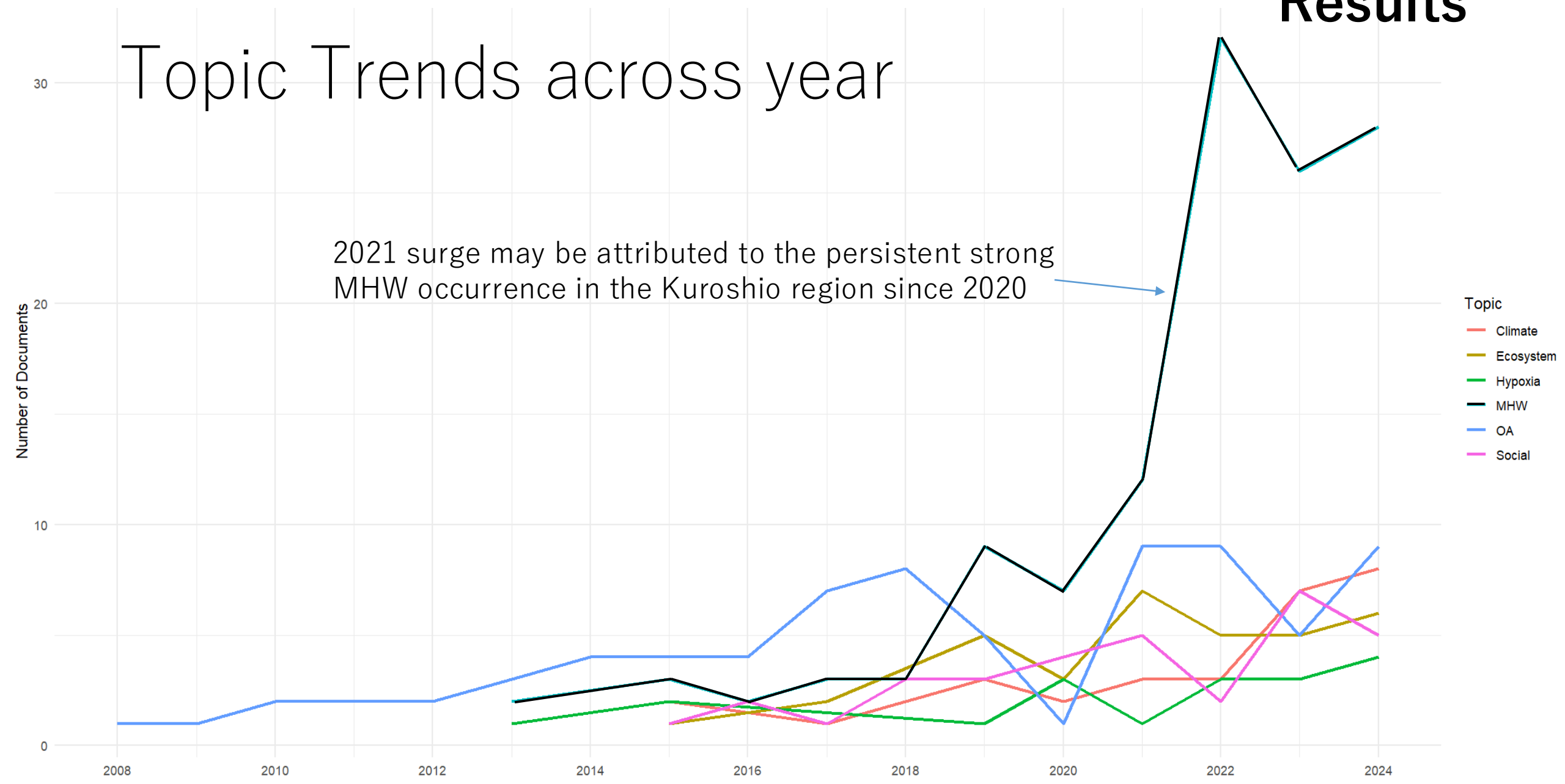Social = "fisheries", "aquaculture", "community", "communities", "resilience"

