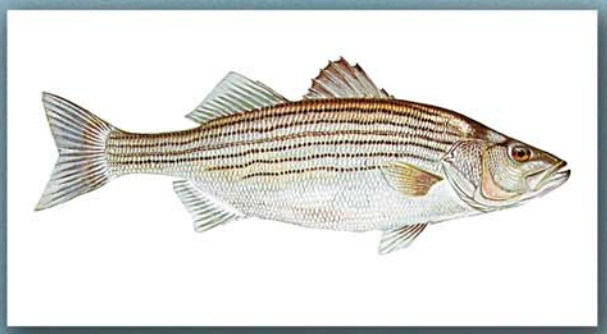
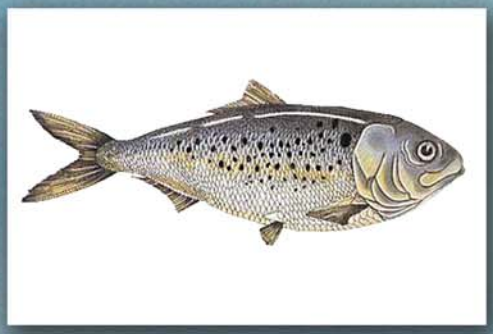
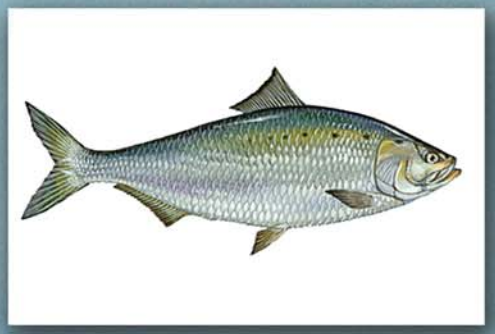
Ecosystem Based Fisheries Management for Chesapeake Bay

REPORT OF THE SOCIOECONOMICS QUANTITATIVE ASSESSMENT TEAM



A Review of Consumer Preferences for Eco-labeled Seafood

Potential Implications for Ecosystem Based Fisheries Management in the Chesapeake Bay

KELLEY APPLEMAN

Produced by
Maryland Sea Grant

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Contents

Preface

How do issues change when you look at them through an ecosystem based management lens? The concept of "eco-labeling" as described in the following brief is being applied to different species based on how they are caught and the fishery is managed. The basic idea is that consumers are willing to pay more for seafood that is caught in a demonstrably sustainable way as indicated by the awarding of the eco-label. What are the implications of this approach for ecosystem-based fisheries management? Will consumers pay more for seafood harvested under an ecosystem-based fisheries management plan? This brief explores the challenges of moving from the single species eco-labeling concept to the ecosystem level.

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Introduction

The concept of "eco-labeling", or marketing products to highlight the environmentally friendly aspects of production, is a relatively new concept to consumers in the United States. In terms of food products, an eco-label can address certain aspects of sustainable production like soil and water conservation and responsible fisheries management, or it can address the safety and physical characteristics of a product, like the use of pesticides and/or synthetic hormones. Another type of food labeling known as "organic" labeling assures consumers that a food product's total plant and animal ingredients must be 95% organic (i.e., free of artificial food additives and processed with very little or no artificial methods like chemical ripening or genetic modification) (Organic Labeling and Marketing Information). The main difference between the two labeling programs is that an eco-label is designed primarily to address sustainability as it relates to a product's production process. As of now, eco-labeling is a voluntary procedure and the criteria for each food product are dependent upon the established standards of a third-party certification agency. The label serves as a guarantee that the product meets the agency standards and provides consumers with all the relevant product information in order to make a well-informed decision. The environmentally friendly attributes of a food product are not implicitly revealed in the product's price; therefore, an eco-labeling program creates a market-based approach to address this issue (Wessells, Johnston, and Donath, 1999).

