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Have we achieved "Ocean to Plate?" *Determining the availability of San Diego- sourced seafood in the city's seafood restaurants*

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Have we achieved “Ocean to Plate?”
*Determining the availability of San
Diego- sourced seafood in the city’s
seafood restaurants*

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Declaration of Authorship

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Abstract

San Diego is an affluent city on the Pacific coast and home to a noteworthy number of seafood restaurants. Surprisingly less than 20% of the seafood consumed in the United States, including San Diego is domestic (Talley et al. 2016, NOAA FishWatch, 2018). The rise in seafood intake in the United States in combination with an increase in consumers dining out provides an opportunity for restaurants to make a difference in consumption patterns. The goal of this project was, therefore, to improve the understanding of the availability of San Diego-sourced seafood at the city's seafood restaurants in order to inform local food system planning, local seafood marketing, and consumer choices. Specifically, I set out to i) define and document the distributions of the different types of seafood restaurants ii) determine the availability of locally-sourced seafood at restaurants throughout the city and iii) test for potential geographic and demographic influences on observed distributions of restaurants and local seafood availability. Seafood availability within seafood restaurants was determined by contacting the seafood purchasers at restaurants to determine the frequency (consistent, occasional, never and unsure) at which these seafood restaurants sold seafood landed by fishermen landing their catch in San Diego. The restaurants and associated seafood information were mapped, and demographic and spatial data were collected and/or calculated by zip code. There were 145 restaurants in San Diego that met the criteria of a "seafood restaurant," with responses from 62 of these, a 43% response rate. Individually owned was the most common type of restaurant (57.2% of all seafood restaurants). Of the 62 restaurants that participated in the survey, 14.5% (n=9) consistently carried San Diego-landed seafood and 17.7% (n=11) carried it occasionally. More than half of the 62 restaurants never carried San Diego landed seafood. The density of seafood restaurants in San Diego decreased with distance from the coast and increased with median per capita income. While ethnicity was not significantly correlated with restaurant density both ethnic diversity and the proportion of communities identifying as Asian increased with distance from the coast suggesting that generally diverse and Asian inland communities may not have access to San Diego seafood in comparison to coastal communities. The type of restaurant that had the highest response rate was Cajun at 100% (5 of 5), while the lowest response rate was from Asian restaurants which included Chinese, Japanese and Sushi at 5.88% (1 of 17). American restaurants that served seafood were the most common cuisine type at 45.5% while the least common were French, Peruvian and sandwich restaurants selling seafood each at .69%. The geographic inconsistency in where local seafood is served may be due to a range of variables including a small commercial fishing fleet, a lack of coastal infrastructure to support a local seafood system, restaurant chains not purchasing from local sources, and lack of awareness about local seafood by chefs and restaurateurs. The information collected from this study can be lead to further research about the food system in San Diego and its importance, and may help producers and consumers alike to make informed decisions about their seafood purchases.

Introduction

Seafood consumption is on the rise and consumers are demanding more fish when eating out. The average American eats 7 kilograms of fish and shellfish in 2015, a 0.4 kilogram increase from the previous year (National Oceanic and Atmospheric Administration, 2016). Not only are Americans consuming more seafood, they want an expansion in availability when eating at seafood restaurants which also include sushi and sushi appetizers. This type of cuisine soared 43.3 percent on U.S. restaurant menus in the second quarter of 2015 compared to the same quarter in 2014, according to new data from foodservice research consulting firm Technomic (Blank, 2015).

As the demand for seafood in restaurants surges, so does the interest in local, sustainable seafood (Loesch and Michaelson, 2017). “The majority of American consumers believe seafood is important to their health and nutrition, but they also want to have peace of mind as to where it came from” (Loesch and Michaelson, 2017). Seafood restaurants can be the uniting factor between local, sustainable and fresh seafood. If restaurants take the leadership role in serving local seafood, consumers that are interested in the origin of their seafood will have a better understanding of where their seafood comes from. Restaurants may therefore potentially be the drivers of consumer interest in local seafood which may affect their attitudes toward seafood. “The city’s proximity to the Pacific Ocean should make locally caught seafood easily accessible, but less than 10% of the seafood consumed by San Diegans (and Americans at large) is domestic” (Talley, Warde and Venuti, 2016).

