

2021 INDUSTRY UPDATE

Alternative seafood



Table of contents

| | |
|---|-----------|
| Author's note | 4 |
| Executive summary | 6 |
| Section 1: Commercial landscape | 8 |
| Launches and partnerships | 9 |
| New company/product launches | 9 |
| Partnerships and distribution deals | 10 |
| Section 2: Investments | 14 |
| Investment activity | 15 |
| Most active investors in alternative seafood by deal count (2021) | 16 |
| 2021 investments in plant-based seafood companies with disclosed deal sizes | 17 |
| 2021 investments in cultivated seafood companies with disclosed deal sizes | 17 |
| 2021 investments in fermentation-derived companies | 17 |
| Section 3: Retail sales | 20 |
| U.S. plant-based seafood retail sales | 20 |
| U.S. consumer research on plant-based and cultivated seafood | 22 |
| Section 4: Conclusion and opportunities | 26 |
| Opportunities | 26 |
| Expert predictions | 27 |
| Additional resources | 29 |
| Acknowledgments | 30 |

The Good Food Institute (GFI) is an international network of organizations developing the roadmap for a sustainable, secure, and just protein supply. We identify the most effective solutions, mobilize resources and talent, and empower partners across the food system to make alternative proteins accessible, affordable, and delicious.

This report, as well as all of GFI's research, data, and insights, is made possible by gifts and grants from our global family of donors.

GFI's **State of the Industry Report** series dives deep into the key technologies, business developments, and scientific advances driving the alternative protein industry forward:

- Cultivated meat and seafood
- Fermentation: Meat, seafood, eggs, and dairy
- Plant-based meat, seafood, eggs, and dairy
- Industry update: Alternative seafood

The Good Food Institute is not a licensed investment or financial advisor, and nothing in the state of the industry report is intended or should be construed as investment advice.

Author's note

Every year, we see advancements in the alternative protein industry that are opening the door for a global shift to a far more sustainable, secure, and just food system than the one we have today. Like 2019 and 2020 before it, 2021 was the most active year yet for growth in the alternative protein industry, and many signs indicate that the world is on the cusp of a global race for alternative protein innovation.

By making meat and seafood from plants, through fermentation, or through the cultivation of actual animal cells, we can reduce the harmful climate impacts of our food system, decrease the risk of zoonotic disease and antibiotic resistance, and feed more people with fewer resources. We can also slow biodiversity loss, reduce air and water pollution, and preserve our oceans. Indeed, alternative proteins are to meat and seafood production as renewables are to energy—the future. As the global community strives to mitigate climate risks, alternative proteins stand as an enormous opportunity that can help us reach net-zero emissions—but more investment and open-access R&D are needed. Together, increased public and private investments in alternative proteins can write the next technological chapter for agriculture and spur economic growth while improving both environmental and global health outcomes.

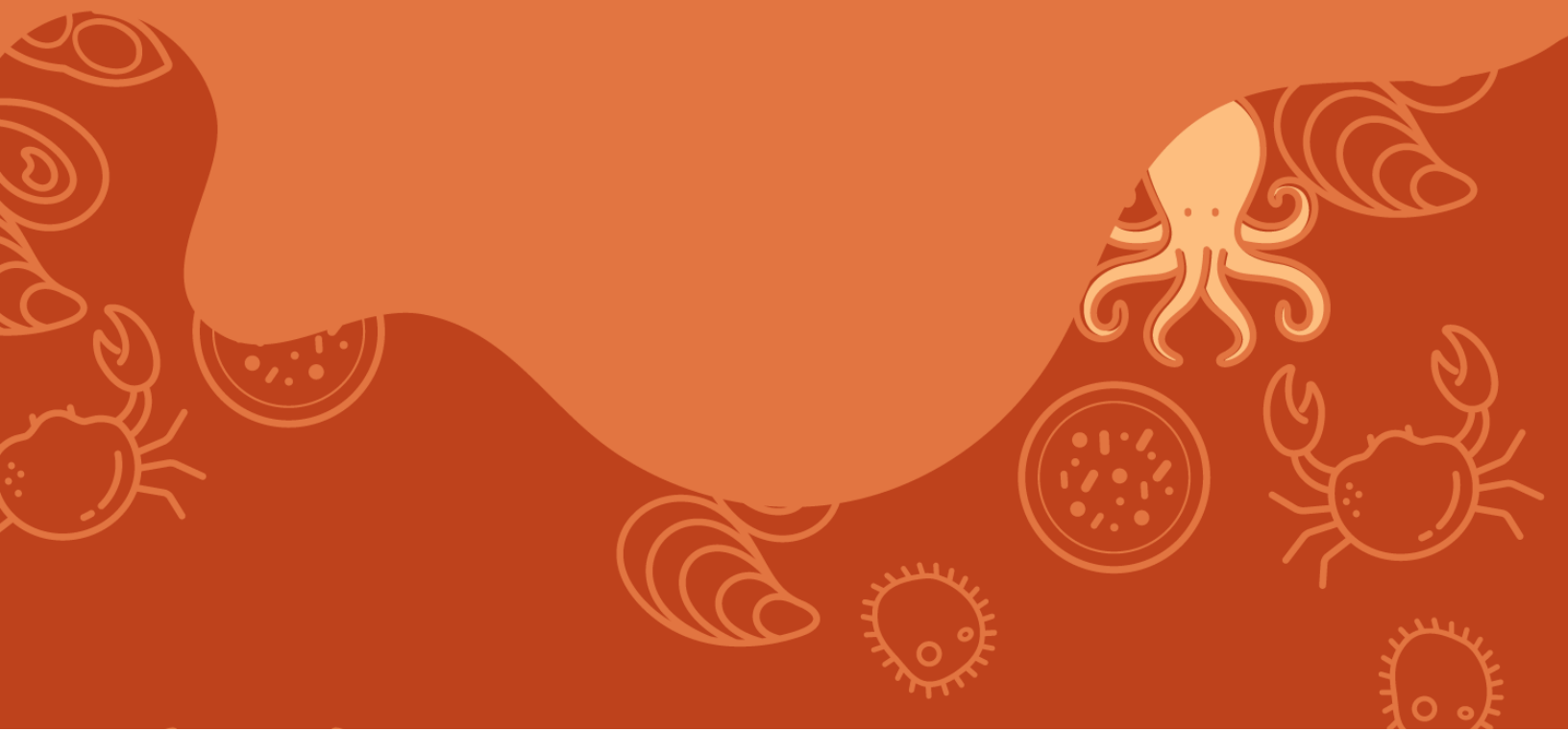
Global seafood demand is on course to rise dramatically as population and income levels increase. Yet more than **90 percent of wild fisheries** are classified as overfished or harvested at maximum capacity, and aquaculture growth is slowing and presents its own challenges, leaving us with an urgent need for new approaches to meet this growing demand. Meanwhile, bottom trawling, a method of industrial fishing responsible for a quarter of all wild-caught seafood today, releases **1.5 billion kilograms of carbon dioxide** into the atmosphere each year. Marine species are some of the most vulnerable to climate change, and warmer oceans have already seen warmer heat waves, coral bleaching, rising sea levels, and the migration of marine species to cooler waters. Together, these challenges have forced fishers into new territories and left little for millions of subsistence fishers and coastal communities that rely on a daily catch for food and income. Over **800 million people are at risk of malnutrition** if fish populations—and the local catch—continue to decline.

