

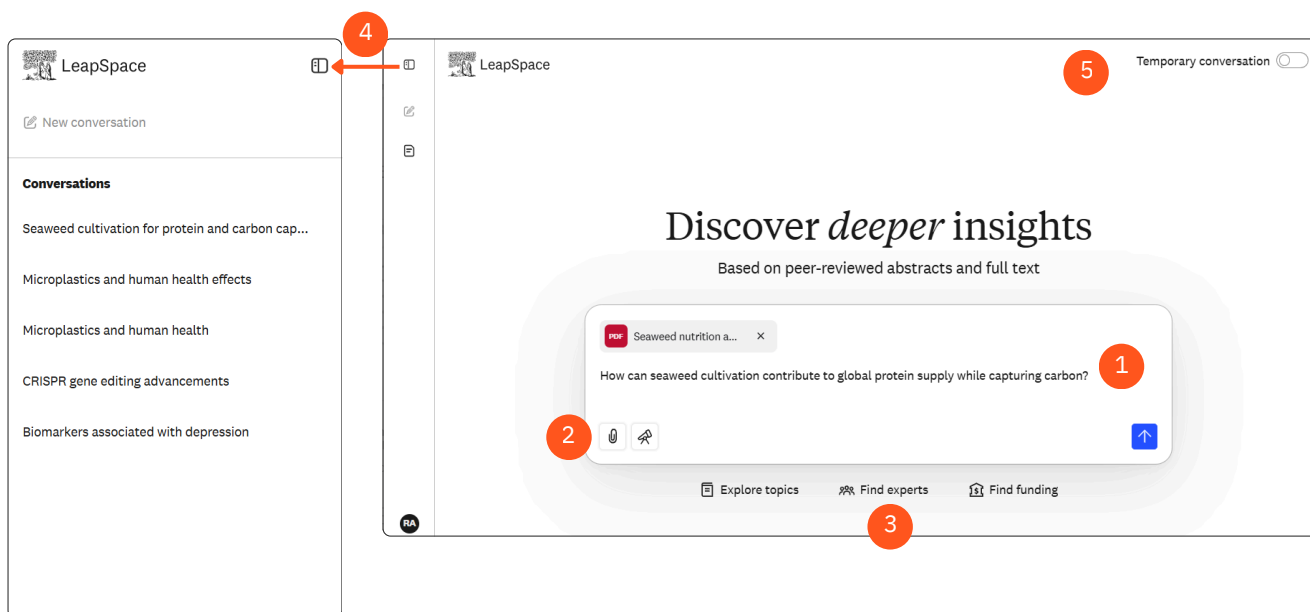
Quick Reference Guide



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1. Begin your search



- 1. Formulate your query** — Simply ask your question or describe your request in a natural, conversational manner. The tool supports complex research, including interdisciplinary fields.
- 2. Add your own files** — Upload up to five files per conversation and ground AI responses in both your work and the published literature. PDFs, Word documents and additional text formats are supported.
- 3. Choose your search type** — The default search explores a topic, but you can also begin a search to find topic experts or funding.
- 4. Revisit previous queries** — Conversational history provides an overview of your previous LeapSpace searches in a tab to the left side of the screen. There you will find up to 10 of your most recent searches listed, along with an option to load older history items – LeapSpace stores up to 200 conversations in total, with a maximum of 20 exchanges per conversation.
- 5. Begin a temporary conversation** — Temporary conversation mode is designed for conducting exploratory, sensitive, or quick queries without retaining the chat history.

2. Analyzing search results

Copilot steps

- Creating a plan to respond to your query
- Performing keyword search
Using data from Scopus
(seaweed OR macroalgae OR kelp) AND (protein OR "biochemical yield" OR nutrit* OR amino acid*) AND (cultivat* OR farm* OR aquaculture OR mariculture)
- Performing natural language search
Using data from Scopus
How do seaweed cultivation practices enhance protein yields and support global protein supply?
- Performing keyword search
Using data from Scopus
(seaweed OR macroalgae OR kelp) AND ("carbon capture" OR "carbon sequestration" OR "blue carbon") AND (cultivat* OR farm* OR mariculture)
- Performing natural language search
Using data from Scopus
How does seaweed farming enable carbon capture and long-term carbon sequestration potential?
- Performing keyword search
Using data from Full text
(seaweed OR macroalgae OR kelp) AND (ecolog* OR environmental impact* OR habitat* OR biodivers*) AND (cultivat* OR farm* OR mariculture) AND (method* OR protocol OR "experimental design" OR result*)
- Performing natural language search
Using data from Full text
What ecological impacts arise from large-scale seaweed cultivation systems?

Ask a follow-up question

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1

Seaweed cultivation for protein and carbon capture

How can seaweed cultivation contribute to global protein supply while capturing carbon?

Copilot steps

Seaweed cultivation for protein and carbon capture

How seaweed cultivation can boost global protein supply while capturing carbon

Seaweed cultivation contributes to **protein production** and **carbon capture** through well-documented mechanisms:

- High-protein biomass generation**, especially when nutrients are optimized.
- Substantial carbon fixation during growth**, with some portion stored long-term as particulate or dissolved organic carbon.
- Ecosystem and climate co-benefits** such as nutrient removal, reduced emissions, and low land/water requirements.