In this large 7,283km, diverse and populated city with over 1.3 million residents, San Diego is home to an array of restaurants. Until the turn of the 20th century, San Diego did not have many restaurants (Johnson, 2017). Now, there are restaurants ranging from individually owned, and regional and national chains for every tasty delight one can imagine. As tourists from all over the globe come to indulge themselves in the diverse cuisine offered in the city, many come to satisfy their taste buds with seafood by dining at waterfront restaurants. “Many Americans would like to see more seafood on restaurant menus, and they’d rather it be wild than farm-raised” (Thorn, 2016). Consumers may be inexperienced in the preparation of the seafood, so they choose to dine out at restaurants. “Restaurants provide the expertise in selection and preparation of seafood consumers are looking for” (McLynn, 2017). Restaurants are an essential part of the local food system in San Diego and can increase the demand of local seafood similarly as it has been done with other foods such as produce, beer and wine.

Despite having a long fishing heritage and being recognized as the Tuna Capital of the World at one point in time (Ellis, 2008, p. 217), the fishing industry in San Diego is relatively small with an estimated 130 commercial fishermen. There are efforts underway by the fishing community and seafood enthusiasts to revitalize the industry since local, domestic seafood is important to the economy and the heritage of the area, as well as being generally well managed and responsibly sourced. Fishermen have increasingly taken charge of their sales and promotion locally through direct sales and outreach, such as at fishermen’s markets and off the boat sales (MarketYourCatch, 2014) along with selling to some local seafood restaurants. Sales to restaurants can be effective at increasing access of local foods to the public however the effectiveness is not entirely certain at this time. It is crucial to understand the origin of seafood

acquired by restaurants because it allows the consumer to decide what seafood to eat, as well as assists in the development of local food systems that support local producers and consumers.

The goal of this project was, therefore, to improve our understanding of the availability of San Diego- sourced seafood at the city’s seafood restaurants in order to inform local food system planning, local seafood marketing, and consumer choices. For at least the past seven years, people have been consuming mainly tuna, salmon and shrimp (National Fisheries Institute, 2014). Although these species can be landed in California, they may not be from San Diego. Understanding which types of these three species are served in seafood restaurants in San Diego will be of assistance to the overall goal of this project.

Specifically, the objectives were to i) define and document the distributions of the different types of seafood restaurants ii) determine the availability of locally-sourced seafood at restaurants throughout the city and iii) test for potential geographic and demographic influences on observed distributions of restaurants and local seafood availability.

Methodology

Seafood restaurants

The first step of this project was to compile a list of all “seafood restaurants” within the city of San Diego. All zip codes that fell within city limits were included in the study; if a zip code spanned the city line, it was included for a total of 35 zip codes. “Seafood restaurant” can be found in this paper in **Table 1**. Sequentially, the following terms were used to search for the restaurants using Google and Yelp: seafood, fish, crab and shrimp.

Figure 1: *Image screen shot from Google search*



Data recorded from the online restaurant listing included restaurant name, address, zip code, phone number, web address, type of cuisine (e.g., American, Japanese, Italian), ownership of restaurant (e.g., national chain, local chain, individually owned), restaurant-market combination, price. The latitude and longitude were calculated by plotting the address in Google Earth.

Survey design

An eight-question survey was designed for use when calling over the phone or visiting restaurants in person to find out about the seafood they offered (**Appendix 1**). The survey began with an introductory statement explaining the purpose of this survey, why it was being conducted along with a clear statement that everything discussed will be confidential and anonymous. The first six questions were specific to seafood, in particular aimed at collecting information about the types of businesses that restaurants purchase seafood from, how often, the location where the seafood was landed, how often the restaurant serves San Diego landed seafood, the species the restaurants offer and finally if these species are purchased live, dead or both. The final two questions were to determine if these restaurants wanted a copy of the complete report and if they wanted to be involved in future seafood events with Scripps Institution of Oceanography. The

survey was piloted by a chef associated with the researcher and modified based on input received then.

