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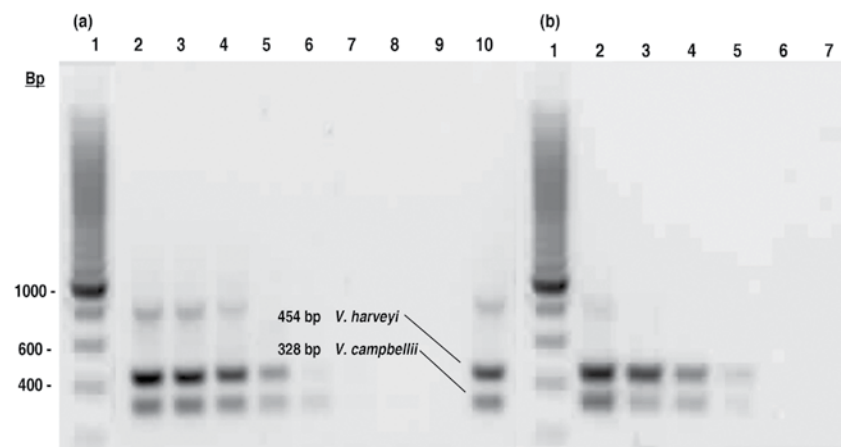


Figure 1. Results of a multiplex PCR assay differentiating *V. harveyi* and *V. campbellii* with species-specific hly gene primers using high-quality DNA (left) or FTA card punches spiked with varying concentrations of *Vibrio* cells (right).

What if the gene is never expressed? Additionally, with many genes having multiple copy numbers in the genome, how quantitative is the approach to determine pathogenic potential?

Current work involves studying the RNA from these same cards, and preliminary results suggest this is very useful. In fact, early work studying the stressors that upregulate the expression of these *Vibrio* toxins is proving quite interesting, but needs to be studied more thoroughly. The authors are also developing quantitative PCR testing to make this approach more robust, more sensitive and less labor intensive. Additionally, their work is seeking to expand the number of virulent species and virulence genes of study.

Call For Field Samples

With RNA and quantitative PCR work under way, the next step for this group is to start studying *Vibrio* samples from abroad, the original intent for the method development. The Microbial Discovery Group will now seek willing shrimp producers to ship nucleic acids on these FTA cards from their low- and high-producing ponds, combined with completed questionnaires relating to management practices and water chemistry data. Collection of this data will help the scientific and shrimp producer communities understand *Vibrios* in relation to management practices, stressors and resulting effects on shrimp economics.

Perspectives

By using FTA cards as a sampling method for remote, overseas or otherwise inaccessible water samples, one can preserve a genetic snapshot of the biological

community present at the time of collection. FTA card-based sampling techniques and DNA- or RNA-based virulence gene detection and quantification can be valuable tools in the monitoring of *Vibrio* virulence potential.

The ability to detect and understand differences in the *Vibrio* community composition of shrimp production system water samples will enable researchers to understand the relationships among these organisms, pond performance, management practices and environmental stressors.



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Trends, Drivers For Seafood Consumption



The demand for foods associated with health benefits is projected to increase. Seafood can be perceived by consumers either as a source of benefits or risks, depending on social and personal factors.

Summary:

Healthy eating will likely be a dominant trend in food consumption in coming decades. According to a literature review, consumers will demand more information about seafood and the possibility to trace its movements through the value chain. Best practices certifications may increase as interest in sustainable production and transparency grow in influence. The extent to which these trends affect future seafood demand will partly depend on the level of retail promotion, as well as the size and economic status of concerned consumer groups.

The major tastes and preferences of consumers in food markets and expected future changes were recently analyzed in a literature review published by SNF Bergen. This review identified five major drivers for consumer food choices: food safety concerns and health benefits, corporate social responsibility, production systems and technology, sustainability and geographic origin. Actions imple-

mented by governments, non-governmental organizations and the private sector were also considered. The effectiveness and consequences of these drivers on seafood consumption are presented here.