For seafood products in particular, one of the most well-known eco-labeling agencies, the Marine Stewardship Council (MSC) was created in 1996 as part of a collaborative effort with the World Wildlife Fund (WWF) and Unilever Corporation (Wessells, Johnston, and Donath, 1999). Their mission is "to use an eco-label and fishery certification program to contribute to the health of the world's oceans by recognizing and rewarding sustainable fishing practices, influencing the choices people make when buying seafood, and working with our partners to transform the seafood market to a sustainable basis" (Vision and Mission: Marine Stewardship Council). Since its inception, the MSC now certifies 48 fisheries worldwide with 10 in the United States alone. Another notable seafood labeling initiative was the "Dolphin-safe" tuna labeling program that was influenced by the 1988 reauthorization of the Marine Mammals Protection Act (Teisl, Roe, and Hicks, 2002). As of today, there are several other organizations that have established eco-labeling initiatives such as, the Global Aquaculture Alliance, the Nordic Council, and the Food and Agricultural Organization. The adoption of labeling programs has generated an entirely new set of information on consumer behavior that serves as a metric to determine the success of these programs relative to agency goals.

The purpose of this paper is to provide a detailed review of the literature on consumer preferences for eco-labeled seafood and to discuss the potential implications of an eco-labeling program for several EBFM species in the Chesapeake Bay. While the literature on the effects of other labels (like nutrition and quality) is well-developed, the literature on the effects of eco-labeled seafood products is relatively new, and typically applies to countries where eco-labels are more established (i.e. United Kingdom, Norway, etc.). Nonetheless, this paper draws on the conclusions from a variety of different studies that address consumer behavior in the presence of

safety, quality, and sustainability labels. In general, most studies have found that consumers are willing to pay a premium for eco-labeled seafood, however, the results vary by region, species and certification agency. The next section provides a detailed review of consumer preferences for labeled seafood. Section 3 discusses the concept of Ecosystem-Based Fishery Management (EBFM) and the targeted species in the Chesapeake Bay, followed by some important considerations when designing an eco-labeling program in Section 4 and the concluding remarks in Section 5.

Literature Review

Some of the earliest studies that assessed consumer preferences for seafood focused primarily on product differentiation by quality and safety assurances. A study of consumer preferences for shellfish in France based on the presence of a quality label revealed that 75% of the respondents were in favor of the label. However, when making the final purchase decision, knowledge of the product was more important to the consumer's choice (Charles and Paquotte, 1999). The same study also revealed that consumer preferences varied significantly by region. For example, consumers who lived near the coast overlooked the quality and safety labels and chose the seafood produced in their region.

Another set of studies compared the pros and cons of a variety of environmental attributes, including quality and safety between farm-raised species and those caught in the wild. Holland and Wessells (1998) used conjoint analysis[1] to determine what attributes were important to a consumer's decision to purchase farmed versus wild salmon. The results showed that safety was an important attribute since consumers preferred products inspected by either the USDA or FDA to products with no inspection. They also found that labeling a product by method of production (farm raised vs. wild) had more of an impact on consumers in the mid-Atlantic region when compared to consumers on the West Coast. The authors concluded that the East Coast consumers may have associated the farm-raised product with a higher level of safety and quality standards. Another study by Young, Brugere, and Muir (1999) outlined the positive and negative aspects of aquaculture production in the European Union and summarized the effects on consumer behavior. Their study revealed that consumers were notably aware of six main farm raised species (salmon, trout, sea bass, carp, sea bream, and turbot). Purchase decisions ultimately depended most on the consumer's knowledge of the species and on his/her previously established preferences (i.e. taste, ease of preparation, nutritional value, etc.) instead of price (Young, Brugere, and Muir, 1999). They also found that physical appearance and consistency with the wild-caught species played an important role in the purchase decision.

