Title
An Analysis of the Market for Certified Sustainable Sea Urchin in San Diego

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Urchin in San Diego

By Anne Grant
An Analysis of the Market for Certified Sustainable Sea Urchin in San Diego

Introduction

The sea urchin fishery is one of California’s most valuable fisheries. In 2006 it reported landings of 10.6 million pounds valued at $5.1 million (NOAA). The potential value of this species was difficult to foresee in the 1960’s. During this time period large populations of sea urchins were destroying local giant kelp forests. The fishery was established in 1971 as a way to manage the sea urchin population. The tissues targeted in this fishery are the gonads of the male and female sea urchin, which are commonly called roe or uni in Japanese (California Fish and Game 2001). Today approximately 99% of the sea urchins harvested in San Diego are sold as uni in the sushi market. Roughly 30% of San Diego sea urchins are exported to Japan and China, 10% stay in San Diego, and approximately 50% leave California destined for other US markets, like New York (Dave, Catalina Offshore Products).

Product quality is judged according to size, texture, and firmness. There are three levels of quality; gold, premium, and select. Distributors prefer to sell their product domestically because of consistent domestic prices, lower transportation costs, and nonexistent currency exchange costs. The remaining product is exported to China and Japan where it is sold at auction with extreme price variability. Sea urchin price and demand have both been relatively consistent for the last 12 years (Peter, San Diego). There is only one processor in San Diego who supplies the majority of the local market, but the local market is only a tiny fraction of his business. A few wholesalers coming
from Los Angeles offer other uni products while a few wholesalers come to San Diego from Mexico but their product is seasonal (Dave, Catalina Offshore Products).

Due to limited growth potential in the traditional uni market this paper will focus on differentiating the San Diego sea urchin though sustainable certification. An analysis of the potential market for sustainably certified sea urchin will be presented. A survey of San Diego sushi restaurants was conducted to determine their level of knowledge about the sea urchin fishery, sustainable certification, and willingness to pay for sustainably certified uni. A number of interviews were conducted with sushi chefs, restaurants managers, divers, and the processor to get an understanding of the local sea urchin market. Menu prices for uni and four other nigiri sushi products were collected. These prices were used to determine price variation between restaurants and if a correlation exists between uni and the other nigiri sushi products.

**Marine Stewardship Council:**

The declining state of the world’s fisheries has inspired a number of governments and non-governmental organizations to consider sustainable certification as a complement to traditional fishery management practices. The leading organization in the area of sustainable certification is the Marine Stewardship Council (MSC) (Wessells et al. 2001). MSC is an independent, non-profit, international organization. Its goal is to promote sustainable and responsible fishing practices world wide. To date 26 fisheries have been awarded MSC certification (MSC 2008). MSC does not certify fisheries it relies on third party accreditation certification bodies to conduct the actual fishery assessments and to make certification decisions. MSC monitors all certification agencies to ensure they are in compliance with MSC rules (MSC 2005).
To become certified a number of steps must be followed. The fishery seeking certification must select an accredited certification body. The certification body then conducts a pre-assessment which identifies areas that need improvement. The fishery is required to make these improvements. Once the initial improvements are completed the certification body develops scoring guidelines and performance indicators. The fishery is then reassessed using these guidelines and a draft assessment report is created; peer reviewed and publicly reviewed. A certification decision is made based on this report. If the fishery fails it is given an opportunity to make necessary changes (MSC 2005).

The certification process can be lengthy and expensive. It has taken 5 to 48 months for fisheries to become certified (MSC 2005). Preassessment cost has ranged from $3,000 to $25,000 and a full certification has cost between $15,000 to $150,000 (Wessells et al. 2001). Since MSC relies on third party accreditation certification bodies to asses the fishery and grant certification it does not receive payment for certification.

Becoming MSC certified can open up new opportunities and secure future success for a fishery. A number of large retailers have committed to selling only MSC certified fish. Most of these retailers are phasing in MSC certified fish products over a certain time period. These retailers include Wal-Mart, Unilever, and Safeway (Constance, Bonanno 2000). As the popularity of MSC labeled fish products increases Potts and Howard found that incentives for fisheries to become MSC certified also increase (2007). Under some circumstances MSC certified fishers have received a price premium for their product (Wessell et al. 2001). Very little information is available on the benefits received by individual fisheries for becoming MSC certified.
Methods:

Through discussions with the local processor and a local diver it was determined that sea urchin demand and price have both remained relatively constant for the last 12 years. Diversification often opens up new markets and can lead to higher product prices. This paper will focus on diversifying the San Diego sea urchin though sustainable certification. Two questions were posed “Does a market for certified sustainable San Diego sea urchin exist at San Diego sushi restaurants?” and “Are sushi restaurants in San Diego willing to pay more for certified sustainable San Diego sea urchin. To answer these questions interviews were conducted, surveys were administrated, and menu price data was collected.