The development and widespread commercialization of alternative seafood is an immensely promising approach to alleviating pressure on both wild fisheries and aquaculture systems while helping to meet global demand for an important source of food. In the past decade, the market has seen significant shifts in consumer demand and product innovation toward plant-based meats. Today, alternative seafood represents but 0.1 percent of the total U.S. seafood retail market. But by following in the path of plant-based meat (with a 1.4 percent market share) and plant-based milk (with a 16 percent market share), alternative protein trends could promote a global transformation in the seafood industry. Along with growing consumer interest in plant-based foods, factors like the high incidence of seafood allergies and the high price points of many seafood products—especially products that are consumed raw and thus pose special consumer risks—generate a sizable number of highly motivated early adopters and market entry points for alternative seafood products.

Alternative seafood producers are leveraging technologies across plant-based, fermentation, and cultivated platforms. Today, we are just scratching the surface of how such applications can reshape the future of food. To meet growing demand and enable alternative seafood to compete with conventional products on taste, price, and accessibility, greater investments from both the private and the public sectors will be needed. Such investments can simultaneously help feed billions of people, protect our oceans, and achieve global climate goals.

We present this industry update on alternative seafood to highlight the sector's key developments in 2021 and look ahead to what's next.

Executive summary



Executive summary

2021 was a year of tremendous growth for the alternative seafood industry. The nascent industry gained momentum with an influx of new companies, products, and investments—and U.S. retail sales showed rapid and sustained growth.

Investments

Alternative seafood companies raised \$175 million in 2021, nearly double the amount raised in 2020. The \$175 million was raised across 15 deals with disclosed deal sizes, bringing total investments to \$313 million from 2013 to 2021.

| Category | 2021 | 2020 | 2013–2021 | Highlights |
|------------------------------------|--------|-------|-----------|--|
| Total invested capital | \$175M | \$91M | \$313M | Invested capital grew 92% from 2020 to 2021. |
| Invested capital deal count | 24 | 20 | 69 | The largest investment of 2021 was \$60M (BlueNalu). |
| Unique investors | 108 | 91 | 215 | The number of new unique investors in alternative seafood grew by 57% in 2021. |
| Series A rounds | 1 | 3 | 6 | New Wave Foods closed an \$18M Series A round in 2021. |
| Series B rounds | 2 | 1 | 3 | Finless Foods and Gathered Foods closed Series B rounds in 2021. |

Commercial landscape

2021 welcomed 21 new alternative seafood companies and saw the first launches of alternative seafood companies in Austria, Latvia, Thailand, Estonia, and South Africa.

Alternative seafood also saw new activity from the conventional seafood industry in 2021, including new investments or launches from Thai Union, Karavela, Long John Silver's, and Nestlé.

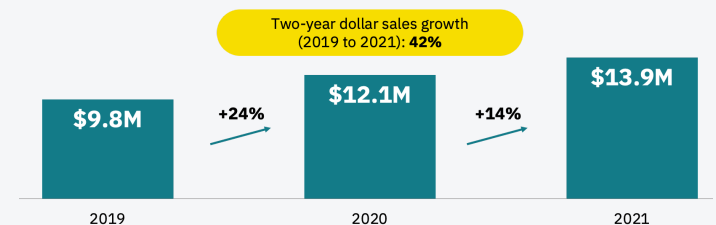
Total alternative seafood companies and companies launched in 2021

| Company type | Total | New in 2021 |
|--------------|------------|-------------|
| Plant-based | 90 | 11 |
| Cultivated | 20 | 9 |
| Fermentation | 10 | 1 |
| Total | 120 | 21 |

Retail sales

Plant-based seafood U.S. retail sales increased from \$12.1 million in 2020 to \$13.9 million in 2021. While this growth is encouraging, plant-based seafood remains a small fraction of the overall plant-based meat and seafood category and a white-space opportunity in the market.

Total U.S. retail plant-based seafood sales increased by 14 percent in the past year and by 42 percent in the past two years—including growth in both plant-based shellfish and plant-based finfish.



There was a **25 percent increase** in the number of plant-based seafood products sold in retail in the United States in 2021.

Section 1

Commercial landscape

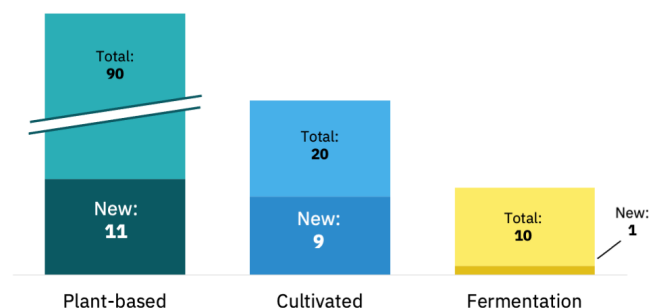


Section 1: Commercial landscape

In 2021, the commercial landscape welcomed at least 21 new alternative seafood companies, bringing the total to more than 120 companies developing plant-based, fermentation-derived, and cultivated seafood around the world. For an up-to-date list of the companies developing alternative seafood products, visit GFI's [alternative protein company database](#).¹