Summary table

Domain	Key mechanisms	Evidence
Protein supply	• Wastewater/process-water cultivation boosts protein content and yields. • Seaweed can reach high protein levels and serve as alternative protein. • Biorefineries and improved extraction increase protein recoverability.	1, 2, 3, 4, 5
Carbon capture	• Very high primary productivity draws down CO ₂ . • Carbon exported as POC or RDOC becomes long-term storage. • Carbon sink estimates for cultivated systems are large (depending on fate of biomass).	6, 7, 8, 9, 10, 11, 12
Integrated systems & co-benefits	• IMTA systems recycle nutrients and enhance both biomass and carbon capture. • Wastewater-based cultivation removes N/P while producing protein-rich biomass.	13, 14, 15, 16

Ask a follow-up question

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2

3

- 1. Review the answer steps** — LeapSpace always displays the steps it takes to answer your question. This transparency builds trust and supports an essential skill in the age of AI - computational thinking or breaking a problem into parts and solving each step logically.
- 2. Examine the topic overview** — Review the structured topic overview to see the main points quickly. The Summary synthesizes content from relevant documents.
- 3. Ask a follow-up question** — You can use the follow-up feature to elaborate on specific points from the report, refocus your query to explore new perspectives, or zoom in on a particular area of interest.

3. Build evidence comparison tables across the literature

Microplastics and human health

Confidence Level

High confidence that these themes represent the major open questions, as they appear consistently across numerous reviews that highlight methodological limitations, research gaps, and missing long-term human data.

If you'd like, I can also generate:

- a conceptual diagram of research gaps,
- a prioritized research agenda,
- or a more detailed breakdown of gaps by exposure route, organ system, or particle type.

Show all 33 references

Explore as a table

1

📄

🔗

🔄

Follow-up Suggestions

↳ What are the potential pathways through which microplastics may affect human health?

↳ How do microplastics interact with the human immune system?

↳ What are the long-term health implications of microplastic exposure in humans?

Ask a follow-up question

📎

➡

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Methods

Results

Bridge gaps regarding the risks of (il) and human health, emphasizing the need to integrate multidisciplinary evidence pathways.	The paper evaluates exposure to nanoplastics, assesses bio-nano interactions, and examines potential risks through a multidisciplinary lens, although specific experimental methodologies are not detailed.	Nanoplastics are emerging environmental health concerns, with sources, with significant health impacts, including 553 park visits and 5.06 million visits.
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Add a column

2

×

Column name

Add column name

0/50

Describe what you want this column to do

Add description

0/140

Cancel

Create column

This is a temporary table and is not being saved

Leaving this page will clear it from your session, to retain a copy, first please export.

Export CSV

Filter ▼	Add column	Add papers	Q. See
Abstract	Methods	Results	
This paper identifies key knowledge gaps regarding the risks of nanoplastics to environmental and human health, emphasizing the need for a One Health approach to integrate multidisciplinary evidence and develop risk mitigation strategies.	The paper evaluates exposure to nanoplastics, assesses bio-nano interactions, and examines potential risks through a multidisciplinary lens, although specific experimental methodologies are not detailed.	Nanoplastics are found in various environmental sources, with significant exposure levels estimated including 553 particles/day for children and 81 adults. Limited data on human exposure levels.	
Microplastics (MPs) are environmental contaminants from plastic breakdown and industrial sources, entering humans via ingestion, inhalation, and skin contact. These sources include consumer and occupational exposure, and organ toxicity and carcinogenic properties are discussed.	Information Not Found	Information Not Found	
This study assesses the internal exposure to microplastics from dietary intake as the primary exposure source, with total exposure quantified at 460.20 µg/kg bwt/d. Microplastics were detected in food, water, and air samples.	assess exposure. Serum, urine, and fecal samples were analyzed for microplastics using pyrolysis gas chromatography/mass spectrometry (Py-GCMS).	460.20 µg/kg bwt/d, with dietary intake contributing 75.60%. Median microplastic levels were 20.8 µg/kg serum and 5.06 µg/kg in urine.	% of food, internal exposure
Microplastics, particularly nano- and microplastics, pose significant health risks through various exposure routes. They can lead to respiratory disorders, neurological symptoms, and gut microbiota disturbances. The review highlights the need for further research to understand the full impact of plastics on human health.	The review utilized an exploratory search strategy in PubMed, assessing 1230 titles and abstracts for inclusion. It focused on retrospective studies, case reports, and in vitro studies related to human exposure to nano- and	Microplastics were found in 81% of global tap water samples, with human consumption estimated at 1.5 mg per day. Inflammatory bowel disease patients show a concentration of microplastics in stool compared to healthy individuals (41.8 vs. 28.0 pcs/g).	

- 1. Extract evidence into a structured view** — Click "Explore as a table" to lift the underlying references into a comparison view — cited papers become rows, key evidence becomes columns.
- 2. Shape the table around your question** — Add columns, refine the dimensions you want to compare, or search across the papers to surface the findings that matter for your synthesis.

4. Explore the Reference details pane and verify claims

The screenshot displays the LeapSpace interface. On the left, a claim titled "How can seaweed cultivation contribute to global protein supply while capturing carbon?" is shown. Below the claim, a "Summary table" lists key mechanisms and evidence. An orange arrow points from a citation number (4) in the "Evidence" column to the "Reference details" pane on the right.

