Experiencing tentacle difficulties? SWOT it out!

A SWOT Analysis on the Giant Pacific Octopus Marine Conservation Tourism Programs at the Seattle Aquarium

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Abstract

Experiencing tentacle difficulties? SWOT it out! A SWOT Analysis on the Giant Pacific Octopus Marine Conservation Tourism programs at the Seattle Aquarium

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Marine conservation tourism, or MCT, is a series of activities tourists participate in that involve the study, protection and restoration of marine wildlife and their ecosystem. While there are two distinct models of conservation tourism, a Hybrid Model, created by combining commercial and non-commercial model, may be much more effective and viable. Currently, the Seattle Aquarium has two programs that represent the two MCT models. These programs are dedicated to the conservation of the Giant Pacific Octopus (GPO): The Octopus Survey Week in October and Octopus Week in February. This thesis used mixed methods research to determine whether it is possible to combine the two programs into one, thus garnering more interest and participation in the GPO conservation programs. The key method was the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis, a business strategy tool. The results show that the while a merger is preferred, there are logistical and temporal challenges. It is recommended that the Seattle Aquarium first invest in promoting the two programs and connect them in a more proactive manner.

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List of Acronyms

BLT- Broker-Local-Tourist

CT-Conservation Tourism

GIS- Geographic Information System

GPO- Giant Pacific Octopus

HANS- Human-Artifact-Natural System

MCT- Marine Conservation Tourism

MECE- Mutually Exclusive, Collectively Exhaustive

SWOT- Strengths, Weaknesses, Opportunities and Threats

TOWS- Threats, Opportunities, Weaknesses and Strengths

Introduction[1]

The field of marine and environmental affairs is vast and consists of several different interconnected disciplines such as science, law and policy. Its interdisciplinary feature is what makes the field so viable and not limited to the confines of the academic world. However, it still has the potential to evolve and, incorporate new disciplines, even though their connection to the field is not always apparent. To that extent, this thesis incorporates one such discipline: business strategy.

In the last several decades, there has been a significant decrease of the Earth's biodiversity, leading to severe ecological imbalances that are directly or indirectly impacting humans. Simultaneously, the environmental and conservation movements have increased in size and vigor in order to combat this threat to wildlife and our world as a whole.

While essentially used to preserve the natural world, conservation projects tend to lack in human and financial resources. This limitation affects the scope and efficiency of the project to protect wildlife and their ecosystems. Tourism can generate considerable amounts of revenue for these projects but can also have negative impacts on the local biodiversity of a region. This is especially evident in marine parks and landscapes across the globe.

Marine conservation tourism (MCT) programs are a means to "kill two birds with one stone" as it were. MCT is *a series of activities tourists participate in that involve the*

[1] Formal papers dealing with the pure sciences aim to convey information regarding their research and new findings in a precise and pertinent manner. They adhere to a strict format with little room for spontaneity. Papers in the social sciences, while having a similar structure and style, can be more unconstrained and verbose. This thesis deals with topics that cover the hard sciences as well as the social sciences. As such, it has been written in a way that pays homage to both styles while trying to do something a bit different from other submitted work. The intent behind selecting this form of writing was to make the thesis not only appeal to the academic community but also the non-academic community i.e. the public community at large.

study, protection and restoration of marine wildlife and their ecosystem. Such programs can acquire the resources necessary to effectively continue conservation projects and provide considerable amounts of benefits for the local economy and community.

There are two different models used to design MCT programs. One is a non-commercial model and the other a commercial model. Each model is used to target a specific group of individuals and tackle marine conservation in different ways. This thesis aims to see if it is possible to make a hybrid model and thus, reach a greater demographic and make a greater impact in the conservation movement.

To achieve this, two Giant Pacific Octopus (GPO) MCT programs of the Seattle Aquarium (Aquarium) are analyzed using a business strategy tool. The first is the Octopus Survey Week program, which is based on the non-commercial model of MCT. Participants of this program are asked to dive and locate GPOs in the Puget Sound and provide that data back to the Aquarium. The next program is the Octopus Week program, based on the commercial model of MCT. This program is a week-long visitor engagement event focused on educating Aquarium visitors on the GPO and other cephalopods. Combining these two programs into one hybrid program could not only provide the Aquarium with more opportunities to generate awareness on the GPO, but also promote the Aquarium and garner more visitors.