The first known study that introduced the concept of consumer preferences for eco-labeled seafood was the Wessells, Johnston, and Donath (1999) telephone survey of seafood consumers in the United States. Assuming that all other physical characteristics of the seafood product were the same, respondents were asked to choose between certified (eco-labeled) and uncertified seafood products. The survey mechanism presented respondents with a hypothetical certification program that would "label seafood in order to guarantee that it is caught under strict controls that prevent too much fishing," (Wessells, Johnston, and Donath, 1999). Respondents were asked to consider three scenarios where each scenario presented respondents with one of three different seafood products (salmon, cod or shrimp). Each scenario varied by price and the presence or absence of an eco-label. In order to determine agency trust, each respondent was given one of

[1] Conjoint analysis is a market research survey technique in which potential consumers are presented with choice sets of different product attributes and are asked to choose the preferred product or rank products.

three certifying agencies (MSC, WWF, and National Marine Fisheries Service (NMFS)) and asked to assume that it backed the label certification.

When looking at the price attribute, the results showed that respondents did not treat all three species as equals when considering each of the hypothetical scenarios. Interaction terms that combined the eco-label premium with a dummy variable for seafood product indicated that a premium increase (rise in the cost of certified seafood) had the most negative impact on cod purchases and the smallest negative impact on salmon. Much like the study by Holland and Wessells (1998), they also found that preferences varied by region. On average, West Coast consumers were more likely to choose the eco-labeled salmon over consumers in other regions. Another important finding was how respondent perceptions of fishing conditions in each of the industries affected their decision. For example, if someone believed that the Atlantic cod fishery was overfished, he/she was more likely to purchase the labeled seafood over the un-labeled. This result was not significant for salmon. The authors concluded that the design of a successful eco-labeling campaign cannot look the same for every species and geographic region. They suggested a tailored approach that considers the population's knowledge and understanding of the fishery and links this knowledge to purchase decisions.

Two years later, Wessells, Donath, and Johnston (1999) compared their results from the United States to a parallel study conducted in Norway in Johnston, Wessells, Donath, and Asche (2001). They expanded the original study by reporting the responses to a set of questions designed to better understand heterogeneity in consumer preferences. They used the standardized ecologically conscious consumer behavior (ECCB) scale to gauge what environmental concerns influenced purchasing behavior. They also compared and contrasted the results from U.S. and Norwegian households. Tests of statistical significance between the two countries showed that there was a statistical difference between the purchase decisions of U.S and Norwegian households. In general, the results indicated that the Norwegian respondents were more sensitive to the price premium (cost of eco-label). The authors postulated that this was due to the Norwegians prior experience with eco-labels, making them better suited to identify unrealistically high prices. In terms of seafood products, the results showed that both U.S. and Norwegian consumers were more likely to choose certified cod over certified shrimp. Also, agency certification did not have any influence on Norwegian purchasing behavior, while the NMFS generated the most (49% of respondents) trust in the U.S. As previously mentioned, the study also included a variety of responses to an ECCB scale. The results from the standardized questions showed that marketing campaigns would be most successful when targeting consumers who have identifiable tendencies toward ecologically conscious purchases. And finally, when looking at the average consumer in each country, the results showed that the estimated probability of a Norwegian consumer choosing certified seafood is lower than the same probability for a U.S. consumer. The results from this study have important implications that would apply to the design of a bilateral or international eco-labeling program. A potential limitation of both the 1999 and 2001 studies is the fact that only seafood consuming households were interviewed. It would also be helpful if the sample included information on the purchase decision of the average consumer when deciding between eco-labeled seafood and a variety of other food products.

In 2002, Teisl, Roe, and Hicks continued the trend of examining consumer preferences for eco-labeling programs of a single species (i.e. tuna). Their study was an ex-post analysis of whether or not the "dolphin-safe" labels on tuna altered consumer purchasing behavior. From 1990 on,

almost all tuna was marketed as "dolphin-safe", so the authors modeled the consumer's choice between labeled tuna and other substitute tinned products like lunchmeats, other seafood, and canned meats (Teisl, Roe, and Hicks, 2002). They used marketing information on monthly sales and price data from 1988 to 1995 (pre and post labeling timeframe). The results indicated that the presence of a "dolphin-safe" label increased the demand for tuna and caused a subsequent decline in the demand for other canned meat products. The findings also suggested that the behavior change may not be visible right away, and that it may take a few years to fully realize the impact of a labeling program.