Summary table

Domain	Key mechanisms	Evidence
Protein supply	• Wastewater/process-water cultivation boosts protein content and yields. • Seaweed can reach high protein levels and serve as alternative protein. • Biorefineries and improved extraction increase protein recoverability.	1, 2, 3, 4
Carbon capture	• Very high primary productivity draws down CO ₂ . • Carbon exported as POC or RDOC becomes long-term storage. • Carbon sink estimates for cultivated systems are large (depending on fate of biomass).	6, 7, 8, 9, 10, 11, 12
Integrated systems & co-benefits	• IMTA systems recycle nutrients and enhance both biomass and carbon capture. • Wastewater-based cultivation removes N/P while producing protein-rich biomass.	13, 14, 15

Reference details

Scopus abstract Chapter

Protein from seaweed aquaculture

Suryaningtyas, I.T.; Je, J.-Y.; Pangestuti, B.

Future Proteins: Sources, Processing, Applications and the Bioeconomy

• Elsevier • Other • 2023

2 citations 1148 FWC

[View at publisher](#) [View Scopus document](#)

Neutral

The reference discusses seaweed's high protein content (up to 47% dry weight) and notes developing extraction techniques (solvent, enzymatic, microbial) but does not address wastewater/process-water cultivation or biorefinery approaches. Thus, while the general topic of seaweed as an alternative protein source and improved recoverability is aligned, parts of the claim are not directly supported.

Do you find it useful? [Yes](#) [No](#)

Abstract **Excerpts**

Seaweed has been used as a healthy food in the East Asian region since ancient times. Studies prove that this marine flora poses a high protein content, some of which even reach up to 47% of its dry weight. Apart from being a potential source of protein, bioactive derivatives of seaweed protein also have a role in improving health and treating various diseases such as CVD, obesity, cancer, etc. As a result, seaweed become an interesting commodity in the agricultural, food, and health industries. The growing market for seaweed increases the seaweed agricultural industry. The use of seaweed as a future protein source is considered to be a possible solution to the problem of highly scarce agricultural land, as well as

Verify claims and explore sources — Clicking on a citation number will open the Reference details pane, which displays:

- 1. Bibliographic details**
- 2. The option to export the reference**
- 3. Claim Radar** — Shows how closely a claim aligns with its cited source and is given a label of Supports, Contradicts or Neutral, answering “Is this claim actually supported by the source being cited?”
- 4. Trust Card** — Passage from the source that supports the claim

5. Validate insights across the research landscape

The screenshot displays the LeapSpace interface, which is used for validating research insights. On the left, a panel titled "Seaweed cultivation for protein and carbon capture" shows a "Copilot steps" section with a question: "How can seaweed cultivation contribute to global protein supply while capturing carbon?". Below this, a "Summary table" lists key mechanisms and evidence for three domains: Protein supply, Carbon capture, and Integrated systems & co-benefits. An orange arrow points from the "Evidence" column of the "Protein supply" row to the "Claim Radar" panel on the right.

The "Claim Radar" panel on the right shows the identified claim: "Wastewater/process-water cultivation boosts protein content and yields." It displays a bar chart for "25 related documents" with 17 Support, 6 Mixed, and 2 Contradict. Below this, it lists "5 key insights" and provides a feedback question: "Do you find Claim Radar helpful?".

Domain	Key mechanisms	Evidence
Protein supply	• Wastewater/process-water cultivation boosts protein content and yields. • Seaweed can reach high protein levels and serve as alternative protein. • Biorefineries and improved extraction increase protein recoverability.	1, 2, 3, 4, 5
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Integrated systems & co-benefits	• IMTA systems recycle nutrients and enhance both biomass and carbon capture. • Wastewater-based cultivation removes N/P while producing protein-rich biomass.	13, 14, 15, 16

Ask a follow-up question

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1. **Check claims against the broader research** — Claim Radar validates AI-generated insights against the broader research landscape. It identifies verifiable claims within a response and tests them against up to 40 of the most relevant sources across 100M+ Scopus-indexed papers - showing whether evidence supports, contradicts, or presents mixed findings, with clear visual summaries and an evidence trail. It answers: "What does the broader research say about this claim?"

6. Find experts and potential collaborators

Summary Table: Top Experts by Domain

Domain	Key Experts	Why They're Relevant	Citations
Seaweed Cultivation & Aquaculture	Ni P.D. Kusuma, Pieter Amalo, Rifqah Pratiwi, Adrian K. Macleod	Work on <i>Kappaphycus</i> and <i>Eucheuma</i> cultivation, growth optimization, and sustainable farm design	48 49 50 51
Seaweed Proteins & Extraction Technologies	Diane Purcell, João P. Trigo, Kristoffer Stedt, Jayani Samarathunga, Maria Hayes	Lead research on seaweed protein extraction, functional foods, biochemical profiling	52 53 54 55 56
Macroalgal Carbon Capture & Blue Carbon Modeling	Si Chen, Xiuting Feng, Ruimin Zhang, Ellen Ould, Bin Li	Produce high-impact work on DOC/POC pathways, carbon accounting frameworks, and macroalgal carbon fate	57 58 59 60 61

1. Experts in Seaweed Cultivation and Applied Aquaculture

Ni P.D. Kusuma

Focus on *Kappaphycus* and *Sargassum* cultivation performance, biochemical composition, and bioactivity [48](#).