Total companies developing alternative seafood in 2021

| Company type | Total companies | New in 2021 |
|--------------|-----------------|-------------|
| Plant-based | 90 | 11 |
| Cultivated | 20 | 9 |
| Fermentation | 10 | 1 |
| Total | 120 | 21 |



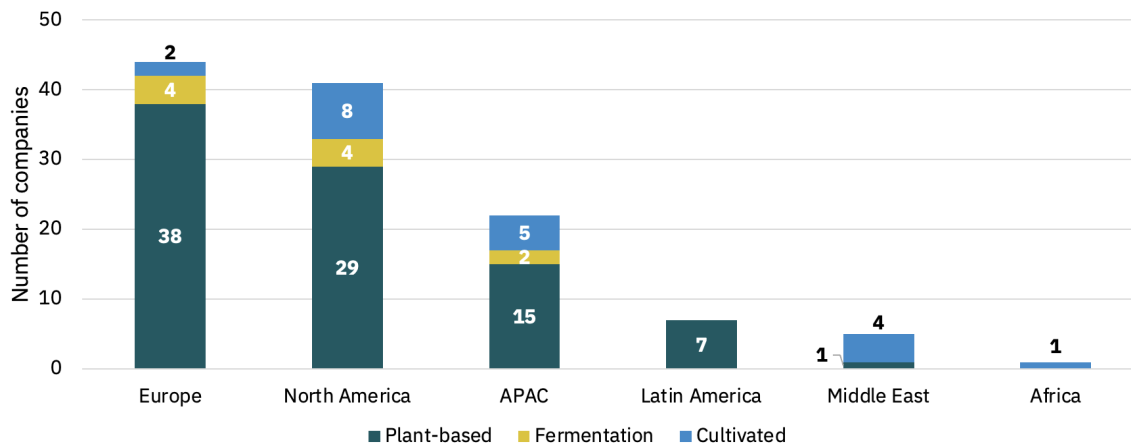
Thus far, plant-based seafood has dominated the alternative seafood industry. But nine new companies—almost half of all alternative seafood companies launched in 2021—are focused on developing cultivated seafood. Highlights include the following:

- Africa's first cultivated seafood company, **Sea-Stematic**, launched in South Africa.
- The country with the most new companies developing alternative seafood was Israel, where four new cultivated seafood companies launched: **Forsea Foods**, **Sea2Cell**, **Wanda Fish**, and **E-FISHient Protein**.
- **SoundEats** and **Bluefin Foods Inc.** were founded in the United States, and **Another Fish** was founded in Canada.
- **Fisheroo** launched in Singapore, bringing Singapore's total cultivated seafood company count to three.

Seafood consumption varies greatly around the world—people consume hundreds of species worldwide. Alternative seafood companies are taking advantage of the opportunity to develop seafood alternatives that appeal to various markets. 2021 saw the first launches of alternative seafood in Estonia, South Africa, Latvia, Australia, and Israel.

¹ We strive to maintain the most comprehensive and up-to-date database of alternative seafood companies. If your company is not on this list, please add it [here](#).

Alternative seafood companies by region of company headquarters and production platform



Distribution of alternative seafood companies by headquarters location



Launches and partnerships

A plethora of new products, companies, and partnerships launched during the second half of 2021. Branded manufacturers and incumbent meat and seafood industry players continued to seize opportunities in the emerging alternative seafood market.

New company/product launches

- Conventional seafood giant Thai Union **launched OMG Meat**, a range of plant-based seafood and meat products in Thailand. The company also offers contract manufacturing for private labeling.

- Birds Eye’s plant-based brand, Green Cuisine, **added fish fingers** to their plant-based meat repertoire.
- Cultivated salmon company Wildtype **opened a pilot facility** that will serve as part plant, part tasting room, and part educational center. The California-based company plans to launch first in foodservice and eventually in retail.
- Green Monday’s food-tech business, OmniFoods, **expanded into plant-based seafood**. Previously known for their plant-based pork mince, OmniPork, the Hong Kong-based company expanded their offerings to include six seafood products: two different fish fillets, an ocean burger, salmon, shelf-stable tuna, and crab cakes. The products, which are high in protein and omega-3 fatty acids, first rolled out in select Hong Kong restaurants before landing in retail later in 2021.
- Finless Foods **expanded their portfolio** to include plant-based tuna. The company, initially focused on cultivated bluefin tuna, developed the plant-based product during the process of developing their cultivated one and decided to bring it to market first.
- Nestlé **launched a plant-based shrimp product**, Vrimp, made from seaweed and peas. Vrimp is the company’s second plant-based seafood product—they launched a tuna product called Vuna in 2020.
- Karavela, one of the largest canned fish producers in Europe, **launched a plant-based canned seafood line** called Fish Peas. The line includes a range of flakes, salads, and spreads.
- Shiok Meats **hosted a tasting event** in Singapore to debut the world’s first cultivated crab. The company also **opened a pilot R&D plant** at their headquarters in Singapore and **acquired cultivated red meat company Gaia Foods**.



In addition to generating new revenue streams, alternative seafood products offer a more stable and predictable supply of inputs, minimizing both risks and costs for large and small producers. **Learn more about the benefits of alternative seafood in GFI’s *Ocean of opportunity* white paper.**

Partnerships and distribution deals

Plant-based:

- The Plant Based Seafood Co. **announced a distribution deal** with Pod Foods, a women-owned, tech-forward distribution and logistics company that specializes in emerging brands.
- New Wave Foods **entered a nonexclusive agreement** with the largest foodservice redistributor in the United States, Dot Foods, to officially launch New Wave’s plant-based shrimp in North American restaurants.
- Dutch plant-based seafood company Novish **launched their plant-based seafood products** in the German fast-food seafood chain Nordsee. The products are now available in all 370 Nordsee locations in Germany, Austria, Cyprus, and the Czech Republic.