Plan of this Thesis

This thesis uses a SWOT analysis (a business strategy tool) to examine the possibility of combining the two GPO MCT programs at the Seattle Aquarium. Chapter 1 defines MCT and explains the thesis goals in detail. Chapter 2 and Chapter 3 are dedicated to the GPO and their relationship with humans. Chapter 4 introduces the SWOT analysis, which was used to study the two programs at the Aquarium. Chapter 5 describes the study area and research methods. Chapter 6 reports the results while Chapter 7 explains the results in detail. The final chapter concludes the thesis with possible future steps and closing remarks.

Chapter 1: Marine Conservation Tourism

"As a conservationist, I can honestly say my thoughts run wild!" ~Manjari Misra

Introduction

In everyday life, when one is interested in an explanation of any terminology or phrase, they often consult Google. This chapter shall attempt to go beyond such a cursory approach by looking into the different variations in definitions and evolution of the core concepts of the thesis. These concepts include wildlife conservation, tourism as an industry and practice and, the union of these two, creating the field of Conservation tourism (CT) and by extension, marine conservation tourism (MCT). Finally, this chapter will introduce the aims of the thesis and the questions that it addressed.

1.1 What is Conservation?

The Merriam-Webster Dictionary simply defines the term conservation as "a careful preservation and protection of something." A common theme across the various types of conservation, including soil conservation and wildlife conservation, is that of a goal to ensure that the object or body of interest is not only protected from extermination, but also sustained with care in its purest form (Ervin and Ervin, 1982; Jokilehto, 2007; Fryxell et al. 2014). At some point in the last few decades, when a variety of Earth's natural resources came under threat of extinction, the term conservation became synonymous with their preservation and management.

As this thesis explores wildlife conservation, specifically octopus conservation, the term conservation, here, explicitly refers to protecting and sustaining the Earth's biodiversity. When one delves deeper into the field, the goals and approaches of conservation are more fractured than they first appear. Formal terms and definitions for this form of conservation vary and are often the subject of rather verbose and "at times ill-tempered" disputes (Sandbrook, 2015, p. 565). The subjects of the disagreements range from exactly what is to be conserved and how, why and where it is to be conserved.

Individuals such as Sarkar (1999, p. 410), a Professor of Philosophy and Integrative Biology, University of Texas, insist that conservation of biodiversity is separate from that of the preservation of wilderness. He stated that:

> "Wilderness preservation cannot be used as a surrogate for biodiversity conservation."

Sarakar (1999, p. 405) and his contemporaries believe the wilderness is a natural space that humans do not reside in, simply visit. He defines biodiversity conservation as:

> "The preservation of diversity at all levels of biological organization, from alleles, to populations, to species, to communities, to ecosystems."

Occasionally, the goals and practices of wilderness preservation and biodiversity conservation align. However, due to external variables, like socio-economic factors, biodiversity conservation gets preference due to its feasibility of the protection of wild spaces.

On the other end of the spectrum, there is Leader-Williams et al. (2011, p. 12) who defines conservation as:

> "Actions that directly enhance the chances of habitats and species persisting in the wild."

Their definition highlights their belief that the habitat, or the wilderness, are integral to the core practice of conservation. Proponents of this definition insist that to protect a species, one must also protect their natural habitat. This practice would ensure the species' health and survival in the wild. These individuals thus stress that wilderness preservation and biodiversity conservation go hand in hand regardless of the situation.

The initial principles that led to the conception of conservation were that the natural world, or the wilderness, has an intrinsic value as it is a place of "beauty, quiet contemplation and spiritual renewal" (Olver et al. 1995, p. 1585). The view was that biodiversity in all its forms should be preserved for no other reason than to be

aesthetically pleasing. Soulé (1985, p. 727)[2], Research Professor in Environmental Studies, University of California-Santa Cruz, advocates and practices conservation for the organism's biological value, stating that by utilizing the:

> "biology of species, communities and ecosystems that are perturbed either directly or indirectly by human activities or other agents" one can develop the "principles and tools for preserving biological diversity."

His approach and ideology focus on the biological aspect of the field and is known to condemn approaches that would compromise it. The practicality and enforcement of conservation requires a more robust reasoning sprinkled with incentives.