Pieter Amalo

Ask a follow-up question

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1. **Identify topic experts and potential collaborators:** Identify key people working in the field by asking LeapSpace—using the ‘Ask a follow-up question’ feature—to see the top experts or to suggest potential collaborators

Seaweed cultivation for protein and carbon capture

Experts in Seaweed Cultivation and Marine Protein

Leading Experts on Seaweed Cultivation, Seaweed-Based Protein, and Macroalgal Carbon Capture

Below is a structured synthesis of the most relevant experts identified from the retrieved author data. These individuals have **substantial publication output, citation impact, or specialized expertise** in seaweed cultivation, marine protein, macroalgal carbon sequestration, or carbon-cycle modeling.

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Pieter Amalo

Ask a follow-up question

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Author preview

Adrian K. Macleod **3**

Matching documents [12](#) [h-index](#) [11](#) [Citations](#) [872](#)

[View profile](#)

Matching documents

Production of acetone, butanol, and ethanol by fermentation of *Saccharina latissima*: Cultivation, enzymatic hydrolysis, inhibitor removal, and fermentation
[Schultze-Jena, A.](#) ; [Voon, R.C.](#) ; [Macleod, A.K.A.](#) ; [López-Contreras, A.M.](#) ; [Boon, M.A.](#)
Algal Research 71 • Journal • 2022
32 citations

Ensilage of sugar kelp biomass for biorefining
[Larsen, S.U.](#) ; [Ma, N.](#) ; [Hou, X.](#) ; [Bak, U.G.](#) ; [Bjerre, A.-B.](#)
Biomass and Bioenergy 71 • Journal • 2021
11 citations

Is social license to operate relevant for seaweed cultivation in Europe?
[Billings, S.-L.](#) ; [Postma, J.](#) ; [Tett, P.](#) ; [Macleod, A.](#)
Aquaculture 71 • Journal • 2021
42 citations

Effects of seeding method, timing and site selection on the production and quality of sugar kelp, *Saccharina latissima*: A Danish case study
[Bodenskov, T.](#) ; [Nielsen, M.M.](#) ; [Basmussen, M.B.](#) ; [Sloth, J.J.](#) ; [Reuben, A.](#)

2. **Review the list of Active contributors** — LeapSpace generates a list of people who are working in your specific topic.
3. **Dive into expert insights** — You can deep-dive into any person on the list to review their experience and past work. This data is sourced from Elsevier's Scopus database.

7. Explore funding opportunities

How can seaweed cultivation contribute to global protein supply while capturing carbon?

Copilot steps >

Seaweed cultivation for protein and carbon capture

How seaweed cultivation can boost global protein supply while capturing carbon

Seaweed cultivation contributes to **protein production** and **carbon capture** through well-documented mechanisms:

1. **High-protein biomass generation**, especially when nutrients are optimized.
2. **Substantial carbon fixation during growth**, with some portion stored long-term as particulate or dissolved organic carbon.
3. **Ecosystem and climate co-benefits** such as nutrient removal, reduced emissions, and low land/water requirements.

Summary table

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Integrated systems & co-benefits	• IMTA systems recycle nutrients and enhance both biomass and carbon capture. • Wastewater-based cultivation removes N/P while producing protein-rich biomass.	13 , 14 , 15

What funding opportunities exist in the U.S. for this topic?

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1. **Inquire about funding** — To find out who is funding research in this topic, use the 'Ask a follow-up question' feature.

Seaweed cultivation for protein and carbon capture

Funding opportunities for seaweed cultivation and carbon capture

U.S. Funding Opportunities Relevant to Seaweed Cultivation, Marine Protein, and Ocean-Based Carbon Capture

Below is a **focused synthesis** of the funding opportunities from your search that meaningfully support work on seaweed aquaculture, blue carbon, marine biomass, sustainable marine protein, or enabling technologies for carbon removal and aquaculture systems. Only opportunities with **direct or enabling relevance** are included.

Summary Table: Most Relevant Opportunities

Opportunity	Funder	Amount	Why It's Relevant	Citations
VentureWell Ocean Enterprise Accelerator	VentureWell	\$140,000	Supports ocean-data tech and innovations; strong fit for MRV, carbon accounting, seaweed-farm monitoring	29 30 31
NIST: Water Quality & Health in Aquaculture	NIST	\$85,764	Directly supports aquaculture R&D including nutrient dynamics important to seaweed and IMTA	32 33
NOAA: Population Assessment Modeling for Marine Aquaculture	NOAA	Not listed	Supports ecological modeling for aquaculture; relevant for seaweed-ecosystem interactions	34
BARD Aquaculture & Desert Farming Program	BARD (US-Israel)	\$600,000	Funds algae, seafood, and aquaculture protein research; requires US-Israel partnership	41 42
NRL Seawater Carbon Capture & Hydrogen Production	U.S. Naval Research Lab	\$104,401	Strong thematic link to ocean carbon pathways; enabling carbon-capture tech	43
NOAA: Inter-Ocean	NOAA	Not listed	Supports foundational	39

Who are the experts on this topic?