- Thai Union signed a **memorandum of understanding** (MOU) with Thai plant-based meat producer V Foods. The two companies will use Thai Union’s manufacturing facilities to produce V Foods’ existing products and co-develop new ones.
- Gathered Foods, makers of Good Catch plant-based seafood products, **launched a trial at five Long John Silver’s restaurants**. Good Catch’s products are the first plant-based seafood products that Long John Silver’s—the largest quick-service seafood chain in the United States—has served. Good Catch also **partnered with Dot Foods**, America’s largest food redistributor, to **launch a line of frozen crab cakes** at all BJ’s Wholesale Club stores nationwide and made their Asian debut in Singapore. Good Catch products can now be found in restaurants across the island.
- OmniFoods **launched OmniSeafood’s Omni Crab Cakes** in 170 Starbucks locations in Hong Kong, signaling a sea change in mainstream consumer demand in Asia. This marks the third distribution deal between Starbucks and OmniFoods—and the first focused on seafood.
- Southwind Foods **began distributing plant-based seafood products from Sophie’s Kitchen**. Southwind is a U.S.-owned and -operated company that distributes fresh and frozen seafood nationwide across retail and foodservice. Sophie’s plant-based seafood products will now be distributed alongside conventional seafood products through Southwind.

Cultivated:

- BlueNalu signed MOUs with **Pulmuone, Thai Union, and Mitsubishi**. The latter two partnerships will assess market development strategies for BlueNalu’s products in Asia.
- Avant Meats **formed a strategic partnership** with Vinh Hoan Corporation (VHC), the world’s largest conventional pangasius company. The partnership will support Avant Meats’ development and commercialization while diversifying VHC’s product portfolio to appeal to a broader customer base. Avant also **partnered** with Chinese biopharmaceutical company QuaCell to help bring the cost of their animal-free cell culture media down an additional 75 percent.
- Avant Meats also **set up a joint research lab in Singapore** with the Agency for Science, Technology, and Research (A*STAR) Bioprocessing Technology Institute. The partnership focuses on scaling up production of Avant’s cultivated fish maw and fish fillets.
- Thai Union **invested in** and signed an **MOU** with Israeli cultivated steak company Aleph Farms to support Aleph’s scale-up and evaluate distribution opportunities across the APAC region.
- Wildtype **signed distribution agreements** with grocery store sushi-counter operator Snowfox and fast-casual restaurant chain Pokéworks.²
- BlueNalu **partnered with Nomad Foods**, Europe’s leading frozen food company, to explore the introduction of cultivated seafood to the European market. BlueNalu also **committed to pursuing third-party food-safety certifications** recognized by the

² It is still unclear when cultivated meat and seafood will be granted regulatory approval in the United States.

Global Food Safety Initiative. With these certifications, the company aims to achieve high standards of food safety and traceability for their products.

- Umami Meats **partnered with Canadian investment platform CULT Food Science** to accelerate the company’s scientific development and path to scale.

Fermentation-enabled:

- Aqua Cultured Foods **partnered with Migros**, Switzerland’s largest retailer, to speed the startup’s development of biomass fermentation-enabled seafood products.



To stay up to date on industry news, sign up for **GFI’s newsletters**.

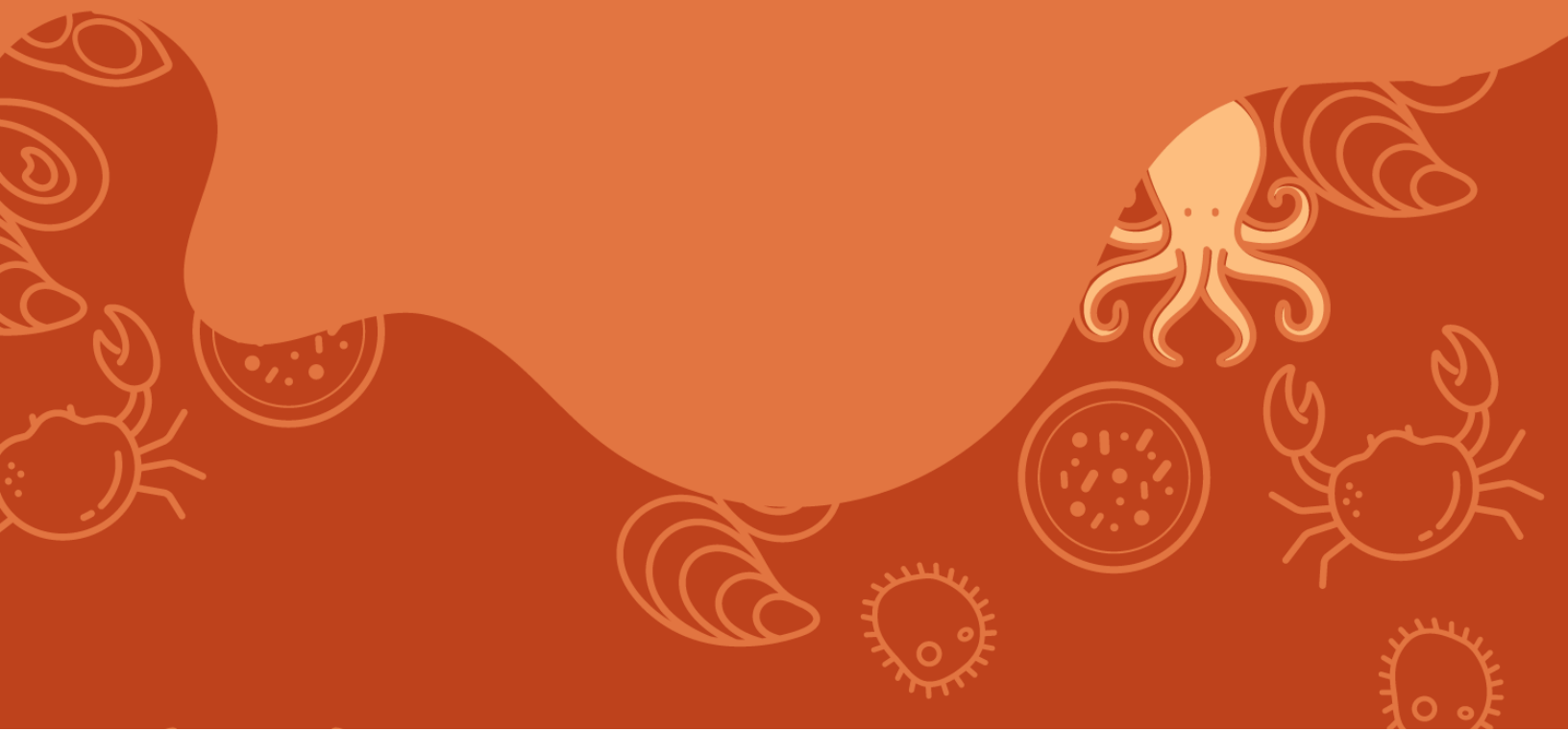


“Foodservice is incredibly important to emerging plant-based brands because it serves as a trial driver for curious consumers. Without trial there is no adoption.”