Table 1: Definitions of terms used in this study of seafood restaurants in San Diego

Seafood restaurant	Any restaurant that self-identified as a seafood restaurant (e.g., had a related word in the name or tagline) or that was categorized as a seafood restaurant by Google or Yelp.
San Diego landed seafood	Seafood that was landed in San Diego County by commercial fishermen
Common	The frequency a species was identified and recorded being served at the restaurants.
Consistent	The restaurant stated that one more San Diego landed seafood species was available in the restaurant throughout an average year.
Occasional	The restaurant stated that one of more San Diego landed seafood species was available at some point during the average year.
Never	The restaurant stated that none of their seafood was landed in San Diego.
Unsure	The restaurant stated that one of more San Diego landed seafood species was available at some point during the average year.

Survey Implementation

This study was conducted from April 2, 2018 through May 3, 2018. The survey (Appendix 1) was administered to restaurants seafood purchasers by phone or in-person; the order of contact was haphazard. Before asking the survey questions, the participant confirmed it was a good time to take the survey. They were also reassured that their name along with the restaurant’s name were nowhere to be published. Each survey took between 5-20 minutes depending on how much information they were willing to give.

The interview data were then entered into an Excel database, including the date contacted, name of person interviewed, email address, contact phone number, distributor, website, survey complete, date of follow up, responses to all of the survey questions.

Coding the availability of local seafood for the mapping

Every seafood restaurant website was researched and the seafood purchaser was contacted directly through telephone or in person to determine the frequency at which the seafood restaurants sold seafood produced by San Diego fishermen and distributors (referred to as “San Diego seafood”). This information was used to assign a local seafood availability category to the seafood restaurant. The following categories were assigned to each of the restaurants, according to the answers received: consistent, occasional, never, unsure which can be found in **Table 1**.

Maps

Maps were then created using ArcMap 10.5.1. The name, address, zip code, latitude, longitude, type of market, price and ownership were imported into ArcMap. The restaurants were mapped according to the type of restaurant and frequency of San Diego seafood availability on ArcMap and then a basemap was added. This software and basemaps are the intellectual property of Esri and are used under license.

Zip code characteristics

Descriptive and demographic data was collected for each zip code from the websites city-data.com, factfinder.census.gov and incomebyzipcode.com. This data included zip code, restaurant per zip, percentage square km per zip, number of restaurants per km, zip code centroid distance to coast in km, H', total population, median per capita income and race population per zip code.

Statistical analysis

Density of seafood restaurants was calculated by dividing the total number of restaurants per zip code by the area of that zip code. Not all restaurants participated in the study verified the frequency that they sold San Diego-landed seafood, so the percent of restaurants selling San Diego seafood consistently and occasionally were calculated by dividing the number of restaurants selling San Diego seafood by the total number of participating restaurants in each zip code.

Relationships between the density of seafood restaurants and independent geographic and demographic variables were tested with forward, stepwise multiple regressions using JMP Statistical Software. Independent variables included shortest distance between the western edge of the zip code and the coast, mean per capita income, total population, H' diversity index, % of population from each of five major ethnic groups (Asian, Black, Hispanic, White). Variables included in the model met the criteria of $p \leq 0.05$ and $r^2 \geq 0.04$. All data were $\log(x+1)$ transformed or, if percent's, arcsin square root transformed to meet assumptions of normality and homogeneity of variance.