Interviews

Interviews were conducted with the San Diego sea urchin processor, a leader from the group of 20 sea urchin divers, 9 sushi restaurants selling uni, and 3 sushi restaurants not selling uni. All interviews were conducted in the winter and spring of 2008. The purpose of these interviews was to hear perspectives from each segment of the San Diego sea urchin market. These interviews provided immense insights into how this market functions.

Survey

As previously noted, data was gathered from a survey of San Diego sushi restaurants selling uni. Survey development involved background research and individual interviews with managers and chefs responsible for making purchasing decisions. Some of the questions were obtained from other studies doing similar research (Wessells et al. 1999; Wessells et la. 2001; Roheim et al 2008). The eight-question survey was read to
respondents. At the beginning of each survey all respondents were read the meaning of certified sustainable: “Certified as sustainable means that the fish is from a source that has been judged to be sustainably managed by the Marine Stewardship Council, meaning that fish harvests are maintained, high fish populations are guaranteed and long term environmental damage is avoided (Wessells et al. 2001). Certified sustainable fish might be more costly than fish that are not certified as sustainable. Currently, a number of fisheries on the West Coast are not being managed in a sustainable way and this worries some consumers, fishery managers, fish processors, and fishermen.”

The survey was designed to obtain information on how knowledgeable restaurants are about programs that certify fisheries as sustainable, their perception of the uni fishery in San Diego, how much they were willing to pay for a certified sustainable uni, and if customers were requesting a sustainably certified product. When respondents were asked about their willingness to pay for certified sustainable uni they were told to assume the uni product would be equal in quality to the uni they are purchasing today. An example of the survey can be found in Appendix 1.

Surveys were administered in person to 15 San Diego sushi restaurants selling uni. Five San Diego communities were selected to be surveyed. In these communities there were 45 sushi restaurants, 36 were visited, and 26 sold uni. All 26 restaurants were asked to take part in the survey and 15 agreed to be involved. The survey was conducted in the spring of 2008.

**Fish Prices**

All 26 sushi restaurants selling uni agreed to provided menu prices for uni and 4 nigiri sushi products; uni (sea urchin), sake (salmon), hamachi (yellowtail), unagi (fresh
water eel), and ebi (shrimp). Nigiri sushi consists of sushi rice formed into 2 rice balls. Each rice ball is topped with wasabi and a thin slice of fish (uni, sake, hamachi, unagi, ebi). This price data was used to compare uni prices across restaurants and to determine if the price of uni was correlated with the prices of the 4 nigiri sushi products. Menu prices were collected in the winter of 2008. The majority of restaurants had not changed their menu prices in over one year.

Results

Interviews

Restaurant

To get a better understanding of what sushi restaurants look for in an uni product a number of sushi chefs and restaurant owners were interviewed. Nine sushi restaurants selling uni and four sushi restaurants not selling uni were selected to be interviewed. The comments and suggestions were very similar across all interviewees.

The primary concern for the restaurants selling uni was quality. In their opinion San Diego sea urchins are the highest quality in the world. Most interviewees agree that uni is an acquired taste but some restaurants encourage their patrons to try uni with the hope they will like it and order it again. Uni is one of the most expensive nigiri sushi and sashimi products on many interviewees’ menus. For some restaurants uni has recently been added to their menus to attract or retain customers. Many of the interviewees agree that customers ordering uni have on average a higher bill and tend to order other more expensive menu items.

Since the divers are considering vertical integration as away to increase the price they receive for their product, restaurants were asked to comment on their willingness to
purchase directly from local divers. Restaurants are apprehensive about purchasing directly from divers. They are concerned about consistent quality, convenience, consistent supply, and current supplier relationship. Often the uni supplier sells many of the other fish products purchased by the restaurant and they do not want to jeopardize this relationship. They were also worried that sea urchins purchased directly from divers could have been harvested illegally. They would need assurances that the catch was legal. Despite all of these concerns, some were interested in exploring the option further if such an opportunity was ever available.

