



Omega-3 **INSIGHTS**

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S P E C I A L R E P O R T

Omega-3s: A Snapshot of Aquatic Sustainability

Consumer media has been known to portray a bleak picture of marine resource depletion—often at the hand of big business. In reality, only about 4 percent of all ocean-harvested fish goes into omega-3 applications such as supplements, foods and pharmaceuticals.

Despite the challenges of implementing uniform sustainability measures across international waters, governmental, scientific, business and advocacy groups are uniting in increasing measure to support responsible fisheries.

by Ellen Schutt

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Sustainability has become a buzzword throughout the natural products industry, particularly in the omega-3 business since the segment's primary raw material comes from a natural resource. Fishing practices and harvests—and the health of the ocean in general—have also been the recent focus of many consumer media articles. Often the “story” revolves around concern about dwindling resources, overfishing and perceived irresponsible harvesting and manufacturing methods, much of it attributed to the popularity of fish oil or omega-3s.

The reality of the omega-3 situation, though, is that only about 10 to 12 percent of the total catch is used in fish oil production—and within that, only 19 percent is used specifically for omega-3 applications such as supplements, foods and pharmaceuticals. This equates to about 4 percent of all the fish harvested from our oceans.

While omega-3 oil fisheries may be a small percentage of overall fishing, they are still incredibly important because they supply so much eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). The good news is, these fisheries are well-managed operations, with sustainability as a high priority.

What Is Sustainability Anyway?

Truly managing a sustainable fishery requires more than just harvesting the right amount of the right fish. A whole process needs to be put into place, including the following:

- Regularly performed monitoring (such as with a sonar survey) of the species biomass
- Assignment of a quota for each fishing season and region based on biomass recordings
- Harvest decisions based on a precautionary principle to maintain species sustainability (see page 3 for more on the precautionary principle)
- Continued analysis of reproductive rates and their implications
- Monitoring and reporting of actual catch data, as well as compliance requirements and repercussions for non-compliance



- A specific plan to eliminate or reduce bycatch of non-target species
- A plan to manage predator populations, native birds, etc.
- Ongoing management support and investment in future sustainability initiatives

* In the development of a sustainability management program, a **precautionary principle** takes into account uncertainties related to the dynamics of the fish population (recruitment, mortality, growth and fecundity), the impact of the fishing activities (discards and bycatch of non-target species) and the physical environment (habitats).
 The challenge comes when oversight is divided among different governing nations, varying certification schemes, and organizations with different agendas and levels of infrastructure.

Omega-3 Fisheries: How Are They Doing?

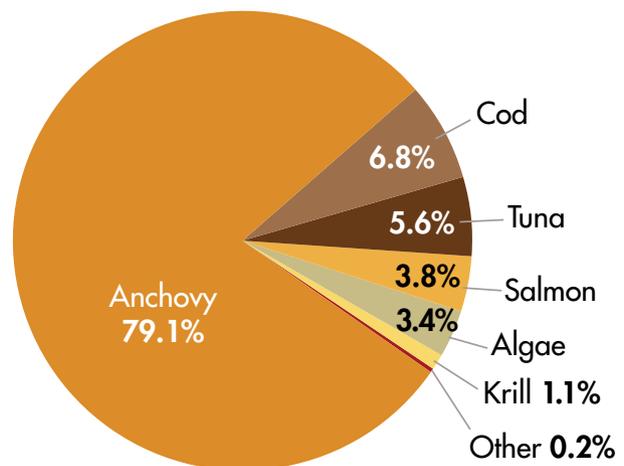
The top five fisheries that supply omega-3s are shown in the chart. The anchovy fishery supplies the vast majority of the raw material, but each of the next four are still multimillion dollar businesses in their own right. (Algae is included for perspective, even though it is not harvested from the ocean.) Here's a look at the top fisheries and a snapshot of how they are doing in terms of sustainability.

Anchovy

As seen in the chart, anchovy oil is by far the largest raw material source for omega-3s, supplying almost 80 percent of the oil used. The bulk of the anchovy business is sourced from a fishery in Peru, although there are smaller fisheries in Chile and Morocco as well. The Peruvian anchovy fishery is unique in that the largest fishing region is completely within Peruvian borders, so the government is the sole body that does the monitoring and regulation.