—Chris Kerr, **founding board chair and co-founder of Gathered Foods and chief investment officer at Unovis**

Section 2

Investments



Section 2: Investments

Investment activity has seen steady growth over the past four years, with all-time highs in 2021. It appears that investors increasingly view the alternative seafood industry as a market white space and recognize the role that alternative seafood has in protecting our oceans while meeting growing global seafood demand.

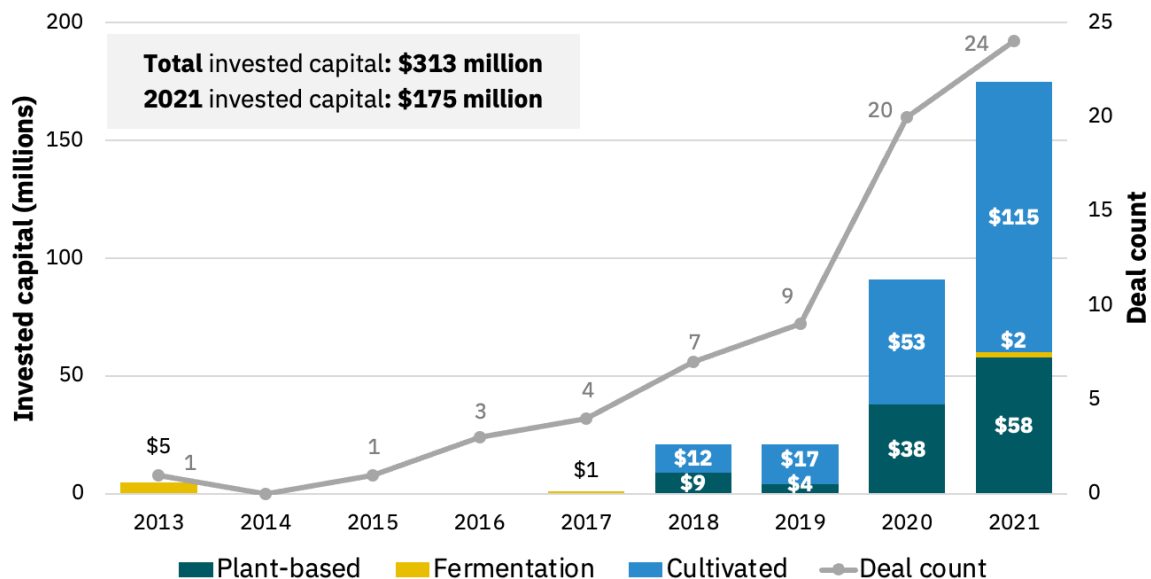
Data collection methodology

GFI conducted a global analysis of alternative seafood companies using data from PitchBook. Our analysis uses a list we custom-built in PitchBook of companies that focus solely on alternative seafood. PitchBook profiled 49 alternative seafood companies, of which 27 have disclosed deals. Of the 80 deals closed from 2013 through 2021, 52 have publicly disclosed amounts. Because these aggregate calculations account only for companies with deals and deal sizes disclosed to PitchBook, they are conservative estimates.

For the purposes of this report, *invested capital/investment* refers to accelerator and incubator funding, angel funding, seed funding, equity and product crowdfunding, early-stage venture capital, late-stage venture capital, private equity growth/expansion, capitalization, corporate venture, joint venture, convertible debt, and general debt completed deals. Please note that the figures published in this report may differ from prior figures published by GFI as we continually improve our dataset.

Investment activity

Annual investment in alternative seafood companies (2013–2021)



Source: GFI analysis of data from PitchBook Data, Inc.
 Note: Data has not been reviewed by PitchBook analysts.

2021 saw record investments, nearly doubling the total investments in 2020:

- Alternative seafood companies raised \$175 million of invested capital across 15 deals with disclosed deal sizes, bringing total investments to \$313 million. The sizes of nine deals were not disclosed.
- The amount raised by cultivated seafood companies, summing to \$115 million, accounted for 66 percent of alternative seafood investments in 2021.
- From 2013 to 2021, cultivated seafood company investments accounted for 63 percent of total alternative seafood investments.
- The largest sum raised in 2021 was BlueNalu’s \$60 million of convertible debt. This enabled BlueNalu to launch the world’s first commercial pilot facility for cultivated seafood. The 40,000-square-foot facility will support BlueNalu in their plans for market launch.
- The second-largest amount raised was that of cultivated and plant-based seafood company Finless Foods, which raised \$34 million in Series B funding. The financing will support the company as they prepare to launch their plant-based tuna, expand the team, continue working to reduce cost, and make strides toward gaining regulatory approval for their cultivated bluefin tuna.

Most active investors in alternative seafood by deal count (2021)

| Investor | Investor type | Headquarters | Deal count | Portfolio companies and company type (PB: plant-based, C: cultivated, F: fermentation) |
|---------------------------|------------------|------------------------|------------|--|
| Big Idea Ventures | Venture capital | New York, NY, USA | 6 | Aqua Cultured Foods (2) F Fisheroo C Gathered Foods PB New Wave Foods PB Shiok Meats C |
| Sand Hill Angels | Angel group | Mountain View, CA, USA | 3 | Finless Foods C New Wave Foods (2) PB |
| Alwyn Capital | Impact investing | Brooklyn, NY, USA | 2 | Avant Meats C Cultured Decadence C |
| Enfini Ventures | Venture capital | São Paulo, Brazil | 2 | BlueNalu C Gathered Foods PB |
| Kharis Capital | PE/buyout | Brussels, Belgium | 2 | Avant Meats C Novish PB |
| Siddhi Capital | Venture capital | Cherry Hill, NJ, USA | 2 | BlueNalu C Gathered Foods (2) PB |
| Sustainable Food Ventures | Venture capital | Raleigh, NC, USA | 2 | Aqua Cultured Foods (2) F |
| Unovis Asset Management | Venture capital | New York, NY, USA | 2 | Gathered Foods PB New Wave Foods PB |
| Vinh Hoan | Corporation | Cao Lãnh, Vietnam | 2 | Avant Meats C Shiok Meats C |

Source: GFI analysis of data from PitchBook Data, Inc.