To determine the importance of fishery sustainability to the interviewees they were asked if they would purchase certified sustainable products and then to explain why. Some interviewees felt that purchasing products from a sustainable fishery was important and they would consider purchasing certified sustainable products. Some of the interviewees said that when a fishery starts to suffer then the quality of the product declines, and this has a direct effect on the product they are selling. Also many of the interviewees had a personal interest in purchasing products from sustainable fisheries. A couple of interviewees used the example of Chilean Sea Bass; when they heard that fish stocks were suffering they substitute away from Chilean Sea Bass. Not because of consumer pressure but because of declining fish quality and a personal interest in preserving species diversity.

The reason for not selling uni varied across sushi restaurants. One restaurant had just hired a new chef from Japan so they reduced their menu until his clientele had grown and he felt comfortable preparing uni and other high end sushi products. While the other
restaurants claimed there was no demand for uni. One restaurant said they catered to consumers demanding traditional sushi choices like salmon, eel, shrimp, and yellowtail.

**Processor**

The processor was also interviewed to determine how he assesses quality and what the market for uni looks like. Quality is determined by color, firmness, and texture; all three are requirements for the gold label. The level of quality is also used to determine the price paid to divers. In general approximately 40% of the sea urchins purchased are Gold, 50% are premium, and 10% are select. The select is sold in bags as uni paste. Roughly 99% of the product processed in San Diego is sold as uni. The majority of the product is sold to wholesalers and approximately 5% is sold directly to sushi restaurants. Demand peaks in the summer with slight increases during certain holidays like Christmas, Valentines Day, and Mother’s Day. Most sushi products experience this same trend in demand. The processor’s clients have not been requesting certified as sustainably harvested uni products yet.

According to the processor the competitiveness of the uni market has been increasing, causing quality ratings to become stricter. The processor is aware of wholesalers from Los Angeles offering alternative uni products in San Diego and wholesalers from Mexico selling a seasonal uni product in San Diego. There are very few sea urchins between Santa Barbara and San Francisco because of over fishing and poor food quality and food quantity. Washington State and British Columbia sell a lower quality sea urchin but they are working to improve the quality. On the international stage Chile is selling a high quality product.
Diver

The last segment interviewed was the sea urchin divers. There are approximately 20 divers in San Diego. The San Diego waters have a reputation for producing the highest quality sea urchins in the world. The divers want to protect this reputation and they are considering branding. When it comes to the idea of sustainability one sea urchin diver is concerned that this is more of a catch phrase. He would rather see the San Diego sea urchin fishery focused on the idea of a stable fishery. One concern he has with the certification process is the method used to assess the fisheries sustainability, maximum sustainable yield (MSY). The MSY represents the maximum amount of fish that can be removed without negatively impacting species recruitment (Goodstein 2008). Historical data on stock size are used to calculate MSY but since this fishery is relatively new minimal data exists. This lack of data makes it difficult to explain why population sizes fluctuate year over year and to determine an accurate MSY.

He believes that being certified as a sustainable fishery will be more important in the future. Right now certification can be an expensive and time consuming process, with no guarantees that sea urchin prices will rise or demand will grow. The per pound price paid to divers has not increased in roughly 12 years despite the fact that costs of production have been increasing. Demand has also remained relatively constant for the last 12 years.

The diver has a vision for the San Diego sea urchin fishery. He would like to see a community based fishery where all the divers work together to decide what should and should not be harvested. This would eliminate the open access problem and could reduce fishing effort. This would allow the divers to feed the sea urchins to achieve the desired
quality. They would market directly to consumers, vertically integrate, and diversify. To test this strategy the diver would like to develop a pilot project in San Diego. Some preliminary exploration into the Italian market had some promising results. He does recognize that this new business plan would create a number of new areas of concern especially if they marketed directly to end users. Some areas of concern could include transportation, quality, and processing.