1.2 What is Tourism?

Upon a basic internet search, common definitions can be found in dictionaries like Webster's New University Dictionary that state that tourism as "traveling for pleasure" and "the business of providing tours and services for tourists." Such a definition, however, fails to accurately encapsulate the complexities of the field. Instead, the following definitions have been coined or utilized by individuals based on their field of expertise.

Smith (1988, p. 88), a professor at the School of Hospitality, Food, and Tourism Management at the University of Guelph in Canada, proposed that:

> "Tourism is the aggregate of all businesses that directly provide goods and services to facilitate business, pleasure, and leisure activities away from the home environment."

This definition fits the perspective of an individual looking at tourism as an industry or business venture; emphasis has been placed on the supply-demand side aspect of the

[2] Michael E Soulé is a founding father of the discipline known as Conservation Biology and was a cofounder of the Society for Conservation Biology

concept. While at the Department of Management, Marketing & Entrepreneurship at the University of Canterbury, Truong and Hall (2013, p. 111) posit that:

> “Tourism is the short-term (usually less than 12 months) voluntary movement of people away from their home environment. Although often identified with leisure travel, tourism includes a wide range of short-term travel behavior for reasons including business, visiting friends and relations, religion, health, and education.”

Though they had a similar academic background as Smith (1988), Truong and Hall’s (2013) understanding of tourism encompassed more aspects to suit their research in social marketing. These quotes highlight how academics interpret the same term based on their field of study.

There are also organizations that oversee tourism across the globe and have their own description of the term. In Canada, British Columbia has its own tourism organization by the name of ‘go2HR’. Their website (go2HR. n.d.) recognized tourism as a social activity with a time limit positioning it as:

> “the activities of people traveling to and staying in places outside their usual environment for leisure, business or other purposes for not more than one consecutive year.”

The most notable one is the UNWTO (United Nations World Tourism Organization) (unwto.org. n.d.) who state that:

> "Tourism comprises the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes."

The UNWTO’s definition is a simpler and overarching definition but the time constraint mentioned limits them from looking at all forms of tourism.

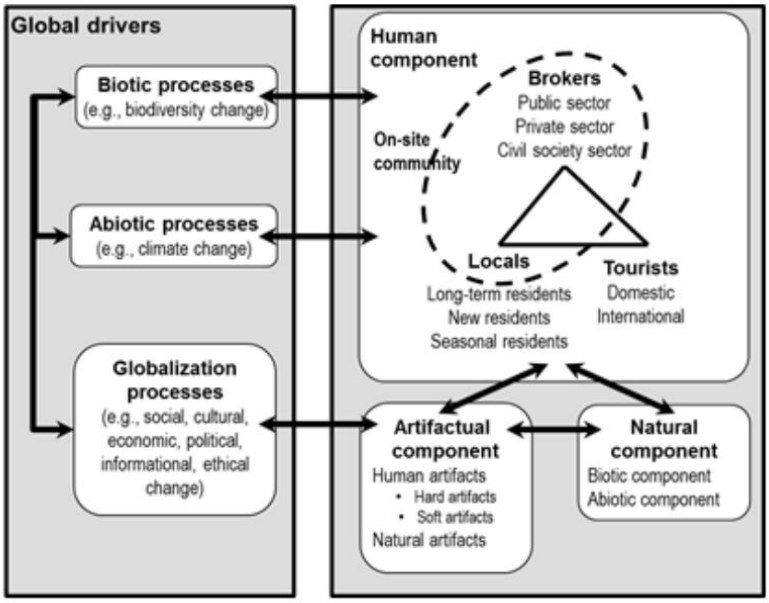

Figure 1.1: The Human-Artifactual-Natural System (HANS) and Broker-Local-Tourist (BLT) conceptual framework. See footnote 3 and 4 for more details about the framework. Image taken from Miller et al. (2014).

Meanwhile, an anthropologist at the School of Marine and Environmental Affairs, University of Washington, Miller (1993, p. 182) states that tourism is "operationally ambiguous," " omnipresent" and, "morally problematic" due to the various other activities and concepts it relates to along with its multicultural aspect. To simplify such a confounding topic, scholars have attempted to explain tourism through various models like the human-artifactual-natural system (HANS)[3] model (Walsh and Mena, 2012) and the Broker-Local-Tourist (BLT)[4] model (Miller, 2008) (See Figure 1.1).