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Funding preview

Funding institutional Funding opportunity

Measurement Science to Promote Water Quality and Health in Aquaculture

National Institute of Standards and Technology USA

mary.bedner@nist.gov

Awarded amount Type
\$85764 USD Individual fellowships

[Apply for funding](#)

Summary Eligibility details

NIST, in collaboration with the Institute of Marine and Environmental Technology (IMET), is seeking a post-doctoral scientist to participate in measurement science research to support the development of sustainable aquaculture in the US. The research will be accomplished through the complementary capabilities or both organizations including advanced analytical capabilities at NIST (e.g., LC-HRMS and LC-MS/MS, GC-MS) and a state-of-the-art aquaculture research center at IMET. Potential research areas of interest include the development of sensitive and selective methods for determining organic contaminants, such as hormones, metabolites, and feed by-products in recirculating aquaculture systems (RAS); evaluation of passive sampling devices for mimicking the bioaccumulation of targeted organic contaminants in RAS; study of antibiotics used as food supplements in aquaculture, particularly transport through the water, metabolic by-products, and development of novel treatment approaches; development of analytical capabilities for off-flavor detection in water and fish tissue, including the development and evaluation of novel technology for off-flavor removal; measurement approaches for understanding contaminant remediation by oysters and other filter feeders in marine aquaculture; and determination of the impact of current-use pesticides on aquaculture animals and water.

Keywords:

2. **Review funding sources** — You can see a list of the major funding sources for this area of research.
3. **Identify specific funding opportunities** — You can drill down into specific funding opportunities that are behind each funder, which may be a source of funding for you.

8. Create a report of your findings

Experts in Seaweed Cultivation and Marine Protein

Leading Experts on Seaweed Cultivation, Seaweed-Based Protein, and Macroalgal Carbon Capture

Below is a structured synthesis of the most relevant experts identified from the retrieved author data. These individuals have **substantial publication output, citation impact, or specialized expertise** in seaweed cultivation, marine protein, macroalgal carbon sequestration, or carbon-cycle modeling.

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Ni P.D. Kusuma

Focus on *Kappaphycus* and *Sargassum* cultivation performance, biochemical composition, and bioactivity [48](#).

Pieter Amalo

Can you make a short report for my team about this and include diagrams? **1**

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- 1. Generate a report** — Use the 'Ask a follow-up question' feature to create a report to share key findings with your team.

Seaweed cultivation for protein and carbon capture

3. Diagram: Protein & Carbon Pathways in Seaweed Cultivation

```
graph TD; Nutrients --> Growth; Growth --> Biomass; Biomass --> Protein; Biomass --> Carbon_fixation[Carbon fixation]; Carbon_fixation --> POC_export[POC export]; Carbon_fixation --> RDOC_formation[RDOC formation]; POC_export --> Long_term_storage[Long term storage]; RDOC_formation --> Long_term_storage;
```

Figure 1: Seaweed nutrient uptake drives biomass formation, protein yield, and carbon pathways **1** **3**

Matching documents

Production of acetone, butanol, and ethanol by fermentation of *Saccharina latissima*: Cultivation, enzymatic hydrolysis, inhibitor removal, and fermentation
[Schultze-Jena, A.](#) ; [Vroon, B.C.](#) ; [Macleod, A.K.A.](#) ; [López-Contreras, A.M.](#) ; [Boon, M.A.](#)
Algal Research 71 • Journal • 2022
32 citations

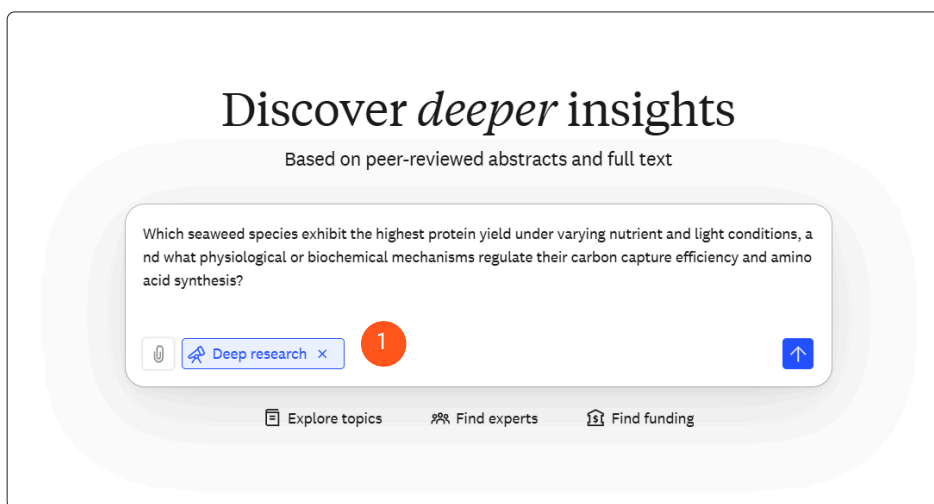
Ensilaging of sugar kelp biomass for biorefining
[Larsen, S.U.](#) ; [Ma, N.](#) ; [Hou, X.](#) ; [Bak, U.G.](#) ; [Bjerre, A.-B.](#)
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Effects of seeding method, timing and site selection on the production and quality of sugar kelp, *Saccharina latissima*: A Danish case study
[Boderskov, I.](#) ; [Nielsen, M.M.](#) ; [Rasmussen, M.B.](#) ; [Sloth, J.J.](#) ; [Bruhn, A.](#)

- 2. Analyze the report** — LeapSpace uses the previous turns as context and generates a structured report, including a diagram. It also pulls in the associated references from the earlier steps — combining everything found in one place.