Findings and Discussion

Results

There were 145 restaurants in San Diego that fit the criteria of a "seafood restaurant;" 62 of which participated in the survey. Of the 145 restaurants, 57.2% were individually owned, 17.9% were national chains, 13.1% were local chains, 7.58% were regional chains and 4.1% were international chains (**Figure 2A**). The most common price range of the 145 restaurants was \$\$ at 62.8% while the least common was \$\$\$\$ at 0.68%. The \$ was recorded at 18.62% and the \$\$\$ was 17.9%. This data shows the most common seafood restaurants in San Diego being individually owned at \$\$ price range. American cuisine seafood restaurants were the highest at 45.5% while sandwich restaurants serving seafood, Peruvian cuisine serving seafood and French cuisine seafood restaurants were the lowest at .69% each. Japanese cuisine was 21.3%, Chinese cuisine was 3.44%, Cajun cuisine was 3.44%, Italian cuisine was 2.75%, Mexican cuisine was 15.86%, Poke cuisine at 4.13% and Steakhouses serving seafood at 1.38%.

Of those 62, 14.5% (n=9) consistently carried San Diego-landed seafood and 17.7% (n=11) carried it occasionally. More than half of the participating restaurants never serve San Diego-landed seafood at 53.2% (n=33) and 9.6% (n=6) were unsure (**Figure 2B**). In the legend, 1=consistent, 2=occasional, 3=never and 4=unsure.

Of the 12 restaurants that consistently carry San Diego-landed seafood, 14.5% (n=9) were individually owned, 3.2% were local chains and 1.6% were regional chain restaurants. Of the 33 restaurants that never carry San Diego-landed seafood, 17.7% (n=11) were individually owned, 4.8% (n=3) were local, 27.4% (n=17) were national chains and 3.2% (n=2) were regional chains.

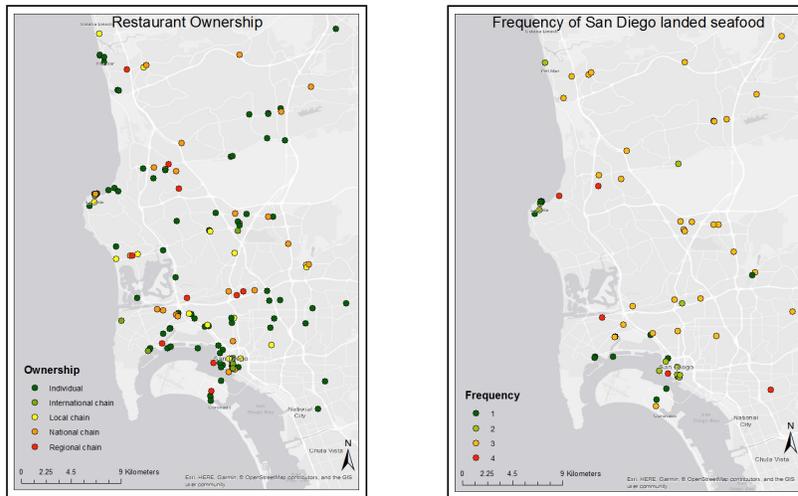


Figure 2: A. Distribution of seafood restaurants of different types of ownership in the City of San Diego county. N=145 restaurants. **B.** Frequency of seafood landed in San Diego in the participating 62 seafood restaurants based on consistent, occasional, never and unsure as the response options. Data are from April to May 2018.

From the 62 participating restaurants the five species, Big eye tuna, Atlantic salmon, squid, bay scallops and clams were the most common (**Figure 3**). Of these five, the ones that could potentially be locally landed are squid, big eye tuna and clams, depending upon the species. In 2016, 2015 and 2014 a total of 679,460 lbs. of big eye Tuna were landed in San Diego. In this three-year period only 76 lbs. of clams were landed in San Diego. The other three species, Atlantic salmon, bay scallops and squid were never landed directly in San Diego during these three years. In 2016 the total landing pounds were 15,360,220. In 2015 the total landing pounds were 29,809,322 and in 2014 the total landing pounds were 90,355,473 (California Department of Fish and Wildlife, 2014 and 2015).