For this thesis, tourism is defined as *a series of interconnected activities and experiences conducted by the tourist in a location away from the tourist's home that may or may not be facilitated by another party.* One can be a tourist by merely going to

[3] This model categorizes the various aspects of human interaction with the world. It separates humans from the artifacts (natural or artificial) as well as the natural world. Artifacts can be anything from infrastructures, technologies, tools, and devices humans and non-human organisms use to influence society and the environment to effect change in the world (Walsh and Mena, 2012).
[4] This model states that the tourism landscape can be divided among three players. The brokers are a group that engage tourists and manage the tourism activities. Locals are those that live in the area that tourists visit. They may or may not be brokers as well. Then of course are the tourist who are people who travel to a place to participate in a series of activities before returning home (Miller, 2008).

an area in the city they reside in so long as that area is not one's home. The purposes for being a tourist can be personal (e.g., taking time off from work/school, visiting friends and/or family, religious endeavors and more) or they can be due to work obligations (e.g., job-specific travel for conferences/conventions to engage with clients, conducting field research of either a business or scientific nature amongst others).

1.3 What is Conservation Tourism?

In the previous sections, the definitions of conservation and tourism are explained in detail to provide background for this section on CT, as this is still a relatively new field. Thus, conservation and tourism have been treated as two separate practices that could take place in the same area (Buckley and Pabla, 2012) or as interrelated acts where one influences or affects the other (Budowski, 1976; Steven et al. 2013). Several individuals consider tourism to be detrimental to the conservation movement as tourism practices can have a negative impact on animal behavior (Constantine et al. 2003; Marchand et al. 2014), habitat health and overall environmental degradation (Green and Giese, 2004; Archer et al. 2005). However, in the last couple decades, studies have shown that tourism practices have assisted the conservation efforts of various species (Salt, 2000; Pennisi, 2004; Buckley, 2010; Steven et al. 2013).

Tourism practices with conservation benefits used to be generalized as part of catch-all term, 'ecotourism'. Ecotourism has had several definitions since its first mention by Handley et al. (1950). Thereafter, there was a subsequent rise in its popularity in the 1970s and 1980s (Honey, 1999). Ceballos-Lascuráin (1987, p. 14), a leading expert in the field of sustainable tourism states that ecotourism is an:

> "environmentally responsible, enlightening travel and visitation to relatively undisturbed natural areas in order to enjoy and appreciate nature (and any accompanying cultural features both past and present) that promotes conservation, has low visitor impact and provides for beneficially active socio-economic involvement of local populations."

Some like Orams (2001, p. 27), a Professor of Marine Recreation and Tourism at the Auckland University of Technology, also believe ecotourism is a “subset of nature-based tourism”. Thus, most studies that dealt with conservation and tourism as one entity would limit themselves to terminologies like wildlife-based tourism (Tisdell, 2001), wildlife tours (Zeppel, 2008), and of course ecotourism (Gössling, 1999; Ross and Wall, 1999; Tisdell, and Wilson, 2002). It was not until the mid-2000s that CT made its first appearance. Simply put, this field utilizes tourism as a tool to actively assist and promote conservation. Consequently, it becomes evident that tourism and conservation are inextricably linked.

There are two models with which one can use the assistance of tourists to help the conservation movement. One is a non-commercial model that asks for active tourist participation in research and preservation programs (Cousins, 2007) and the other is a commercial model which focusses on receiving funds (Buckley, 2010).

1.3.1 Non-commercial and Commercial Definitions and Models

As mentioned in the previous section, there is a non-commercial model of CT. Cousins (2007, p. 1021), the Regional Manager for Africa at World Wildlife Fund of the United Kingdom (WWF-UK), considers CT a:

> “specialty sub-sector of the larger ecotourism market, which uses the ‘hard’ ecotourist with the volunteer tourist, in which paying members of the general public travel for actively participating in organized conservation work.”

In this instance, the “hard ecotourist” is one that plans their travels in small groups on rather esoteric trips (Weaver, 2001). According to Cousins (2007), conservation tourism, or conservation holidays, involves individuals who volunteer to directly interact in and aid the conservation effort in an organized manner. The activities the tourists take part in include assisting scientific research (Bright et al.1996; Johnson, 2001; Walsh et al. 2001; Newman et al. 2003), working on reserves and wildlife parks and assisting in wildlife rehabilitation (Mumby et al. 1995; Kidd et al. 1996; Broad, 2003; Newman et al.