The health of the fishery has been the source of controversy in the last year. In the fall of 2012, IMARPE (Instituto del Mar del Perú), the scientific body that makes recommendations to the government on fishing quotas, recorded lower

Percent of Omega-3 Market



than normal biomass levels and recommended the fishing quota be cut by 68 percent. The decision sparked concern throughout the industry regarding the supply situation and caused speculation in the media that the anchovy fishery was on the verge of collapse.

Fast-forward six months to the sonar survey completed by IMARPE in April 2013. This survey recorded the highest biomass on record, at 12.1 million metric tons. IMARPE still recommended a quota based on a more conservative 10.8 million ton estimate for the next fishing season, to give the higher-than-average portion of juveniles in the catch a chance to mature.

Several GOED members with whom GOED discussed this situation believe the low biomass readings last fall were the result of the weather—specifically, that an El Niño pattern had brought warmer currents to the region, sending the anchovy deeper into the ocean where they were not detectable by the monitoring equipment. Now that the weather pattern has changed and the currents have shifted, the anchovy are back in their normal habitat and detectable by sonar.

Regardless of the cause of the fluctuations, the important point is the government responded to the scientific recommendations and allocated the harvest quota accordingly to maintain a sustainable fishery.

The fishery has achieved certification from the International Fishmeal and Fish Oil Organisation (IFFO), a global organization representing marine ingredient companies, which offers a certification called the Global Standard for Responsible Supply of Fishmeal and Fish Oil (IFFO R.S.).

Also, according to fishsource.com, a site run by the Sustainable Fisheries Partnership that scores fisheries on sustainability, the stock is well-managed and healthy with the main criticism being the need for greater transparency.

Cod

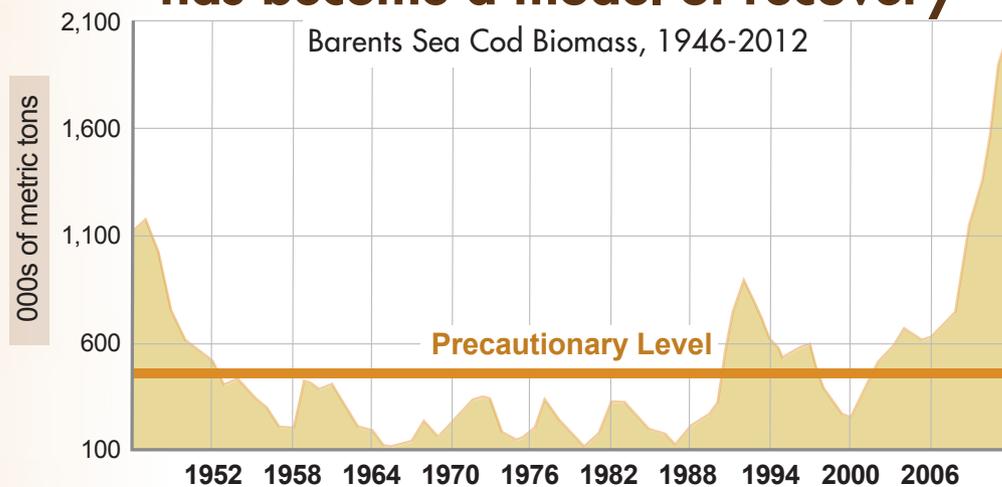
The cod used in omega-3s comes from the Arctic cod fishery, which includes a region from the Gulf of Maine in North America across southern Greenland, Iceland, Barents Sea, Norwegian Sea, Baltic and southwards around the British Isles to the Bay of Biscay. The Barents Sea stock and the Icelandic stock are considered among the most important sources of omega-3s. The Barents Sea area is overseen by the Institute of Marine Research, which obtains scientific advice from Norway's Institute of Marine Research and Russia's Polar Research Institute of Marine Fisheries and Oceanography. The Icelandic fishery is monitored by ICES, a network of more than 4,000 scientists from 300 institutes concerned with enhanced ocean sustainability.