Note: Data has not been reviewed by PitchBook analysts. The table includes any organization that made two or more publicly disclosed investments in an alternative seafood company in 2021.



“Overfishing has been depleting our oceans for decades and our population is growing quickly. Without alternatives to current seafood production, it will be difficult to meet demand. Innovation in plant-based and cultivated seafood has the potential to provide healthier, cleaner alternatives to conventional seafood production that can allow us to feed 10 billion people by 2050 while giving our ocean ecosystems the chance to recover. It’s this potential combined with our history of innovation in aquaculture technology that is driving Earth First Food Ventures’ focus on alternative seafood. While nascent today, the alternative seafood industry can continue to scale up and supply new food innovation as more investors gravitate toward climate capital and impact investing for a better food future.”

2021 investments in plant-based seafood companies with disclosed deal sizes

| Company | Headquarters | Total disclosed funding (\$M) | Year founded |
|---------------------------------------|-------------------------|-------------------------------|--------------|
| Gathered Foods (makers of Good Catch) | Austin, TX, USA | 26.35 | 2016 |
| Hooked Foods | Stockholm, Sweden | 4.52 | 2019 |
| Monkeys by the Sea | Roosendaal, Netherlands | 0.50 | 2021 |
| New Wave Foods | Stamford, CT, USA | 18.00 | 2015 |
| Revo Foods | Vienna, Austria | 2.72 | 2020 |
| Sophie's Kitchen | Sebastopol, CA, USA | 5.60 | 2010 |

Source: GFI analysis of data from PitchBook Data, Inc.

Note: Data has not been reviewed by PitchBook analysts.

2021 investments in cultivated seafood companies with disclosed deal sizes

| Company | Location | Total disclosed funding (\$M) | Year founded |
|--------------------|------------------------|-------------------------------|--------------|
| BlueNalu | San Diego, CA, USA | 60.00 | 2017 |
| Bluu Biosciences | Berlin, Germany | 8.38 | 2020 |
| Cultured Decadence | Madison, WI, USA | 2.10 | 2020 |
| Finless Foods | San Francisco, CA, USA | 34.00 | 2016 |
| Fisheroo | Singapore | 0.13 | 2021 |
| Shiok Meats | Singapore | 10.00 | 2018 |

Source: GFI analysis of data from PitchBook Data, Inc.

Note: Data has not been reviewed by PitchBook analysts.

2021 investments in fermentation-derived companies

In early 2021, Chicago-based startup Aqua Cultured Foods raised \$130,000 in accelerator/incubator funding from Big Idea Ventures and raised an additional undisclosed amount of early-stage VC funding in a round led by Sustainable Food Ventures. In October, Aqua Cultured **closed an oversubscribed pre-seed round** of \$2.1 million.

In October, French startup Algama Foods **received a €2 million grant from the European Commission** to continue developing fermentation-enabled seafood products.³ Algama is developing a range of seafood alternatives, including smoked salmon and tuna flakes.

For more investment information on the full alternative protein market, visit **GFI's investment page**.

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³ GFI's investment data does not include grants. Therefore, this €2 million grant is not represented in investment totals.

Section 3

Retail sales

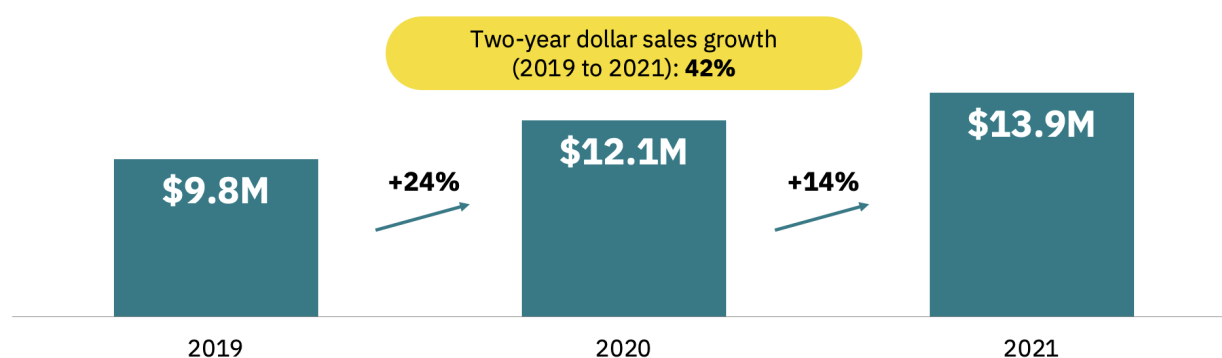


Section 3: Retail sales

U.S. plant-based seafood retail sales

In the United States, plant-based seafood retail sales increased by 14 percent in 2021. Plant-based seafood remains a small fraction of the overall plant-based meat and seafood category, accounting for less than 1 percent of dollar sales. Notably, conventional seafood composes one-fifth of total conventional meat and seafood sales. Plant-based seafood represents a significant white space.

U.S. retail sales of plant-based seafood (2019–2021)



Source: SPINS Natural Enhanced Channel, SPINS Conventional Multi Outlet Channel (powered by IRI) | 52 Weeks Ending 12-26-2021.

Note: Data is based on custom GFI and PBFA plant-based categories that were created by refining standard SPINS categories. Due to the custom nature of these categories, the data presented will not align with standard SPINS categories.

Key insights:

- **From 2019 to 2021, plant-based seafood grew 42 percent**—albeit on a small base, as several brands and products came to market or expanded distribution.
- **2021 saw dollar sales growth in both plant-based shellfish and plant-based fish.** Plant-based shellfish, which includes plant-based analogues for shrimp, scallops, and crab, grew 30 percent, and plant-based fish grew 9 percent. By dollar sales, plant-based fish composes about 75 percent of the plant-based seafood market, while plant-based shellfish makes up the other quarter.
- **The number of plant-based seafood products on retail shelves is increasing.** A year ago, only 32 plant-based seafood products were sold in U.S. retail.⁴ 2021 saw eight plant-based seafood products with their first sales in U.S. retail, growing the product base by 25 percent. In contrast, more developed categories, like plant-based beef, have hundreds of SKUs in the marketplace—more options, at varied price points, merchandised across departments, including the fresh-meat case.