9. Generate a Deep Research Report



- 1. Develop a comprehensive, well-reasoned report** — Deep research takes your exploration a step further—producing comprehensive, well-reasoned reports in minutes. When you pose a question, Deep research goes beyond summarizing existing information—it develops a detailed research plan, conducts extensive searches across the curated literature in LeapSpace, and refines its approach as new insights emerge.

Seaweed species protein yield and mechanisms

Which seaweed species exhibit the highest protein yield under varying nutrient and light conditions, and what physiological or biochemical mechanisms regulate their carbon capture efficiency and amino acid synthesis?

Show deep research steps - Processed for 1m 57s

Deep research report View Deep research response as PDF

This report may contain inaccuracies. Please verify the information independently.

Protein Yield, Carbon Capture, and Amino Acid Synthesis in High-Protein Seaweeds: Species Comparisons and Environmental Regulation

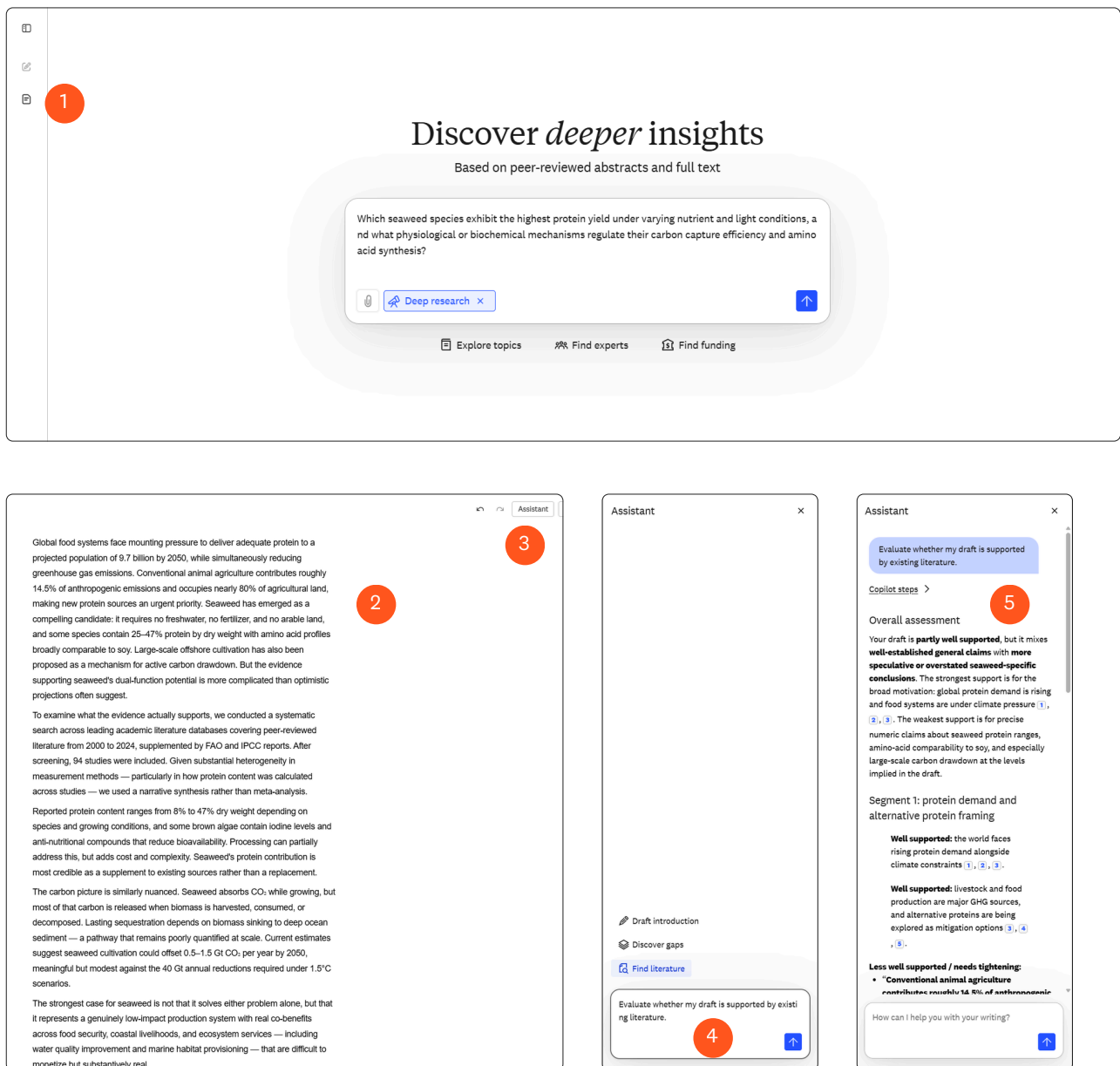
Quick Reference

Key Findings Table

Species/Group	Max Protein Yield (% DW)	Optimal Conditions	Key Mechanisms for Carbon Capture & Amino Acid Synthesis	Notable References
Ulva fasciata	24.5	High nutrients, high light	Robust CCMs, boundary-layer acidification, GS/GOGAT, PII/NAGK	1 2 3
Ulva prolifera	Highest in Ulva group	400 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 25°C, high N	CCM flexibility, strong N assimilation, GS/GOGAT	4 5
Porphyra/Pyropia spp.	30–47	Winter/spring, high nutrients	Efficient Rubisco, GS/GOGAT, PII/NAGK	6 7

- 2. Analyze the report overview** — Quickly review a structured, fully referenced summary—including key findings, a direct answer to the query, study scope, assumptions and limitations, synthesis and discussion, future research directions, conclusions, and recommended reading.