Food Safety, Health Benefits

Increasing concerns about a global rise in the proportion of overweight consumers and obesity-related diseases will make healthy eating one of the dominant trends in food consumption in the coming decades. Governments will play an important role in promoting healthy eating habits to the public through campaigns of many kinds. As a consequence, demand for foods associated with potential health benefits will increase, and the consumption of "fast and fat" food will decline. Seafood can be perceived by consumers either as a source of benefits or risks, depending on social and personal factors.

The identification of fish and shellfish species as part of a healthy diet, mainly related to their omega-3 fatty acid content, makes this consumer concern an opportunity for market development. However, the adoption and consumption of healthy foods will not be equal among countries and individuals due to varied availability and ability to process technical nutritional information, understand



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the health benefits of seafood and consumer involvement in personal health care. Consumers' concerns about health are closely related to food safety concerns.

Consumers will demand more information about seafood products and the possibility to trace their movements through the value chain.

Corporate Social Responsibility

Attention toward corporate social responsibility is a rising trend among consumers and retailers. Consumers will demand more transparency from producers about food products and pay more attention to production sustainability, ethical sourcing and "food miles," among other factors. An abundance of publicly available information related to the seafood industry, impacts on natural stocks, production mistakes, failures and unreached social respon-

Consumers will demand more information about seafood products and the possibility to trace their movements through the value chain.



The attitudes, traditions and special production methods that distinguish the food in national and international markets will influence choices for local foods over imported products.

sibility goals will motivate producers to fully disclose information about the species they use to consumers.

The reliability and honesty of producers will increasingly influence consumers' choices toward food and to the origin and harvest procedures of wild fisheries and aquaculture. However, in practice, most consumers will continue to buy based largely on what is in their wallets. The same goes for importers and retailers to an extent.

Best practice certifications, whether public or private, may increase their presence in the markets as consumer demand for transparency grows in influence on final seafood purchase decisions. Once again, factors like cultural issues or confusion across consumers may affect the effectiveness of tools like ecolabels as drivers to increase responsibility in the seafood industry.

Production Systems, Innovations

The future development of the food industry and processing procedures will be affected by consumers. In some cases, such as organic aquaculture, production systems will revert toward more traditional ones. In other cases, developments in nanotechnology and genetic modification will stimulate the production of new and more sophisticated species. The

acceptance of genetically modified products and nanotechnology will continue to be low due to consumers' negative perceptions toward modified foods.

The confrontation between traditional and innovative food production is of special interest in seafood. This fact materialized in the market interactions between wild and farmed species, and the limitations of the latter for achieving optimal prices in regions and cultures with strong preferences toward traditional catch production.

Sustainability

Consumers' interest in the sustainable production of foods will continue to be an increasing trend, especially in wealthy developed countries. Fish stock and forest depletion, as well as the effects of production on climate, were among the concerns consumers mentioned. Legislation will reinforce the trend toward sustainable production.

Ecolabels are the best known example of the translation of consumers' sustainability concerns into the seafood markets. As in the case of health benefits, results in terms of market return may depend on several social, economic and individual factors. Having the right to use an ecolabel will not necessarily mean increased income for a fisherman or farmer, but certainly can avoid rejection due to environmental critics of the fishery and aquaculture industries.

Country, Region Of Origin

The concept of buying local products is heavily promoted among consumers, particularly in Europe. Attitudes, traditions and special production methods distinguishing the food in national and international markets are the elements that will influence choices for local foods over imported products.

Region of origin has proven to be a powerful influence in consumer seafood choices, both positive or negative. For some species, the region of origin is a quality assurance itself – as with wild salmon from Alaska or farmed fish from Norway. In other cases, consumer ethnocentrism may limit consumer purchases of imported seafood, although for value-added products and fillets this is much less the case.

Perspectives

The extent to which these new trends will in fact affect seafood demand in the future will partly depend on the level of retail promotion, as well as the size and economic status of the segments of concerned consumers. Unless these consumer

segments reach a minimum profitable audience for producers and retailers, the main drivers in global seafood consumption will remain price, health and food safety, and technical quality – the dominating present trend.