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The Arctic cod fishery is an excellent example of a recovery in progress. In prior years, a variety of economic and technological factors, coupled with oversight challenges, caused an overfishing situation. As evidenced in the chart below, recovery is in-progress and there are reports that the biomass in the area is increasing. It is important to note that the Arctic cod fishery is part of Atlantic cod fishery, which still has sustainability issues.

The Arctic cod biomass has become a model of recovery



Source: FishSource

Both the Barents Sea and Icelandic cod fisheries rate high on fishsource.com and are certified by Marine Stewardship Council (MSC), which has a comprehensive sustainability certification program.

Tuna

Tuna is one of the most challenging species to analyze because the tuna used for tuna oils comes from several different species harvested in a variety of regions. GOED estimates more than 50 percent comes from skipjack tuna, followed by 30 percent from yellow fin, with albacore and big eye contributing 5 to 10 percent each. Regions involved include American Samoa, Thailand, Seychelles, Mauritius, Japan and Vietnam.

The bulk of tuna oil comes from the byproduct of tuna canning operations, which then goes through a refining process to turn it into high-DHA omega-3 oil for human consumption. Because tuna canning operations are well-established in the aforementioned countries, these areas in the Pacific are the primary focus for omega-3 tuna oils. This is good news, as the Atlantic tuna fisheries have been facing extreme stress.

Because of the many regions in which tuna are found, biomass surveys are difficult to conduct and information on quotas is not easily obtained. In addition to the fisheries being spread out and subject to various jurisdictions, tuna swim the entire ocean, so it is not easy to do a systematic sonar survey. Additionally, it is hard to estimate the stock in areas where multiple countries have jurisdiction. Unfortunately, another reality is tuna is a high-value fish, so some fishermen are ignoring the rules regarding catch limits and harvest regulations.

For omega-3s, the good news is for the most part, tuna canneries, from which tuna oil is sourced, are big corporations that have incentives for their brands to be sustainable.

Salmon

The primary harvest area for salmon oil is in Alaskan waters, which is a very well-regulated and monitored fishery. Because the fishery falls under the jurisdiction of the Alaska Department of Fish and Game, the infrastructure and recordkeeping is extremely detailed and goes back to 1959 when Alaska gained its statehood.

Salmon are unique in that they migrate from freshwater spawning grounds to the ocean and back again. The actual sustainability of the salmon population is measured by the “escapement” of the salmon back to the spawning grounds. Because of this unique system, biomass is not measured, but the number of fish that escape the fishery is used to analyze its sustainability. Also, hatcheries are used to stock the spawning grounds with juveniles, so there is a guaranteed sustainable source.

For omega-3s, the primary source of raw material is pink salmon, which GOED estimates supplies about 80 percent of the salmon oil used today. Chum salmon supplies another 10 percent and sockeye supplies 10 percent.

The Alaskan salmon fishery was MSC-certified, but because the state’s fishery oversight is constitutionally mandated, ASMI (Alaska Seafood Marketing Institute), an industry organization, took over the certification process. ASMI pursued FAO Responsible Fisheries Management Certification, which uses ISO-certified methodology. Additionally, the fishery is also being assessed for MSC certification through the Alaskan Fisheries Development Foundation (AFDF), a nonprofit foundation.



Tuna is a high-value fish, so some fishermen are ignoring the rules regarding catch limits and harvest regulations.

Krill

One of the fastest-growing sources of omega-3 is krill, which is harvested exclusively in one region off the coast of Antarctica. The fishery is strictly regulated by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), which tracks the biomass of the region, sets fishing quotas and determines the actual areas where fishing vessels are allowed to fish. In this region, non-target species such as penguins and whales are a major concern and regulations are in place to maintain the ecosystem's balance.

The krill sustainable harvest quota is 9.3 percent of the total determined biomass, but CCAMLR actually mandates a lower precautionary quota that is only 1 percent of the biomass number. In 2011, the actual catch was about one-third of this 1 percent, so it's easy to see that the fishery is well-managed and the catch is far below any trigger levels for overfishing.

Since bycatch and the impact on non-target species and predators is such a concern—and hugely in the public eye—at least one major krill supplier, Aker BioMarine, has developed patent-pending technology that uses a specially designed trawl system to totally eliminate bycatch. Aker, which harvests close to 60 percent of the krill from the region, is MSC-certified and partners with the World Wildlife Federation (WWF-Norway) to ensure it adheres to best practices around conservation.