A more recent example of a study that examined consumer preferences for seafood in the presence of an eco-label was Erwan (2009) who surveyed French consumers about their willingness to pay (WTP) for labeled pollock. On average, consumers were willing to pay 10.9% more over the average unit price for labeled pollock. They also found that over 80% of the sampled population was willing to pay a price premium for the sustainability guarantee. In the end, the author concluded that the ultimate economic impact depended on consumer awareness and acceptance of the eco-labeling program.

Jaffry et al. (2004) were the first authors to explore consumer purchase decisions among several different types of species with or without eco-labels. Their conjoint analysis expanded the set of attributes found in previous studies, as they varied the product form and species (i.e. canned tuna, frozen prawns, fresh salmon, etc.), the certifier, country of origin (U.S., U.K. or unspecified), production method, price and brand. In each hypothetical choice scenario, respondents were faced with four different seafood products that varied based on the previously described attributes. The results showed that certification had a positive impact on the consumer's purchasing decision. Also, wild production (as opposed to farmed) had a positive impact on purchases, signaling the importance of sustainable practices to consumers in the United Kingdom. Another important finding was the negative and significant impact of non-governmental certifying agencies, indicating that consumers had more confidence in the product if the certification was backed by the government. Overall, the authors found that cod fillets and canned tuna experienced the most positive impact from the presence of an eco-label. The findings from this study were in accordance with the results from the others, further illustrating the potential benefits of an eco-label that guarantees the quality and sustainability of a seafood product.

Another recent study (Roheim and Johnston 2005) wanted to find out if consumers would choose a less-preferred species (based on taste) among several different species in the presence of an eco-label. Unlike the Jaffry et al. (2004) study, Roheim and Johnston confronted consumers with seafood products of the same processed state instead of allowing it to vary (i.e. fresh, canned, frozen). They felt that this was arguably more representative of the consumer's actual purchase decision. To obtain the results, Connecticut households were surveyed and asked to establish their preferred species out of a choice of four seafood products: salmon, swordfish, cod, and flounder. After establishing the baseline preferred species, respondents were presented with four choices (one for each species) and asked to rank them in order of preference (highest to lowest). Each choice varied by the price and presence or absence of an eco-label. The results of the main model without interaction terms indicated that respondents preferred salmon and flounder to cod but not swordfish to cod. The coefficient on the eco-label variable was positive and significant, which means that the presence of the label increased the probability of choosing that product. However, after parsing the main model into four sub-models based on the respondents'

preferred species (i.e. Salmon Preferred Model, Cod Preferred Model, etc.) to see if the presence of an eco-label on competing species changed consumer behavior, the importance of the eco-label diminished. The main finding from the model stratification showed that those who preferred the milder fish (cod and flounder) were unwilling to switch to salmon or swordfish regardless of price. It also revealed that utility from an eco-label on a non-preferred species was never great enough to offset the positive utility associated with the most preferred species (Roheim and Johnston, 2005). The authors concluded that for the average consumer, "Taste trumped environmental convictions!"

In summary, the empirical evidence has shown that the average seafood consumer, and in some cases the average general consumer, is willing to pay a premium for eco-labeled seafood. Other attributes that affected consumer purchase decisions were the geographic region, the consumer's knowledge of the fishing industry, consumer acceptance of the certifying agency, average weekly budget for seafood, and the consumer's environmental purchase patterns. Another attribute that will be discussed further in Section 4 is the "local" element that may be associated with the influence of a consumer's geographic region on his/her behavior. Although this concept is less developed in the seafood literature, there is evidence from studies of other food products that show strong preferences for a freshness or "local" cue when making purchase decisions. The next section provides an overview of Ecosystem-based management and a brief description of each of the targeted species in the Chesapeake Bay.