**Sushi Restaurant Survey**

To evaluate the relationship between each of the survey responses a correlation matrix was calculated. The matrix includes 15 sushi restaurants and 8 survey response variables. The descriptive statistics for each of these variables can be found in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Distribution Answer= # of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>fishing A</td>
<td>1=severely over fished</td>
<td>9</td>
<td>2.44</td>
<td>0.73</td>
<td>1=1</td>
</tr>
<tr>
<td></td>
<td>2=moderately over fished</td>
<td></td>
<td></td>
<td></td>
<td>2=3</td>
</tr>
<tr>
<td></td>
<td>3=not at all over fished</td>
<td></td>
<td></td>
<td></td>
<td>3=5</td>
</tr>
<tr>
<td>knowledge B</td>
<td>1=very knowledgeable</td>
<td>15</td>
<td>2.07</td>
<td>0.59</td>
<td>1=2</td>
</tr>
<tr>
<td></td>
<td>2=somewhat knowledgeable</td>
<td></td>
<td></td>
<td></td>
<td>2=10</td>
</tr>
<tr>
<td></td>
<td>3=not knowledgeable</td>
<td></td>
<td></td>
<td></td>
<td>3=3</td>
</tr>
<tr>
<td>cost C</td>
<td>The additional amount restaurants are willing to pay for</td>
<td>15</td>
<td>22.67</td>
<td>27.12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>certified sustainable uni. (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>distributor</td>
<td>1=distributor sells certified sustainable fish</td>
<td>10</td>
<td>1.00</td>
<td>0.00</td>
<td>1=10</td>
</tr>
<tr>
<td></td>
<td>2=distributor does not sell certified sustainable fish</td>
<td></td>
<td></td>
<td></td>
<td>2=0</td>
</tr>
<tr>
<td>purchase</td>
<td>If distributor =1 than</td>
<td>10</td>
<td>2.10</td>
<td>0.57</td>
<td>1=1</td>
</tr>
<tr>
<td></td>
<td>1=always purchase certified sustainable fish</td>
<td></td>
<td></td>
<td></td>
<td>2=7</td>
</tr>
<tr>
<td></td>
<td>2=sometimes purchase certified sustainable fish</td>
<td></td>
<td></td>
<td></td>
<td>3=2</td>
</tr>
<tr>
<td></td>
<td>3=never purchase certified sustainable fish</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>consumer D</td>
<td>1=consumer always ask if fish is certified as sustainable.</td>
<td>15</td>
<td>2.64</td>
<td>0.63</td>
<td>1=1</td>
</tr>
<tr>
<td></td>
<td>2=consumer sometimes asks if fish is certified as sustainable</td>
<td></td>
<td></td>
<td></td>
<td>2=4</td>
</tr>
<tr>
<td></td>
<td>3=consumers never asks if fish is</td>
<td></td>
<td></td>
<td></td>
<td>3=10</td>
</tr>
</tbody>
</table>
The descriptive statistics found that restaurants mean willingness to pay for certified sustainable unis equal in quality to the uni being purchased today was 23% more.

Respondents are somewhat knowledgeable about programs that certify fisheries as sustainable. While respondent’s customers infrequently inquire if the fish being served is sustainably certified.

The correlation matrix in Table 2 measures the degree of linear association between each of the variables. However, this model does not reveal the existence of nonlinear relationships. The magnitude of the values in the matrix indicated the level of association between each of the variables. Larger values indicated a stronger linear relationship between two variables (Giffiths et al. 2001).

Table 2: Correlation Matrix for Sushi Restaurant Survey Responses.

<table>
<thead>
<tr>
<th></th>
<th>uni price</th>
<th>fishing</th>
<th>knowledge</th>
<th>cost</th>
<th>purchase</th>
<th>consumer</th>
<th>choice</th>
<th>member</th>
</tr>
</thead>
<tbody>
<tr>
<td>uni price</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fishing</td>
<td>0.39</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>knowledge</td>
<td>-0.15</td>
<td>-0.20</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cost</td>
<td>-0.48</td>
<td>-0.37</td>
<td>-0.36</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>purchase</td>
<td>-0.04</td>
<td>0.10</td>
<td>0.65</td>
<td>-0.55</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>consumer</td>
<td>0.23</td>
<td>0.89</td>
<td>0.27</td>
<td>-0.54</td>
<td>0.41</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>choice</td>
<td>0.08</td>
<td>0.52</td>
<td>-0.22</td>
<td>-0.18</td>
<td>-0.33</td>
<td>0.41</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>member</td>
<td>0.40</td>
<td>-0.52</td>
<td>0.22</td>
<td>-0.40</td>
<td>0.33</td>
<td>-0.41</td>
<td>-0.33</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Matrix results depict numerous correlations between survey response variables, illustrating some very interesting relationships. The more knowledge the respondent had about programs that certify fisheries as sustainable the more likely the respondent was to
purchase certified sustainably harvested seafood products. There was also a positive correlation between how often the respondent purchased certified as sustainably harvested seafood with the frequency consumers asked if the fish being served was certified as sustainably harvested. A negative correlation exists between the menu price of uni and the frequency consumers asked if the fish being served was certified as sustainably harvested. Indicating that at restaurants with higher menu prices for uni consumer more frequently ask if the fish being served in certified as sustainably harvested. Respondents with memberships in environmental groups were more likely to be knowledgeable about programs that certify fisheries as sustainable.