Beyond the Top Five

While these five fisheries make up the bulk of the current omega-3 supply, the future will look very different as market dynamics shift and the supply situation evolves accordingly.

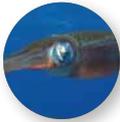
On the market dynamics side, the entrance of additional pharmaceutical players into the business is going to change the availability of omega-3 raw materials. Because pharmaceutical products are very high concentrate products, they require a large amount of crude oil that is then concentrated to very high omega-3 levels. Pharma companies are willing to pay a premium for this supply; therefore, the majority of the anchovy harvest (which is high in EPA and DHA content) could be claimed by these products. This will result in the emergence of other sources of supply that are now in the early stages of developments or in the process of commercialization.



The entrance of additional pharmaceutical players into the business is going to change the availability of omega-3 raw materials.

Commercially Available

In Development

Fish	Squid	Zooplankton	Algae	Fungi	GM Plants
 <ul style="list-style-type: none"> Anchovy Sardine Mackerel Tuna Cod Salmon Menhaden Trout Pollock Hoki Halibut Sandeel Angelfish Saithe 	 <ul style="list-style-type: none"> Market Squid Shortfin Squid 	 <ul style="list-style-type: none"> Antarctic Krill Pacific Krill Northern Krill Calanus Shrimp 	 <ul style="list-style-type: none"> Schizochytrium Cryptocodinium Euglena Nannochloropsis Phaeodactylum Nitzschia alba 	 <ul style="list-style-type: none"> Y. Lipolytica M. alpina Sap. diclina Sac. kluyveri C. elegans 	 <ul style="list-style-type: none"> Soybeans Rapeseed Brassica Linseed Rockcress

The list of omega-3 sources, both commercial and in research, is getting longer with new algae, new fish and new zooplankton projects having been announced in the last six months.

One answer is algae. As shown in the chart above, the algae business is already capturing more than 3 percent of the market—and this is primarily the result of one company's involvement. Currently, there are several companies about to commercialize algae production on various scales. Algae suppliers can offer unique EPA/DHA ratios not currently available, the material can be tailored to a particular end use, and, of course, algae offers a theoretically unlimited sustainable raw material supply. The current challenge is the high capital investment required to scale up production and resulting high costs for the finished oils; but, as the market dynamics shift, costs will come down and the situation will rebalance.

On the marine front, there are a host of new fish or zooplankton offerings also being developed. While these products may not have the very-high EPA and DHA content anchovy can offer, they are scalable, sustainable options that can fill the gap in certain segments or broaden market offerings with different product profiles. As the krill industry has shown, these sources can offer unique value propositions that, while small in volume, generate higher margins.

Farther down in the pipeline are land-based options, with a few companies working on genetically modified (GM) plants that are high in EPA and DHA. For the natural products industry, the words "genetically modified" have a

negative connotation, so there will be marketing obstacles to overcome—but if the industry continues to grow as rapidly as it has, it will need alternatives beyond what comes out of the ocean.

The word “sustainability” will also continue to evoke mixed opinions and education challenges. Sustainability will continue to be a moving target as ecosystems evolve and change, and new technological advancements allow for better ways to monitor and control the manufacturing process from ocean to shelf. The good news is systems are in place globally at the source to make sure the world’s population continues to benefit from omega-3s in a variety of forms. □

This article is excerpted from an upcoming whitepaper on sustainability to be published by GOED. Special thanks to many of its member companies, as well as IFFO, MSC and fishsource.com for the information included.

Since 2011, Ellen Schutt has been the communications director for the Global Organization for EPA and DHA Omega-3s (GOED). With 15 years’ experience in the natural products industry, Schutt handles all of GOED’s member communications including newsletters, website management and social media. She is also coordinating GOED’s public relations and communications strategy for industry and consumer outreach. Schutt created Nutraceuticals World, a leading industry magazine, and is an expert on the natural products supply chain, manufacturing, channels, markets, ingredients and issues. She previously ran Schutt Solutions, a consulting business, and was a partner in LaunchNatural, which helped launch high-growth natural product companies in the United States.

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