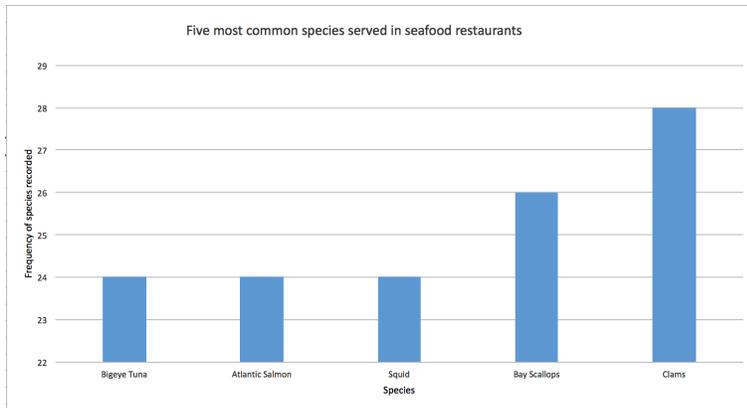


Figure 3: Most common seafood items sold in seafood restaurants in the city of San Diego county. N= 62 restaurants. Data are from the survey conducted over the phone or in person in San Diego County from April and May 2018.

Of the participating 62 restaurants, the results below determine the origin of the seafood served in San Diego seafood restaurants.

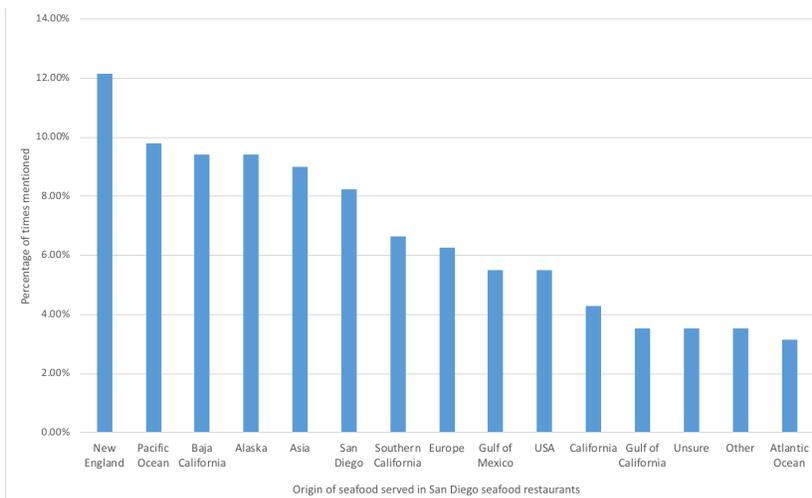


Figure 4: Origin of seafood by percentage

N=62. This was calculated by the total number of locations mentioned with the total number of responses being 255. This data was gathered by on the phone or in person surveys from April to May 2018 in San Diego County.

The seafood consumed when dining out at seafood restaurants in the city is mainly not from San Diego (**Figure 4**). New England was the most commonly mentioned source of seafood in San Diego restaurants (12.16%, **Figure 4**). It is unfortunate that San Diego does not come into the discussion until the sixth spot. This figure shows that there is still room to change the origin of where our seafood comes from to make San Diego the primary origin.

The density of seafood restaurants in San Diego decreased with distance from the coast and increased with per capita medium income (**Figure 5 A, B**). The proportion of restaurants that participated and stated that they consistently or occasionally carried San Diego-landed seafood also tended to decrease with distance from the coast, although not significant at $p \leq 0.05$ (**Table 2**). Most of the participating restaurants that carried San Diego-landed seafood at least occasionally (17 of 20) were located in a zip code that is adjacent to the coastline (0 km to the coast); and all

but one occurred within 2 km of the coast. Participating restaurants that did not carry San Diego seafood ranged from 0 to 18 km from the coast (Avg±1SE= 5.2±1.2 km).