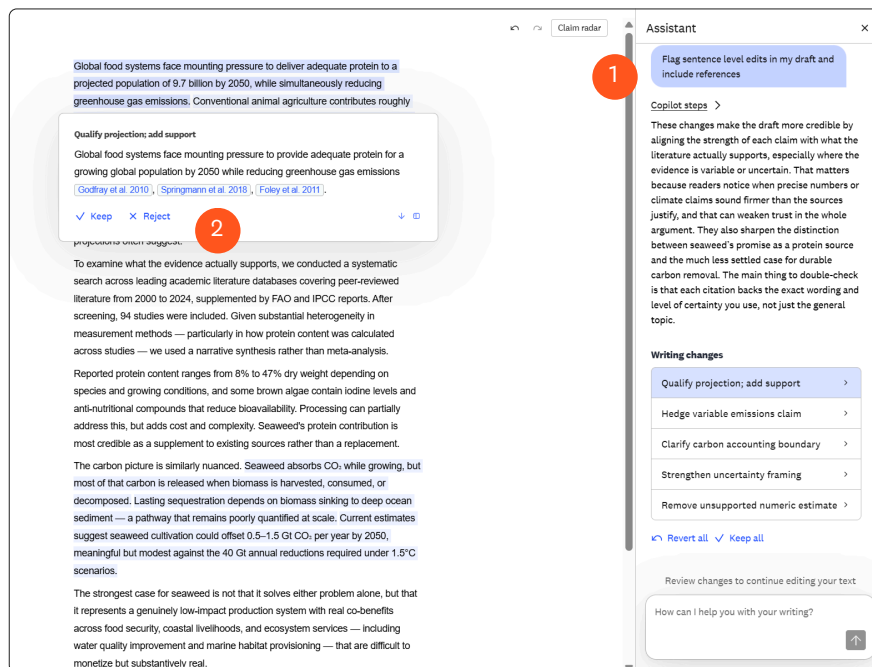
10. Draft with Writing Coach



Writing Coach is a drafting tool built for researchers — a secure and private conversational workspace to contextualize reasoning, strengthen arguments, and identify gaps.

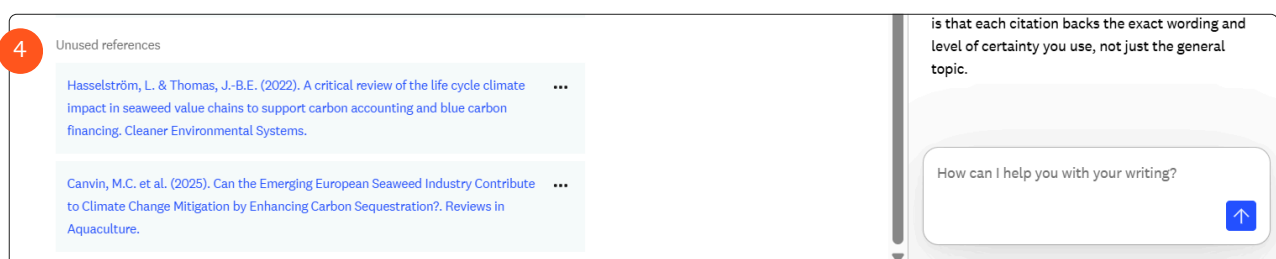
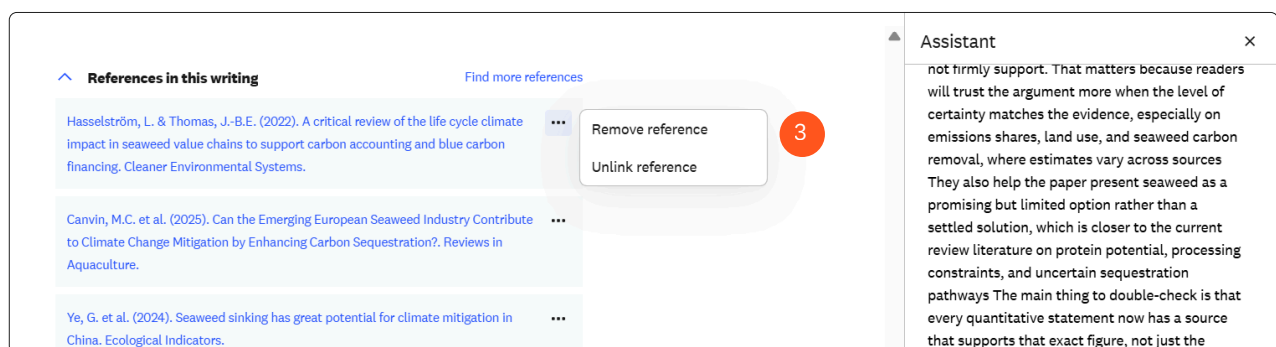
1. **Open Writing Coach** — Access Writing Coach from the LeapSpace home screen.
2. **Add your draft** — Type or paste your draft into the document editor.
3. **Open the Assistant panel** — Select the ‘Assistant’ icon to pop out a conversation panel on the right.
4. **Start a conversation** — Begin a conversation; for example, contextualize evidence against the wider literature.
5. **Strengthen and refine** — Strengthen arguments and surface gaps through evidence-based, back-and-forth dialogue.