Given that the majority of issues concern mainly consumers in developed countries, expected future changes in international food flows will have some influence in this respect. One interesting question is whether these consumers' concerns, which seem to impact the demand for seafood in the South-North trade, will have any impact in South-South flows and the production of food to address local demand.

The rise in consumer concerns strongly depends on the promotional efforts undertaken by stakeholders, mainly governments and non-governmental organizations, but also media, groups of influence and others. These stakeholders do not always act in the same way or share the same interests and goals, often resulting in increased confusion rather than increased concerns.

Price sensitivity is a major constraint in the market development of these food trends. Even concerned consumers are limited by their budgets when they make seafood choices, and this will affect the acceptability of premium prices. The fall in household purchasing power in many Western countries due to the policies adopted to overcome the financial crisis will also have an impact on the demand for premium foods and may become an obstacle for market development. Finally, even in countries with similar levels of income, cultural issues may result in differences in terms of concerns and consumption. However, in practice, most consumers will continue to buy based largely on what is in their wallets. The same goes for importers and retailers to an extent.

Editor's Note: This article was based on a longer article by the authors titled "Consumer Trends and Preferences in the Demand for Food," which is available online at www.snf.no/Publications/SNF-publications.aspx.

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marketplace

Healthy ... But Tasty, Too Seafood Must Join New Frontier' In Food



Seafood in its many forms has much to offer consumers. Balancing nutrition and taste is key to increasing consumption of fish and shellfish.

Summary:

International food organizations fully understand that seafood plays an essential role in human nutrition and is an excellent source of protein as well as essential fatty acids and micronutrients deficient in many diets. Now seafood production people have to bring on new product innovations, and marketing people must promote them to consumers who favor taste over health benefits in food choices. "The new frontier is how to make healthy food delicious."

As we continue breaking through on the importance of seafood in human health – and believe me, we are – seafood production people have to bring on new product innovations, and our marketing people have to keep hitting the right messages.

Recently, I was in Bergen, Norway, to attend both the United Nations Food and Agriculture Organization (FAO) Committee on Fisheries (COFI) Fish Trade meeting and the North Atlantic Seafood Forum (NASF), and I was impressed by

how many times the subject of seafood and health came up in a positive way.

The United Nations clearly has seafood's role in human health as an agenda item now. While human nutrition is a relatively new item for the COFI sub-committee on fish trade, there was much agreement about the need to increase fish consumption.

It is now fully understood in these circles that seafood plays an essential role in human nutrition and is an excellent source of protein as well as essential fatty acids and micronutrients deficient in many diets.

Perspectives: FAO

According to FAO, fish accounts for about 17% of the global population's intake of animal protein, but this share can exceed 50% in some countries. In West African coastal countries, where fish has been a central element in local diets for many centuries, the proportion of dietary protein from fish is very high: 43% in Senegal, 72% in Sierra Leone and 55% in Ghana and Gambia. The same picture is seen for some Asian countries and small island states.

The paper presented by FAO at the

seafood and health



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COFI Fish Trade meeting also reinforced that seafoods provide the long-chain omega-3 fatty acids that support brain function and are important for optimal brain and neurodevelopment in children. Alternative fatty acids found in vegetable oils must be converted into docosahexaenoic acid in an inefficient process that makes it difficult to rely only on vegetable oil during the first critical 1,000 days of our lives.

What is most important is that a paper is being prepared by FAO on the role of fish in nutrition for the November 2014 Second International Conference on Nutrition. This high-level ministerial conference will propose a flexible policy framework to address today's major nutrition challenges and identify priorities for enhanced international cooperation on nutrition. The FAO paper will highlight existing knowledge on the roles aquaculture and fisheries can play in combating malnutrition, both as a provider of essential nutrients and as an income-generating activity.

Perspectives: NASF

At NASF, we learned from a number of organizations about their involvement in seafood and health issues. WhiteFishMall, which is establishing a branding concept for North Atlantic whitefish through a web-linked information site, promotes the nutrition information of all their species directly to consumers.

The European Union End User Session – which included representatives of Young's, Sainsbury's, Metro, ICA, Delhaize and M & J Seafoods – also highlighted issues relating to health. Sains-