2003; Cousins, 2007). These activities also have an impact on the tourist's values, habits and lifestyle as they gain knowledge, skills and overall awareness. They learn about the organisms they work with but also the country and local they work in (McGehee and Norman, 2001; Wearing, 2003; Broad and Spencer, 2008).

Utilizing these tourists has been observed to be inexpensive and allow researchers the benefits of having a bigger workforce that is able to assist in conducting viable conservation projects (Macdonald et al. 1998; Toms et al. 1999; Macdonald and Tattersall, 2002; Foster-Smith and Evans, 2002; Newman et al. 2003). However, the value that the tourists provide are is to their scientific experience and skills. Complex scientific methodologies used in conservation research cannot be conducted by individuals who are unsuitably trained. This issue is further compounded when the techniques required have a molecular/wet lab component, for example, DNA extraction and PCR amplification. Moreover, tourists may not have the same rigor in data collection and animal care as the professionals, rendering such programs uneconomical at times. Thus, it is important to determine the skills and overall value tourists can provide to conservation projects before including them (Newman et al. 2003). One should also provide these tourists with sufficient training before assigning them their duties in the field (Macdonald et al. 1998; Newman et al. 2003).

The United Kingdom is known to have a high degree of CT agencies, or, as they refer to them, 'conservation holiday' organizers and operators. These are usually non-government organizations (NGOs) that either conduct conservation projects themselves (Greenforce) or, partner with the local organizations, NGOs and government departments and provide them the tourists to help with the projects (British Trust for Conservation Volunteers or BTCV).

On the other side of the spectrum, Buckley (2010, p. 2), the Director of the International Centre for Ecotourism Research at the Griffith University in Australia emphasizes the commercial model of conservation tourism, stating that:

> “commercial tourism which makes an ecologically significant net positive contribution to the effective conservation of biological diversity.”

Buckley (2010) states that the tourist can significantly contribute to the conservation effort through financial assistance and political lobbying. Such models include paying mandatory fees to conservation institutions. Such fees help the institutions by supporting the staff and paying for equipment. However, many times these fees only fund infrastructure that is meant for visitors and not the conservation effort (Buckley, 2003; Buckley 2010). Tourists can also help convert public land into land for conservation purposes by supporting tour operators, NGOs and other parties that politically lobby for such conversions (Buckley and Mossaz, 2018).

Another model of conservation tourism is for tourists to financially support the conversion of private or community land (Buckley, 2010). One major concern here is the privatization of conservation, where it is up to the landowner as to what type of conservancy they wish to run. There are several cases, especially in South Africa, where private reserves claim to assist in the conservation movement by offering hunting packages to tourists (Castley et al. 2001; Loveridge et al. 2007). Such practices have shown to be unsustainable, decrease population abundance (Packer et al. 2011; Loveridge et al. 2016) and seen to be unethical in nature (Batavia et al. 2019).

Tour operators directly contribute to the conservation effort by assisting NGOs with transport, infrastructure, and accommodations. They can also help with organizing the tourist groups for NGOs and providing donations, too (Buckley, 2006; Buckley 2010). Tourists can also financially support private and community conservancies. These conservancies boost the socio-economic status of the region by employing locals. As such, the local community gets invested in the conservation effort and assists in habitat restoration activities and anti-poaching patrols (Spenceley, 2008; Buckley

2010)[5]. However, such CT models are not viable in every locality, let alone countries with poor infrastructure and unstable political climates (Buckley, 2010).

Unlike Cousins (2007), who explains that the tourist goes merely to participate in conservation-related activities; Buckley (2010) insists that one does not participate in CT unless a significant result comes out of the practice. One would argue that including the term "commercial tourism" (Buckley, 2010, p. 2) is not warranted because CT projects do not necessarily have to contain any commercial activities. However, CT persists and is a fairly recent concept. As a result, there are not many studies, pertaining to this, in the original literature. Consequently, this provides scope for the exploration of key definitions and principles.

Therefore, this thesis will consider conservation tourism as *a series of activities tourists participate in that involve the protection and preservation of wildlife and ecosystems.* These activities would range from donations to wildlife institutions like national parks, to active field work like camera trapping.