Discussion of Ecosystem Based Management in the Chesapeake Bay

Traditionally, single species management has dominated the world's fisheries, where regulation is based on maintaining sustainable population levels through responsible fishing practices. Rather than focusing on one species alone, over the past decade, scientists, policy makers and resource managers have recognized the importance of incorporating other ecosystem components into fisheries management. Some of these components include but are not limited to human/ environment interaction and predator/prey relationships. The formal term for this multifaceted management approach is Ecosystem-Based Fisheries Management (EBFM). For the Chesapeake Bay, the foundation for EBFM was laid in July of 2000 during a workshop sponsored by NOAA's Chesapeake Bay Office (NCBO) (Resources: Ecosystem-Based Fisheries Management in the Chesapeake Bay). The goal of the workshop was to develop a Fisheries Ecosystem Plan (FEP) for the Chesapeake Bay and to formally establish a technical advisory panel (TAP) to carry out the plan. In response to this workshop, the TAP put forth a formal document that outlined the specific goals and principles of a Chesapeake Bay FEP. The first five species targeted for ecosystem-based management in the Chesapeake Bay are the striped bass, blue crab, alosine, Eastern oysters, and Atlantic menhaden. The next four sub-sections will briefly describe each species' population status, current threats, and interaction with each of the other species under consideration.

Striped Bass

The striped bass, *Morone saxatilis,* more commonly known as "rockfish" or "striper", is one of the most coveted finfish to both commercial and recreational fishermen in the Chesapeake Bay. The stripers' importance along the Atlantic coast is evident by its role as the State fish in Maryland, Rhode Island, South Carolina and the State marine fish in New York. Its range along the Atlantic coast extends from the St. Lawrence River in Canada to the St. John's River in Florida. There are several distinct spawning stocks along the Atlantic coast, but the Chesapeake stock is largest and spends the majority of its time in the Chesapeake Bay and its tributaries (Striped Bass Profile: Chesapeake Bay Program). Due to its popularity as both a trophy fish and as a culinary delight in restaurants, increased fishing pressure in the early 1970's contributed to a 90% reduction in total pounds landed by 1983 (Striped Bass Harvest: Chesapeake Bay Program). Aside from the increased harvest levels, reproductive failure as a result of habitat degradation and pollution in the Chesapeake Bay also contributed to the population decline. As a result of the depleted status of the stock, the Atlantic States Marine Fisheries Commission (ASMFC) enacted the first coast wide management plan for the striped bass in 1981. To further the conservation efforts in 1985, Maryland and Delaware enacted a four-year moratorium on the harvest of striped bass, while Virginia followed with a 1-year moratorium in 1989 (Striped Bass Harvest: Chesapeake Bay Program). The moratoria were lifted in 1990, and by 1995, scientists considered the Chesapeake Bay fishery restored.

Although the striped bass population in the Chesapeake Bay no longer faces the imminent threat of overfishing, other threats like poor water quality, harmful disease and the availability of prey species remain. The striped bass has an important role in the food web in the Chesapeake Bay since they feed on three key prey species, the blue crab, the Atlantic menhaden and American shad (also included in EBFM initiative). Although competition from these fisheries in the Chesapeake Bay reduces the available prey for the striped bass, an increased abundance of striped bass over the last 15 years has lead to increasing predatory pressure on the menhaden and other prey species.

Blue Crab

The blue crab, *Callinectes sapidus,* is one of the most well-known and highly symbolic species of the Chesapeake Bay. Not only does it play an important role in the food web, but it is also the most economically valuable species in the Chesapeake Bay (General Info: Blue Crab Management). According to the Chesapeake Bay Program, more than one-third of the nation's total landings of blue crab come from the Chesapeake Bay. Although they can be found all along the Eastern seaboard from the Gulf to the Atlantic Coast, there is a distinct Chesapeake stock of blue crab.