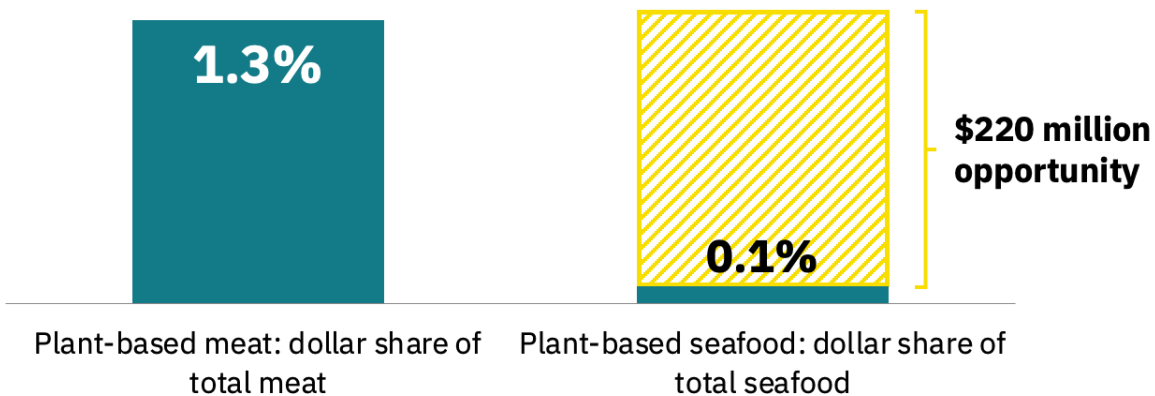
⁴ For the purposes of this report, this analysis includes products with more than \$1,000 in annual sales.

The dollar opportunity

Plant-based seafood is well poised to capitalize on the momentum of the broader plant-based industry. While plant-based seafood composes less than 1 percent of the total plant-based meat and seafood market, conventional seafood accounts for one-fifth of total conventional meat and seafood sales. This share suggests that plant-based seafood represents a significant white space. In U.S. retail in 2021, plant-based meat made up 1.4 percent of the dollar share of the total meat market, while plant-based seafood composed an estimated 0.1 percent of the retail dollar share of all seafood products—IRI data suggests that **2021 U.S. retail sales of all seafood products were \$16.9 billion**.

Retail plant-based seafood sales could grow by an estimated \$220 million if the category were able to capture the same dollar share of the seafood market that plant-based meat currently has of the meat market. And because **65 percent of seafood sales in the United States occur in foodservice**, the total market opportunity is likely much greater.

Estimated plant-based meat and seafood dollar shares of total categories



Source: SPINS Natural Enhanced Channel, SPINS Conventional Multi Outlet Channel (powered by IRI) | 52 Weeks Ending 12-26-2021.

Note: The plant-based seafood, plant-based meat, and conventional meat data is based on custom-GFI plant-based categories that were created by refining standard SPINS categories. Due to the custom nature of these categories, the presented data will not align with standard SPINS categories. The conventional seafood category estimate is based on [IRI data](#) for the year ending November 28, 2021.

U.S. consumer research on plant-based and cultivated seafood

To date, little research has been conducted on consumer attitudes toward alternative seafood. To fill this gap, GFI partnered with Kelton Global, a consumer insights and brand strategy firm, to determine U.S. consumer needs, preferences, and motivations as they relate to choosing alternative seafood:

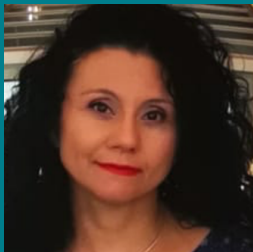
- **Taste and texture.** This research shows that both plant-based and cultivated seafood are well poised to appeal to the general consumer as long as the products achieve parity with conventional seafood on flavor and texture.
- **Health and environmental benefits.** Once products' sensory characteristics appeal to all consumers, the health and environmental benefits of alternative seafood can bring early adopters into the category. In the long term, capturing the omnivore segment will require providing consumers with a truly familiar product.
- **Plant-based seafood.** After learning about plant-based and cultivated seafood, 42 percent of respondents said they found plant-based seafood appealing, and 43 percent would consider purchasing it in the future.
- **Cultivated seafood.** Cultivated seafood appealed to 35 percent of respondents, and 38 percent said they would consider purchasing it in the future.

With continued investment in the technology behind scaling cultivated seafood and the right marketing and consumer-education efforts, alternative seafood has exciting potential to appeal to a wide array of seafood consumers.



[Read the full report.](#)

For a full picture of retail sales across plant-based meat, seafood, egg, and dairy products in 2021, [visit GFI's market research page.](#)



“We're continuously expanding our plant-based seafood alternatives. Thanks to our expertise and global R&D network, we ensure that in addition to an authentic texture and flavor, plant-based alternatives have a favorable nutritional profile with a short ingredient list. Plant-based seafood alternatives also help to reduce overfishing and to protect biodiversity of the oceans.”

—Hagit Peretz, global plant-based meal solutions R&D lead, Nestlé

Section 4

Conclusion and opportunities



Section 4: Conclusion and opportunities

2021, like 2020 before it, was a year of record investments, accelerated commercial development, and sustained retail sales growth in alternative seafood. This growth shows that more and more industry players are taking advantage of the opportunities that alternative seafood provides. However, compared with the **\$401 billion global seafood industry**, alternative seafood is still a nascent category.

In the past decade, the market has seen massive shifts in consumer demand and product innovation for plant-based alternatives to products of terrestrial animal agriculture. The rapidly growing unmet demand for seafood coupled with the looming collapse of many global fisheries signal the need for public and private sectors to accelerate a similar shift in the seafood industry. Innovation is needed to develop alternative seafood products that compete with conventional ones on taste, price, and accessibility.