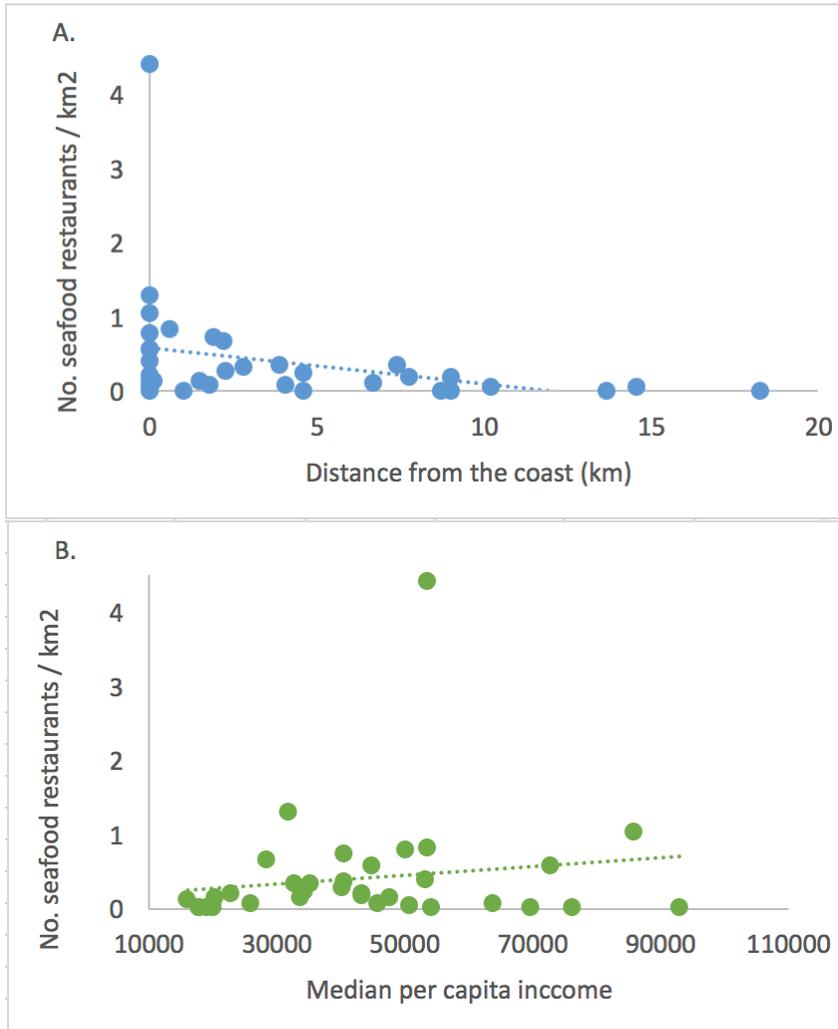


Figure 5: Relationship between density of seafood restaurants and (A), distance from the coast in km and (B) median per capita income. N=62 participating restaurants, data were collected during spring 2018.

Table 2: Relationships between the density of seafood restaurants in San Diego’s zip codes and both geographic and demographic independent variables. Data were compiled fall 2017-spring 2018. +/- indicates the direction of the relationship.

Response variable	R ²	P	F	n	df	Independent variable	+/-	r ²
Density of all seafood restaurants	0.29	0.004	6.7	35	2,32	Distance from coast	-	0.21
						Median income	+	0.09
% of seafood restaurants that consistently or occasionally carry San Diego seafood	0.14	0.088	3.2	21	1,19	Distance from coast	-	n.a.

Although the distribution of seafood restaurants was mostly correlated with proximity to the coast and not correlated with particular major ethnic groups nor with ethnic diversity, it is interesting to note that ethnic diversity ($R^2=0.34$, $p=0.0003$, $F_{1,33}=16.8$) and proportional abundance of people identifying as Asian ($R^2=0.23$, $p=0.004$, $F_{1,33}=9.7$) both increased with distance from the coast. This reveals that more diverse areas (zip codes) and those with larger Asian populations may not have as much access to seafood, in particular San Diego-landed seafood, in restaurants.

Limitations

While this project provides a useful snapshot of seafood availability in San Diego's seafood restaurants, results should not be over interpreted due to several limitations of the study. The relatively short length of the survey period (one month) limits the findings because seafood purchasers were contacted only two times, either by phone or in person, to complete the survey.