Based on a 2008 survey of the blue crab population in the Chesapeake Bay, it was estimated that the population decreased by 70% since 1990 (Blue Crab Harvest: Chesapeake Bay Program). Some of the main factors contributing to the population decline were record high harvest levels in the mid 1990's, the degradation of the blue crab's habitat (underwater bay grass) due to pollution and poor water quality, and predation from larger species like the striped bass and Atlantic croaker. In addition to the Chesapeake Bay Program's Blue Crab Fishery Management Plan that was adopted in 1989, a Bi-State Blue Crab Advisory Committee (BBCAC) was established in 1996 to address some of the management concerns. The main role of the committee was to act as an intermediary between the three jurisdictions (Maryland, Virginia and the Potomac Fisheries Commission) that manage the commercial blue crab fishery in the Chesapeake Bay (Blue Crab Harvest: Chesapeake Bay Program). By the turn of the century, BBCAC recommended a fisheries management plan that would reduce the annual harvest by 15%. As of June 2009, the Chesapeake Blue Crab Advisory Report indicated that the level of spawning age crabs (age 1+) was 70% higher than the 2007-2008 level of 131 million (NOAA Chesapeake Bay Office, 2009). According to the report, this was the first time that the level of spawning age crabs exceeded the preceding year's target since 1993. Despite the encouraging news, resource managers continue to recommend a precautionary approach for the blue crab until the effectiveness of current conservations measures are fully understood.

Eastern Oyster

Perhaps one of the most ecologically important species in the Chesapeake Bay, the Eastern Oyster, *Crassostrea virginica*, contributes to the health of the Bay ecosystem and to the region's cultural and economic significance. The Eastern oyster is known as a filter feeder, since it takes in large quantities of water to consume plankton and other microscopic plants, and then expels the water back into the ecosystem. As a result of this filter feeding process, the oysters remove nutrients and sediment suspended in the water column. This process contributes to the health of the Bay's underwater grasses, an essential habitat for another EBFM species such as blue crab.

In addition to the oyster's role as a water filter and natural reef habitat for other species, it is also an essential component in the food web. The blue crab and other fish are predators of oysters.

Aside from its ecological importance, the Eastern oyster is an iconic species whose cultural and economic significance dates back to the early 19th century. Once a nuisance to ships attempting to navigate through the piles of oysters that arose from the bottom of the Bay, the native oyster population is now at less than 2% of what it was during colonial times (Oyster Harvest: Chesapeake Bay Program). Intense harvesting, loss of habitat, natural predators, and diseases have all contributed to the decline of the Eastern oyster in the Chesapeake Bay.

Historically, the oyster fishery has been controlled by state legislators, dating back to the first law passed in Maryland in 1820. More recently, the 2004 Chesapeake Bay Oyster Management Plan was adopted to indentify some of the key components of oyster restoration. Some of the main goals include the restoration of oyster reefs to improve larval production and the development of native raised oysters that are resistant to disease (Eastern Oyster: Research and Restoration). Given the ecological significance of the oyster to the Bay and its important connection with other EBFM species, continued conservation efforts and management requires a multi-species approach.

Atlantic Menhaden

The Atlantic menhaden, *Brevoortia tyrannus*, can be found in the waters of the Chesapeake from spring through early fall, and plays an important role in the link between the higher and lower levels of the food web. Much like the Eastern oyster, the menhaden is also a filter feeder. They filter water through their gills to consume plankton and then return the water back to their surroundings. Menhaden is also an important prey species for striped bass and other large fish.