11. Refining drafts through dialogue



1. Move between dialogue and edits — You can keep refining and shaping your draft as the conversation continues. For instance, by asking for sentence level edits and references, the tool understands you are requesting a change to the document and generates an inline suggestion — making it easy to move smoothly between discussion and structured writing.

2. You stay in control — Writing Coach does not change your work automatically. You decide what to keep or reject as you develop your draft.



3. Manage references inline — You can see any added references listed at the bottom of your draft and you can always choose to remove or unlink a reference if it is no longer relevant.

4. Full traceability — Removed references remain listed below for full traceability.

12. Verifying the claims in your draft

Global food systems face mounting pressure to provide adequate protein for a growing global population by 2050 while reducing greenhouse gas emissions (Godfray et al. 2010, Springmann et al. 2018, Foley et al. 2011). Conventional animal agriculture is widely cited as a major contributor to food-related emissions, but precise estimates vary across studies; more broadly, food systems account for a substantial share of global anthropogenic greenhouse gas emissions, and shifts away from animal-source foods can reduce those impacts (Poore & Nemecek 2018, Tilman & Clark 2014, Crippa et al. 2021, Vermeulen et al. 2012, Zhao et al. 2026). Seaweed has emerged as a compelling candidate: it requires no freshwater, no fertilizer, and no arable land, and some species contain 25–47% protein by dry weight with amino acid profiles broadly comparable to soy. Large-scale offshore cultivation has also been proposed as a mechanism for active carbon drawdown. But the evidence supporting seaweed's dual-function potential is more complicated than optimistic projections often suggest.

To examine what the evidence actually supports, we conducted a systematic search across leading academic literature databases covering peer-reviewed literature from 2000 to 2024, supplemented by FAO and IPCC reports. After screening, 94 studies were included. Given substantial heterogeneity in measurement methods — particularly in how protein content was calculated across studies — we used a narrative synthesis rather than meta-analysis.

Reported protein content ranges from 8% to 47% dry weight depending on species and growing conditions, and some brown algae contain iodine levels and anti-nutritional compounds that reduce bioavailability. Processing can partially

Assistant

not firmly support. That matters because readers will trust the argument more when the level of certainty matches the evidence, especially on emissions shares, land use, and seaweed carbon removal, where estimates vary across sources. They also help the paper present seaweed as a promising but limited option rather than a settled solution, which is closer to the current review literature on protein potential, processing constraints, and uncertain sequestration pathways. The main thing to double-check is that every quantitative statement now has a source that supports that exact figure, not just the general idea.

Flag sentence level edits in my draft and include references

Copilot steps >

These changes make the draft more credible by aligning the strength of each claim with what the literature actually supports, especially where the evidence is variable or uncertain. That matters because readers notice when precise numbers or climate claims sound firmer than the sources justify, and that can weaken trust in the whole argument. They also sharpen the distinction

Claim Radar

Select a claim to explore the evidence and research connected to it. Some matches may be imperfect.

Update claims

"Conventional animal agriculture contributes roughly 14.5% of anthropogenic emissions and occupies nearly 80% of agricultural land."

"Seaweed generally requires little or no arable land and freshwater relative to terrestrial protein crops."

"Some species reach high protein concentrations on a dry-weight basis."

"Reported protein content ranges from 8% to 47% dry weight depending on species and growing conditions."

"Some species also present iodine burdens, phenolic compounds, and digestibility constraints that can reduce usable protein, even when amino acid profiles appear favorable"

"Processing can partially address this, but adds cost and complexity."

"Seaweed absorbs CO₂ while growing"

"much of that carbon is subsequently returned to the system when biomass is harvested, consumed, decomposed, or converted to biofuels"

Claim evidence

Processing steps >

Identified claim

Conventional animal agriculture contributes roughly 14.5% of anthropogenic emissions and occupies nearly 80% of agricultural land.

46 related documents

Support 31

Mixed 14

Contradict 1

4 key insights

- Provided abstracts mostly place animal agriculture near the claim's emissions range and land-use dominance.

Show more

Do you find Claim Radar helpful?

Yes No

31 support 14 mixed 1 contradict

Pre- and post-production processes increasingly dominate greenhouse gas emissions from agri-food systems

Tubello, F.N. 7; Karl, K. 7; Flammini, A. 7; Conforti, P. 7; Torero, M. 7

- 1. Surface claims from your draft** — Clicking on the Claim Radar icon opens a panel listing the claims pulled from your draft.
- 2. Check claims against the literature** — Claim Radar shows whether a claim is supported or contested in the wider literature.
- 3. Evidence-based validation** — Selecting a claim searches up to 40 relevant sources across 100M+ Scopus-indexed papers, showing whether evidence supports, contradicts, or presents mixed findings, with a clear evidence trail.