Scaling the industry and reaching more consumers will require greater investment, improved production technologies, optimization of side streams, and capacity scaling. Accelerating the development, commercialization, and widespread availability of alternative seafood can help establish a future of food with responsible stewardship of land and sea while feeding billions of people and preserving their livelihoods.

Opportunities

This report highlights the alternative seafood industry's impressive growth in the context of its still relatively small market size. With a small but growing industry comes significant opportunities for new product development and innovation:



Species variety: Because far more aquatic animal species are consumed than terrestrial ones, opportunities are nearly endless to develop novel products to meet niche market needs around the world.



Texture parity: Most plant-based seafood products on the market are breaded or minced. With more sophisticated plant-based manufacturing methods, and with the advent of cultivated seafood, it is possible to create the layers of fat, collagen, and protein that give fish its desirable textural and cooking properties, such as flakiness.



Products in the refrigerated seafood section: There is little plant-based seafood in the refrigerated seafood section or at the seafood counter, where consumers shop for conventional seafood. Securing space in this highly valuable section requires not only having the right product with the right packaging but developing strong relationships with retailers. Moving beyond frozen and shelf-stable products and getting out of the frozen veggie section will increase the visibility of plant-based seafood and accelerate the growth of the category by bringing in new consumers. This is particularly true for Asian countries, where freshness is considered one of the most important attributes of a great seafood product.



Animal-free omega-3 ingredients: To appeal to health-conscious consumers, alternative seafood products should contain similar quantities of the same omega-3 fatty acids, especially DHA and EPA, present in conventional seafood. While animal-free omega-3 ingredients can be expensive and supply can be inconsistent, scaling up their production is critical to the success of the global alternative seafood market. Adding omega-3s to other alternative protein products could also provide a point of difference while improving health appeal.



For more information about research and technological white spaces specific to alternative seafood, check out GFI's [Advancing Solutions for Alternative Proteins \(ASAP\) database](#).

Expert predictions

We asked industry experts for their predictions on what's next in alternative seafood.



“We’ve finally reached a critical mass of academic researchers focusing on different aspects of cultivated seafood, from cell lines to culture media to scaffolding. Cultivated seafood has a big hill to climb, but the resulting additional opportunities for collaboration and cross-pollination of ideas within this growing community represent the momentum we will need to get up this hill. This community is laying the groundwork today for the breakthroughs of a few years from now.”

—**Claire Bomkamp, PhD, senior scientist, the Good Food Institute**



“We think more and more start-ups will continue to grow in the cultivated meats and seafood area, and also in the supporting industries like growth/nutrient media, scaffolds and bioreactors. In terms of products and collaboration, we expect to see more hybrid blend products with plant-based and cultivated meats or seafood which is a great avenue to widen the choices available to consumers.”

—**Ka Yi Ling, co-founder and CTO, Shiok Meats**



“As a scientist and enthusiast working on alternative proteins, I predict huge growth in all sectors in 2022 and beyond. Further investment in the industry will pave the way for new plant-based, fermentation-enabled, and cultivated seafood products that appeal to the general consumer. I anticipate enormous growth in scientific knowledge relating to cultivated seafood’s cell line availability, scaffolding, and manufacturing innovation.”

—**Diana M. C. Marques, MS, scientific researcher in the Algae2Fish project at IBB (Institute for Bioengineering and Biosciences), Lisbon**



“Plant-based seafood, a nascent category—and for consumers a new novelty—will continue its accelerated growth into 2022, driven by consumer trial due to high interest and curiosity. Foodservices operators and retailers will be keen to adopt products. New entrants in the category will drive the needed innovation, communication, and thus excitement, helping to grow the category globally.

Future growth beyond the novelty phase is highly dependent on the industry delivering quality seafood experiences (the wow factor, great taste, and textures) at scale. This will see the category incorporate new technologies like fermentation and cultivation, and ingredients like algae. Governments will start to see the need for this change and will accelerate the necessary regulatory changes to make innovation happen.

I predict that the future holds a rich plethora of alternatives for consumers to choose from—across multiple protein solutions suiting everyone’s taste, wallet, and nutritional needs. One thing is for sure, alternative seafood is here to stay, and it will enhance and grow the entire seafood category.”

—**Maarten Geraets, managing director of alternative proteins, Thai Union Group PCL**



“The vast majority of the world's seafood is produced and consumed in the Asia Pacific, putting immense stress on the environment. The alt-seafood market in the region is still nascent, but I believe it will grow rapidly over the next few years. In Asia, seafood is considered one of the healthiest sources of protein and is a crucial part of culinary and cultural traditions. That's why it is important that alt-seafood products match animal equivalents both nutritionally and functionally. New technologies like biomass fermentation are promising to deliver more versatile and nutritious products at scale.”

—**Michal Klar, founding partner, Better Bite Ventures**

Additional resources

A hub for all things alternative seafood, GFI's **Sustainable Seafood Initiative** compiles resources and opportunities for anyone seeking to learn more about this dynamic segment of alternative protein:

- GFI's ***Ocean of opportunity*** white paper provides a comprehensive look at the need for alternative seafood and the unique challenges and opportunities of this segment of alternative protein.
- Sign up for the ***Turning the Tide*** quarterly newsletter for alternative seafood industry news, insights, research updates, events, and networking opportunities.
- Explore GFI's **PISCES/ATLAS tool** for qualitative and quantitative data that can inform alternative seafood species selection. This tool centralizes research on specific marine species, including nutritional profile, market size, greenhouse gas footprint, and animal welfare metrics, to accelerate the development and commercialization of alternative seafood products.
- Dive into GFI-commissioned **U.S. alternative seafood consumer research** to learn about U.S. consumer needs, preferences, and motivations as they relate to choosing alternative seafood.

Are we missing something? Did we get something wrong? We'd appreciate your feedback via [this form](#).

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About GFI

The Good Food Institute is a nonprofit think tank working to make the global food system better for the planet, people, and animals. Alongside scientists, businesses, and policymakers, GFI's teams focus on making plant-based and cultivated meat delicious, affordable, and accessible. Powered by philanthropy, GFI is an international network of organizations advancing alternative proteins as an essential solution needed to meet the world's climate, global health, food security, and biodiversity goals. To learn more, please visit www.gfi.org.



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