The commercial fishery for menhaden is considered the most productive fishery in the entire Bay and one of the most important fisheries on the Atlantic coast, with over 100,000 tons landed each year (Houde). Unlike the other three species mentioned, the menhaden is not eaten by humans but is used in the production of fishmeal, fish oil and solubles. The Atlantic States Marine Fisheries Commission (ASFMC) has managed the menhaden since the adoption of the original FMP in 1981. In 1992, concerns of a population decline lead to a revision of the original FMP that included biological reference points (Atlantic Menhaden: ASMFC). In 2006, the third addendum introduced a 5-year annual cap on the harvest set to expire in 2010.

As of today, the menhaden does not face any threats from over-fishing, however, there are concerns about "localized depletion" and low levels of young menhaden in the Chesapeake Bay (Houde). Just like the Eastern oyster, the menhaden plays an ecologically important role in the Bay's ecosystem and its predator-prey relationship with other EBFM species further illustrates the need for a multi-species management approach.

So, what does this mean for these species in the Chesapeake Bay and what are some potential implications of an eco-labeling program that would market ecosystem-based fisheries management to consumers? As previously discussed, in the context of seafood products, the goal of an eco-labeling program is to create a market based incentive for responsible fishing practices and to convey information that may have been previously unknown to consumers so they can incorporate it into their purchase decision. The next section revisits some of the main findings

from the literature review in attempt to outline what a similar program might look like for EBFM species in the Chesapeake Bay.

Important Considerations for Eco-labeling and EBFM

In general, one of the first steps when considering an eco-labeling program is to outline the basic structure of the retail market and to understand how to target the consumer. For most seafood products, commercial fishermen sell to a dockside buyer who channel the fish to either a wholesale distributor, processor or directly to a restaurant (Lipton). The distributor or wholesaler can also channel the product to restaurants or to retail markets, both leading directly to the consumer. In the Chesapeake Bay area, consumers have the option of buying blue crab, Eastern oysters, and striped bass in local fish markets or grocery stores and as entrées in area restaurants[2]. Most of the studies indentified in this paper used on-site intercepts of consumers at specialty markets and grocery stores, or collected a random sample of household seafood purchasers via mail and telephone surveys. Depending on the target audience (either seafood consumers or consumers in general) the on-site intercept method was the most successful in terms of obtaining responses from the sampled population. Therefore, if a similar study were to be carried out in the Chesapeake Bay area, on-site sampling would be the most effective way to obtain results that are representative of the target population.

A second and very important component of the successful implementation of an eco-labeling program is the description of what the label means in terms of sustainability. With the exception of Jaffry et al. (2004), most of the studies outlined in Section 2 defined the eco-label to represent a program that would guarantee "no-overfishing." The Jaffry et al. (2004) study took the definition one step further by interpreting 'sustainably managed' as "fish supplies that are maintained, and long term environmental damage is avoided," instead of just "no overfishing." The introduction of EBFM to the consumer presents some additional complexities that would need to be clearly defined and well thought out. An eco-label program for an EBFM species would require a general description of EBFM, followed by a statement that connects the management practice to the targeted species. An example description might look like:

> *The Chesapeake Bay Program, is considering a program that would label seafood products in local fish markets and grocery stores. The label is an indicator that the seafood product is being managed under an Ecosystem Based Fishery Management Plan (EBFM). An EBFM considers the important links between multiple species in the Chesapeake Bay instead of focusing on just one species alone. The seafood certified with the Chesapeake Ecosystem logo guarantees that it is being managed to consider all factors that affect the species well-being like:*

[2] Since the menhaden is not eaten directly by humans, it may be more useful to eco-label a product that uses menhaden in its production process (i.e. chicken fed with fishmeal that includes menhaden or fish oil capsules, etc.)

- *HEALTHY HABITAT*
-
- *ABUNDANT FOOD SOURCES*
- *POLLUTION REDUCTION*
- *RELATIONSHIPS WITH OTHER SPECIES*

Seafood that is not certified with the Chesapeake Ecosystem logo does not have this guarantee. The first seafood product that will bear this label is the striped bass, or "rockfish."