One unexpected results was the negative correlation between the menu price of uni and the additional amount respondents were willing to pay for certified sustainably harvested uni equal in quality to the uni they are purchasing today. This correlation says that as the menu price of uni increases the willingness to pay for certified sustainable uni decreases. The potential explanation for this result is that a couple of restaurants charging a high menu price for uni indicated that they charge this price to ensure the cost of the raw uni product are covered even for weeks when supply exceeds demand.

The respondents willingness to pay for certified sustainable uni equal in quality to the uni being purchased today increased with the frequency that consumers asked if the fish being served was certified as sustainable. Willingness to pay also increased with the respondent’s knowledge of programs that certify fisheries as sustainable.

Level of knowledge seems to be the common theme in all of the correlations described above. This could be an excellent opportunity for the sea urchin fishery if they decide to proceed with sustainability certification. They most educate the sushi customer
about the importance of fishery sustainability. The customers could potentially start requesting the product from the restaurant which could lead to an increase in demand though out the whole uni supply chain.

Next a multiple correspondence analysis was used to look for additional relationships between survey responses. Each triangle on the graph represents the response to a question; please refer to table 1 for the letter that corresponds with each question. The numbers represent each restaurant (1-15).

Graph 1: Multiple Correspondence Analyses for Survey Responses

The responses in the upper quadrant are negatively correlated meaning that they are moving in opposite directions. We expected these responses to move in opposite directions. They characterize a respondent that is willing to pay 10% more for certified sustainable uni equal in quality to the uni being purchased today. They are also somewhat
knowledgeable about programs that certify fisheries as sustainable. The cluster of survey responses in the upper right quadrant of Graph 1 are positively correlated with each other. They describe respondents that are not willing to pay more for certified sustainable uni that is equal in quality to the uni they are purchasing today, they are not knowledgeable about programs that certify fisheries as sustainable, they do not know the state of the San Diego sea urchin fishery, and when choosing between two products they do not take into consideration the effect that harvesting this product has on the environment. This cluster of respondents represents a potential opportunity for the sea urchin industry. Perhaps if these individuals were educated about the importance of sustainability then this would increase their willingness to pay for certified sustainable uni.

**Price Comparisons**

The correlation matrix, found in Table 4, includes the price of uni and four other nigiri sushi products from 26 San Diego sushi restaurants. Descriptive statistics for each of these variables can be found in Table 3. This correlation matrix was created to determine if any of the nigiri sushi products were linearly related with the price of uni.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Observations</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>puni</td>
<td>price of uni</td>
<td>26</td>
<td>$7.50</td>
<td>$1.51</td>
<td>$4.95</td>
<td>$12.75</td>
</tr>
<tr>
<td>pshrimp</td>
<td>price of shrimp</td>
<td>23</td>
<td>$4.17</td>
<td>$0.91</td>
<td>$2.75</td>
<td>$6.50</td>
</tr>
<tr>
<td>peel</td>
<td>price of eel</td>
<td>26</td>
<td>$4.55</td>
<td>$0.89</td>
<td>$2.95</td>
<td>$6.50</td>
</tr>
<tr>
<td>psalmon</td>
<td>price of salmon</td>
<td>26</td>
<td>$4.37</td>
<td>$0.70</td>
<td>$2.75</td>
<td>$6.00</td>
</tr>
<tr>
<td>pyellowtail</td>
<td>price of yellowtail</td>
<td>26</td>
<td>$4.96</td>
<td>$1.05</td>
<td>$3.25</td>
<td>$7.50</td>
</tr>
</tbody>
</table>

All price variables have a positive linear relationship, Table 4. The price of uni is highly correlated with the price of shrimp and least correlated with the price of eel, indicating that when the price of uni increases or decreases the price of the other nigiri sushi products will increase or decrease. However, since they are not perfectly correlated they will not change by the same proportion.
Table 4: Correlation Matrix of Nigiri Sushi Prices.