1.3.2 Marine Conservation Tourism

Marine conservation tourism (MCT), deals with conservation tourism in relation to ocean and coastal ecosystems. It is different from Miller's (2008, p. 234) definition for marine wildlife tourism which states that:

> "Wildlife tourism is that component of nature tourism in which non-human life is visited, witnessed, appreciated and revered- and in some instances, more formally studied and restored- with minimal violence to the integrity of the ecological system. Marine wildlife tourism, then, is wildlife tourism where the wildlife at issue has natural connections to the ocean and coastal ecologies."

Marine wildlife tourism deals with all aspects of visitation and can be conducted for leisure with minimal direction. Marine conservation tourism is *a series of activities*

[5] For more information and examples of these commercial tourism models, read Buckley's (2010) *Conservation Tourism.*

tourists participate in that involve the study, protection and restoration of marine wildlife and their ecosystem.

For example, between 1997 and 2000, the Juvenile Lobster Monitoring Program utilized the assistance of volunteers to collect abundance and distribution data of juvenile American lobsters in Penobscot Bay, Casco Bay, Southern Maine, New Hampshire, and Massachusetts (Ellis and Cowan, 2001). These volunteers were trained and equipped with additional reference materials like handbooks to conduct quadrat sampling in the intertidal sites. This use of volunteers was shown to be cost-effective over the long-term and helped the researchers study the juvenile lobsters across a significantly larger geographic area, encompassing more than one site. This information can help improve predictive lobster fisheries models and be used as a model for other related studies. It also contributed to generating awareness on environmental conservation amongst the volunteers who participated in the research (Ellis and Cowan, 2001).

Protected areas are prime locations for CT (Crosby et al., 2000). They assist in the conservation of not only a flagship species but also its entire ecosystem. The first marine protected areas (MPA) were declared in the early part of the 20th century. By 1985, there were about 430 MPAs across the world, covering small pockets of coastal areas (Silva et al.1986). Within ten years, the number of MPAs increased to a staggering 1306 (Kelleher et al. 1995). According to IUCN (IUCN. n.d.) MPAs account for about 6.35% of the world's oceans.

The Tiahura Marine Protected Area in French Polynesia is a 2.5 km^2 MPA, situated on the North-West of the Moorea Island (Galzin 1979). Established in 2004, its primary goal is to protect the local stingray population. One of the major activities that takes place in this MPA is stingray feeding. Around 60,000 tourists visit for this main attraction as well as for the nearby privately-run Dolphin Center which allows tourists to interact with the dolphins. The proceeds of the stingray feeding project and dolphin interaction project go to the local turtle rescue and rehabilitation center. Since its

inception, there has been a significant increase in marine biomass in the locality (de Loma et al. 2008). As such, this MPA has made progress in its endeavors in MCT.

Aquariums are another institution where MCT takes place. Aquariums, along with other zoological parks, are currently used as a means to educate the public on topics relating to conservation (Patrick et al. 2007). They help change the perspectives of tourists in relation to the environment, by providing them with a unique experience of charismatic animals as well as relevant and interesting information about them (Falk et al. 2007). This can be seen in a study at the Baltimore Aquarium where tourists were observed to improve their knowledge about the exhibits and showcase a heightened interest in conservation. However, this interest decreased in a few weeks and so, such experiences could not motivate individuals into supporting enforceable legislation on conservation. The study concludes that the aquarium experience had significantly less impact on the global conservation movement (Adelman et al. 2000). As such, an aquarium's (or any park's) potential is yet to be met as it is not just a place of education. Aquariums can significantly contribute to in-situ conservation through the research that can be conducted on the captive species. Using the funds collected from the tourists at the aquarium, research on behavior, breeding, ecology and climate change adaptability can be furthered (Gusset, 2010).

1.4 Thesis Aim and Questions

This thesis aims to determine whether a hybrid model of commercial and non-commercial MCT models is viable by analyzing two representative programs on the Giant Pacific Octopus (GPO) at the Seattle Aquarium (Aquarium). By using the BLT model (Miller, 2008), the Aquarium would be listed as a civil society broker (other brokers will be identified in Chapter 4). Those that interact with the Aquarium are either tourists or the local people that live in the Seattle area.