Although this is an example for the striped bass, this description could easily be modified for any of the other key species targeted for EBFM. The purpose of this statement is to ensure that the consumer understands the management scheme and the environmental impact on the specified seafood product. It was clear in several of the aforementioned studies that consumer acceptance played an important role in whether or not the eco-label was a success. Consumers also need to trust the agency administering the label and have faith that the intended goals of the program will be achieved. The acceptance of the certifying agency chosen would need to be explored further.

Another component of an eco-labeling program that has not received as much attention in the seafood literature is whether or not adding a "local" or freshness guarantee would increase the probability of an eco-labeled seafood purchase. In a recent study by Darby, Batte, Ernst, and Roe (2006), direct market and grocery store consumers in Ohio were surveyed about their preferences for locally produced strawberries. The respondents were asked to choose between two different strawberry products that varied by price, location of production (i.e. "grown near-by", "unidentified, etc.), type of production (i.e. large scale vs. small scale) and freshness guarantee. The initial results indicated that consumers valued freshness over the location of production, but when they held freshness constant and allowed all other variables to vary, the results showed that consumers preferred the local product more often. They also found that the average grocery store customer was willing to pay $0.87 more for strawberries labeled "Grown in Ohio", while the average direct market consumer was willing to pay $1.38 more. However, the final results showed that consumers were willing to pay an even higher premium for the freshness guarantee. This means that the time of harvest was more important to consumers than the time it took to transport the strawberries from the production location to the market (Darby, Batte, Ernst, and Roe, 2006). If the same concept were applied to a seafood product, this could translate into positive benefits to local consumers for species harvested in the Chesapeake Bay area. In addition to presenting consumers with an eco-label that guaranteed sustainable management under an EBFM plan, they could also be presented with a "freshness guarantee" as an indicator that the harvest occurred in the Chesapeake Bay. This local cue could also be described to the consumer as a reduction in the carbon footprint due to the lower transportation needs.

Finally, based on recommendations from several of the studies in Section 2, a successful eco-labeling program would require careful consideration of an integrated education and outreach campaign to increase consumer awareness of the connection between the seafood in the market and the meaning of a sustainable fishery. If consumers do not make this connection and

realistically incorporate it into their purchase decision, then the probability of the program's success would be likely to decrease.

Concluding Remarks and Future Recommendations

The purpose of this paper was to provide a detailed review of the literature on consumer preferences for eco-labeled seafood and to discuss some of the important findings that may be applicable if a similar program were implemented for EBFM species. In addition to the design and implementation of a labeling program, it's also important to consider the long-term economic impacts. Since eco-labeled seafood is a relatively new concept and not well-established in the United States, there exists little to no market data on the long term economic impacts. However, findings from the empirical studies discussed in this paper suggest that, on average, consumers are willing to pay a higher price to obtain an "environmentally friendly" product. For now, this may only be relevant in the short run since there is little evidence as to how long the market would sustain the higher premium. Some evidence from Europe suggests that price premia are often not sustained in the long run due to shifts in production processes (more producers offering eco-labeled products) that satisfy demand and lead to lower prices (Rotherham, 2004). A possible solution that may increase the probability of long-term success would be to implement an eco-labeling program that accompanied a policy change or directive. For example, in the United States, federal tax credits that accompanied the Energy Star label helped improve the efficacy of this environmental initiative.

Overall, the literature review provided important insight into consumer behavior and purchasing patterns in the presence of eco-labeled products. Several important considerations when designing a similar program for EBFM species include consumer preferences for substitute species, consumer knowledge and awareness of the species fishery and management practices, ensuring a link between the product and the meaning of sustainability, certification by a government agency, the addition of a "local" cue that specifies the time since harvest, and directing policy initiatives to ensure program success and longevity. There is great potential for the success of a labeling program for species within the EBFM framework, and the success will ultimately depend on consumer acceptance and belief that the management scheme will lead to a sustainable fishery and healthy ecosystem.

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