Another limitation was the lack participation of most restaurants (43%) in the survey, and in particular sushi restaurants. Of the 31 sushi restaurants recorded, only three participated in the survey, while two declined and the other 26 stated that they were unavailable to provide information.

Conclusion

Have we achieved "Ocean to Plate"? The answer is "only slightly". Over half of the restaurants surveyed never sell San Diego landed seafood, 9.6% were unsure of where their seafood comes from and only about a third carry San Diego landed seafood at least occasionally. The information provided by this study provides a glance at the current conditions of the availability of San Diego landed seafood in the city's seafood restaurants. The seafood restaurants who did carry locally landed seafood were also limited to 2km from the coast. There are a few factors that attribute to this limitation. San Diego is only home to only about 130 commercial fishermen, who as in many other areas in the country, are approaching or at retirement age. This suggests that there could soon be a gap in the fishing industry without enough qualified people to complete the job (Gilmore, 2011; Society for Human Resource Management, 2013; Leschin-Hoar, 2014). In addition to a small fleet size, the lack of waterfront infrastructure used for docking, offloading, maintaining boats and gear, holding and refrigerating catch, and direct marketing of catch along the San Diego coast (Halmap, 2013) may all contribute to the gap between ocean to plate (Talley, Warde and Venuti, 2016).

Furthermore, some chain restaurants have contracts with big, not-always-local distributors and don't always have the availability to purchase from local buyers. In 2014, \$20.2 billion worth of seafood (2.5 billion kg) was imported in the U.S. In that same year, the U.S. exported \$5.3 billion, almost the same value of seafood as it landed (\$5.5 billion for 4.3 billion kg) (National Marine Fisheries Service, 2014). This alone contributes to restaurants being a major supplier to imports from abroad. Lastly, chefs and restaurant patrons like reliability in a product when they dine out. Local products vary with season, year/weather conditions and tend to be unpredictable which leads to the seafood supplier purchasing from distributors instead of local.

What is needed is a better understanding of the importance of local food systems. Chefs and restaurant owners have the potential to encourage "catch of the week" specials to allow for

species caught in San Diego to gain attention and new diners. Consumers may be unsure if they would enjoy novel, local species because they may have had little to no exposure to these species. Restaurants have the upper hand as many diners turn to them for the preparation and cooking of their seafood dish. Chefs and restaurants have the ability to eliminate the disconnect between what is caught locally and served in seafood restaurants. Public awareness needs to be raised to educate chefs and restaurateurs of what is landed locally and the value of local. In regards to future work that can be done to diminish this gap would be a citizen scientist app where seafood consumers are able to record what they ordered at restaurants along with details such as where the seafood came from and if it was wild or farmed in real time. The results of this study, as well as the limitations and potential solutions reviewed above, disclose that there are many remaining research needs within the San Diego seafood system.

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Appendices

Appendix I (Survey asked during interviews)

Seafood Survey

Hello! My name is Melissa Soto and I am a graduate student at Scripps Institution of Oceanography at UCSD researching the sources of seafood San Diego. I'm conducting a survey to better understand where the seafood in San Diego's seafood restaurants comes from.

I found your restaurant through an internet search for seafood restaurants and I see that your restaurant is as passionate about seafood as I am. If this is a good time, I was hoping I could talk to whoever is in charge of your seafood purchasing? The survey is for academic purposes only, and all responses will remain anonymous. The survey will take about 15 min to complete.

If it's not a good time, do you mind if I ask who is in charge of seafood purchases (position and name of person) so that I may call back at a more convenient time? What time would be good to call back or stop in?