<table>
<thead>
<tr>
<th></th>
<th>puni</th>
<th>pshrimp</th>
<th>peel</th>
<th>psalmon</th>
<th>pyellowtail</th>
</tr>
</thead>
<tbody>
<tr>
<td>puni</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pshrimp</td>
<td>0.57</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>peel</td>
<td>0.39</td>
<td>0.87</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>psalmon</td>
<td>0.54</td>
<td>0.81</td>
<td>0.72</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>pyellowtail</td>
<td>0.51</td>
<td>0.87</td>
<td>0.77</td>
<td>0.85</td>
<td>1.00</td>
</tr>
</tbody>
</table>

A comparison of menu prices for 5 nigiri sushi products across 26 sushi restaurants is depicted in Graph 2. It is assumed that all restaurants are paying the same price for the fish products. The price differences illustrated by the graph represent differences in operating costs and profit margins.

Graph 2: A Comparison of Menu Prices for 5 Nigiri Sushi Products.

The mean difference between the price of uni and the other sushi products is approximately $3. The price of uni is higher than the other sushi products across all 26 restaurants, with one exception. The majority of restaurants charging $8 or more are located within walking distance of each other.
Conclusions

In this paper, the market for certified as sustainably harvested sea urchin has been investigated. The results show that a market does exist for certified sustainable uni and that restaurants are willing to pay 23% more for certified sustainable uni that is equal in quality to the uni being purchased today. Education is the key to increasing the size of this market. Those respondents that were willing to pay more for certified as sustainable uni were more knowledgeable about programs that certify fisheries as sustainable and their customers more frequently asked if the fish being served was sustainable. To expand the market for certified as sustainable uni the sea urchin industry must educated the sushi consumers about the importance of fishery sustainability. This could lead to an increase in demand at the restaurant level causing an increase in demand from all levels of the supply chain. To ensure that the results from this study accurately characterize the market for certified sustainable uni in San Diego another larger study needs to be completed. This study would include more sushi restaurants, a more in-depth survey instrument and information on the demand for uni. Another restriction of this study was the use of correlation matrices to illustrate the relationships between survey responses. Correlation matrices only show linear relationships. With a larger sample size additional statistical analysis could be completed to more accurately determine if other types of relationships are present.
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<http://www.fmepc.uconn.edu/research/other/Connecticut%20Final%20Ecolabel%20Report%202012%202004.pdf>

Rudie, Dave. In person interview. 10 March 2008.


<http://www.uri.edu/cels/enre/docs_CRoheim/ecolabel.pdf>
Appendix 1: Sample Survey

Thank you for meeting with me today and for completing this questionnaire. The information that you provide will be used to characterize the Uni market in San Diego. All responses will remain confidential. Please do not put your name or restaurant name on the survey. This information will be used for my final project, which is one of the requirements for my Master’s degree at UCSD Scripps Institution of Oceanography.

Certified as sustainable means that the fish is from a source that has been judged to be sustainably managed by the Marine Stewardship Council, meaning that fish harvests are maintained, high fish populations are guaranteed and long term environmental damage is avoided. Certified sustainable fish might be more costly than fish that are not certified as sustainable. Currently, a number of fisheries on the West Coast are not being managed in a sustainable way and this worries some consumers, fishery managers, fish processors, and fishermen.

1. In general would you say that California Sea Urchins are:
   __Severely over fished
   __Moderately over fished
   __Not at all over fished
   __Do not know/not sure

2. How knowledgeable are you about programs that certify fisheries as sustainable:
   __Very knowledgeable
   __Somewhat knowledgeable
   __Not knowledgeable

3. What additional cost would you be willing to incur to purchase certified sustainably harvested uni that is equal in quality to the uni that you are purchasing today? 0% = not willing to pay more, 100% = willing to pay 100% more.

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4. a) Does your distributor sell fish that is certified as sustainably harvested?
   __Yes
   __No
   __Not sure

   If yes
   b) How often do you purchase fish that is certified as sustainably harvested?
   __Always
   __Sometimes
   __Never
5. How often do your customers ask if the fish is certified as sustainably harvested?
   ___Always
   ___Sometimes
   ___Never

6. When you are purchasing uni which characteristics are the most important to you?
   Please rank uni characteristics in order of most important to least important, where
   1=most important and 4=least important.
   ___Price
   ___Quality
   ___Taste
   ___Certified Sustainable

7. When you are choosing between two equal products, do you take into consideration the
   impact that harvesting this product has on the environment?
   ___Never
   ___Sometimes
   ___Always

8. Are you a member of any environmental groups, either local or national? Some
   examples of such groups include World Wildlife Fund, The Sierra Club, or the Nature
   Conservancy?
   ___Yes
   ___No