Climate = "climate change", "warming", "global warming"
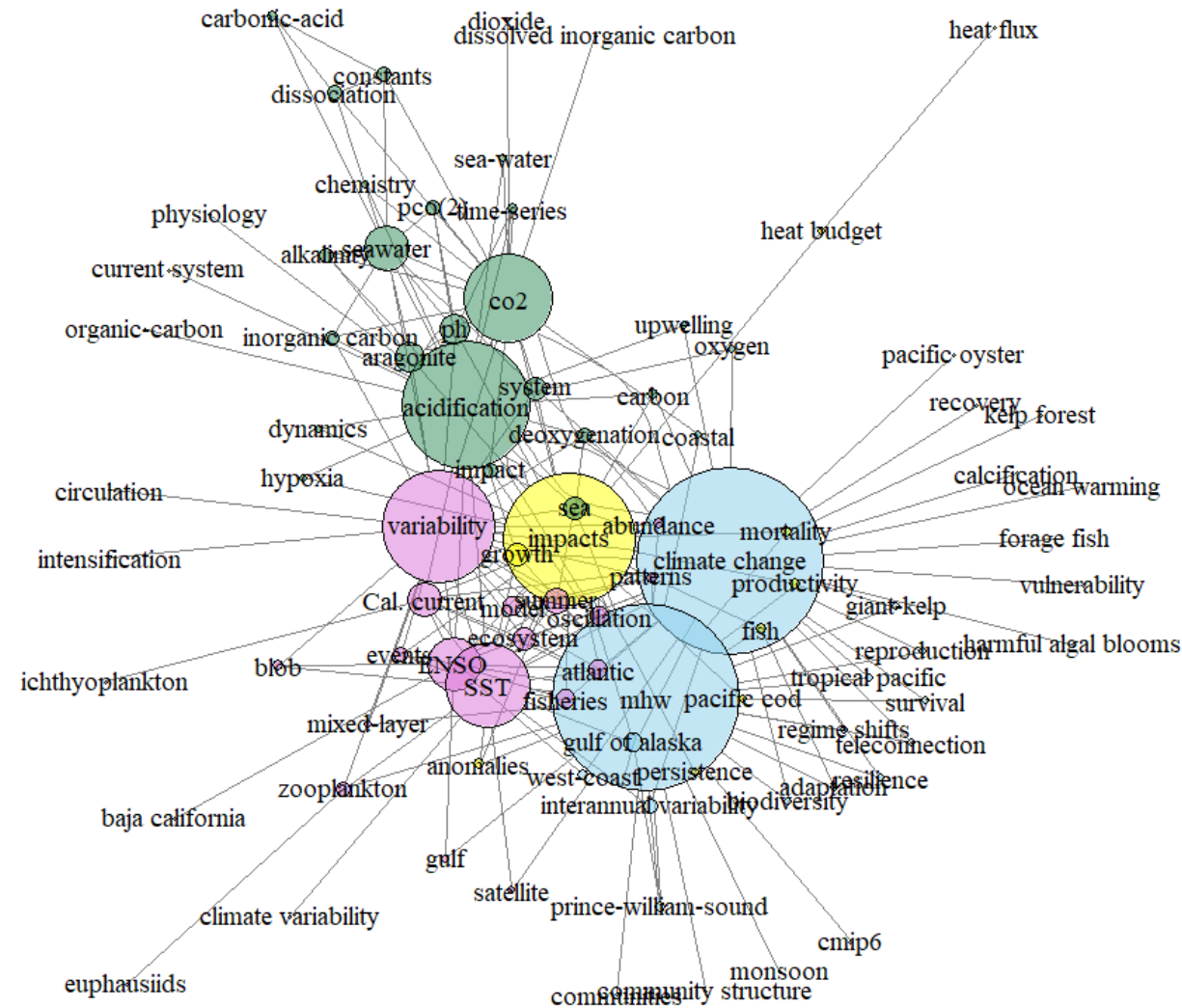
Hypoxia = "hypoxia", "low oxygen", "deoxygenation"

Number of Documents by topic

Co-occurrence Network (frequent words in titles and abstracts)

Results

Clustering

- Cluster tokens (words from titles/abstracts) using Louvain-method
- → **5 Clusters**
  1. Climate Variability and Adaptation
  2. Ecosystem Impacts
  3. Ocean Acidification
  4. Regional Climate Phenomena
  5. Oceanographic Variability

rank	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
1	climate change	impacts	acidification	ENSO	variability
2	MHW	summer	CO2	atlantic	SST
3	Gulf of Alaska	sea	seawater	fisheries	California current
4	interannual variability	carbon	aragonite	blob	ecosystem
5	Prince-William Sound	fish	Ph	west-coast	growth
6	adaptation	mortality	system	gulf	model
7	biodiversity	productivity	alkalinity	baja california	oscillation
8	coastal	dynamics	constants		deoxygenation
9	giant-kelp	heat budget	dissociation		events
10	oxygen	hypoxia	impact		zooplankton
11	regime shifts	pacific cod	inorganic carbon		abundance
12	reproduction	persistence	pco(2)		anomalies
13	resilience	california	carbonic-acid		patterns
14	survival	heat flux	time-series		mixed-layer
15	teleconnection		chemistry		satellite
16	tropical pacific		sea-water		circulation
17	upwelling		current system		climate variability
18	calcification		dioxide		euphausiids
19	cmip6		dissolved inorganic carbon		ichthyoplankton
20	communities		organic-carbon		intensification
21	community structure		physiology		
22	forage fish				
23	harmful algal blooms				
24	kelp forest				
25	monsoon				
26	ocean warming				
27	pacific oyster				
28	recovery				
29	vulnerability				

Conclusion

- The number of scientific literature on MHW increase at higher rate than any other climate extreme events
  - The others are also increasing
- Screened data (by titles/Abstracts) are categorized into 5 clusters
  - Clusters cover macro-level ocean physics to micro-level biochemical processes, reflecting a multi-scale understanding of marine responses to climate extreme events