****Everything we talk will be completely confidential and anonymous unless you specify otherwise.****

**1. Can you tell me who, what types of businesses, the restaurant purchases seafood from?
Are you willing to provide specific business names?**

- Direct from fishermen outside of San Diego County
 - Direct from San Diego fishermen
 - Seafood distributors (Santa Monica Seafood, Catalina Offshore Products, etc)
 - Food service company (ex: Sysco, US Foods)
 - Aquafarms in San Diego County
 - Aquafarms outside of the County
 - Tuna Harbor Dockside Market
 - Other
 - Unsure
-

**2. Can you tell me how often the restaurant purchases from these businesses?
(Consistent/Occasional/Never/Unsure)**

Consistent: The restaurant confirmed that one or more San Diego landed seafood species was available in the restaurant throughout an average year.

Occasional: The restaurant said that one or more San Diego landed seafood was available occasionally during an average year, and/or said that the seafood was potentially San Diego landed.

Never: The restaurant confirmed that none of their seafood was landed in San Diego.

Unsure: The restaurant was uncertain about where the seafood was landed.

3. Do you know where the seafood was landed (where it came to shore on fishing boats or location of farms)?

Landed: Location on land where harvested species are brought in from the sea

- San Diego
- Southern California
- Central California
- Northern California
- Baja California
- Gulf of California
- California
- Alaska
- New England
- USA
- Pacific Ocean/ Oregon/Washington
- Mid Atlantic coast
- South East Atlantic
- Gulf of Mexico
- Asia
- Northern Europe
- Atlantic Ocean
- Unsure
- Other

4. Can you tell me how often the restaurant carries San Diego County-landed seafood?
(Consistent/Occasional/Never/Unsure)

5. Can you tell me what species the restaurant purchases? (will mark off with excel spread sheet of species)

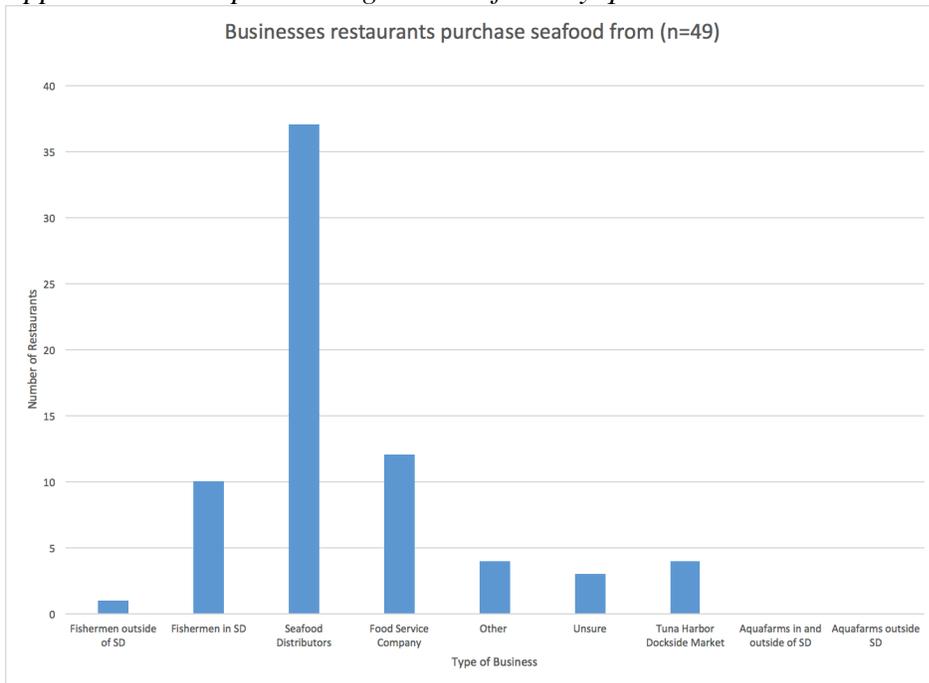
6. Does the restaurant purchase any species alive?

7. Would you like a copy of my report when I've finished the project?

8. Would you be interested in being involved with future sustainable seafood/San Diego seafood/ Ocean to Table events with Scripps Institution of Oceanography?

Thank you very much for taking the time to complete this. I will be completing this project by June 12.

Appendix 2 – Graph showing results of survey question #1



Appendix 3: Pie graph showing results of survey question #6