Started in 2002, the Octopus Survey Week is the Aquarium's citizen science program dedicated to collecting and monitoring the Puget Sound's GPO population data. It is the Aquarium's non-commercial, research-oriented program as described by Cousins (2007). In the first week of October, scuba divers, associated and not

associated with the Aquarium, are encouraged to dive into the Sound to find GPOs and other cephalopods. They are asked to record factors such as depth, time, surface temperature and size of cephalopod for the study and send this information to the Aquarium via their website (Seattleaquarium.org. n.d.).

Octopus Week is the commercial program where visitors help the Aquarium in its conservation goals through the fees collected from guests (Buckley, 2010). The program started back in 2000 as a visitor engagement activity. It was strategically held in the midst of the winter break period for most schools in the region, as to attract visitors during one of the least busy times of the year. It was first introduced as part of a Valentine's Day event where the Aquarium would encourage the male and female GPOs in their exhibit to meet and "Make a Date". This evolved into a week-long event to celebrate and educate visitors on the GPO and other cephalopods. While the "Make a Date" event no longer takes place, visitors are still enthralled by Octopus Enrichment talks, Cephalopod Dissections, Swimming with the Octopus, Octopus Release and other interesting activities (Seattleaquarium.org. n.d.)

As MCT is still a relatively new concept, it has the potential to evolve. Business strategy tools can assist in this evolution by providing focus and direction as well as a better understanding of the current models (Van Wijk et al. 2015). One such tool is the SWOT analysis, which has been used to analyze the current status and improve conservation and tourism strategies and models. This tool examines an organizations Strengths and Weaknesses while identifying its external Opportunities and Threats in order to make viable and actionable decisions to improve internal status and market standing (See Chapter 4).

In the context of this thesis, a SWOT analysis entails determining the status of the two GPO MCT programs as well as the potential to evolve them. In other words, the thesis tackles the following questions:

1. What is the current status of Octopus Survey Week (OS)? Can it be improved? (SWOT Analysis 1)

2. What is the current status of Octopus Week (OW)? Can it be improved? (SWOT Analysis 2)
3. Can we combine Octopus Survey Week and Octopus Week into one program? If not, what compromises can be achieved? (SWOT Analysis 3)

Summary

This chapter began by addressing what the terms conservation and tourism meant. These concepts were then used to introduce and explain MCT. MCT is a form of tourism where tourists contribute to the protection and preservation of marine biodiversity on Earth. It is still a relatively new concept, and currently has two major models: a non-commercial and commercial model.

The non-commercial model involves volunteer tourists assisting in research and animal rehabilitation. The commercial model has tourists providing monetary assistance directly or indirectly to conservancies. The goal of this thesis is to determine if a hybrid of these two models can be all-encompassing and viable. To do so, the thesis will study the potential for the Seattle Aquarium to combine their two Octopus MCT programs using a SWOT analysis.

Chapter 2: Giant Pacific Octopus

"What did the octopus tell the scientist that was studying it?
Thank you for this wonderful Octo-tunity!" *~Manjari Misra*

Introduction

Octopuses[6] are one of the most unique and bizarre creatures to have ever evolved on Earth. This chapter shall explore the physical characteristics, behavior and conservation status of the octopuses in the Incirrina sub-order. This thesis specifically focusses on the *Enteroctopus dofleini or* Giant Pacific Octopus (Norman and Hochberg, 2005), henceforth referred to as the GPO.

2.1 Taxonomy

Octopuses are members of the order Octopoda, part of the class Cephalopoda under Phylum Mollusca (Wells, 1978; Mather et al. 2010; Courage, 2013; Montgomery, 2015). According to the fossil record, the earliest known ancestor of the octopus, called Pohlsepia, had evolved by the Carboniferous period around 296 million years ago (Courage, 2013).

Octopuses are soft-bodied creatures that are bilaterally symmetric, have two eyes, eight tentacles with two rows of suckers and a beak in the middle of their eight arms. There are two major suborders of octopuses: the Cirrina and Incirrina. Cirrina octopuses are named for the pair of small cilia found along each sucker of their arms. They also have two little fins on their mantle and a small internal shell (Mather et al. 2010; Courage, 2013). Incirrina octopuses do not have cilia on their arms nor do they have an internal shell or fins on their mantle (Courage, 2013).

[6] The word octopus comes from the Ancient Greek term Okto'pous or eight-foot, after their signature eight appendages or arms. Thus, the plural of octopus is octopuses and not the Latin form, octopi (Courage, 2013).

2.2 Physiology

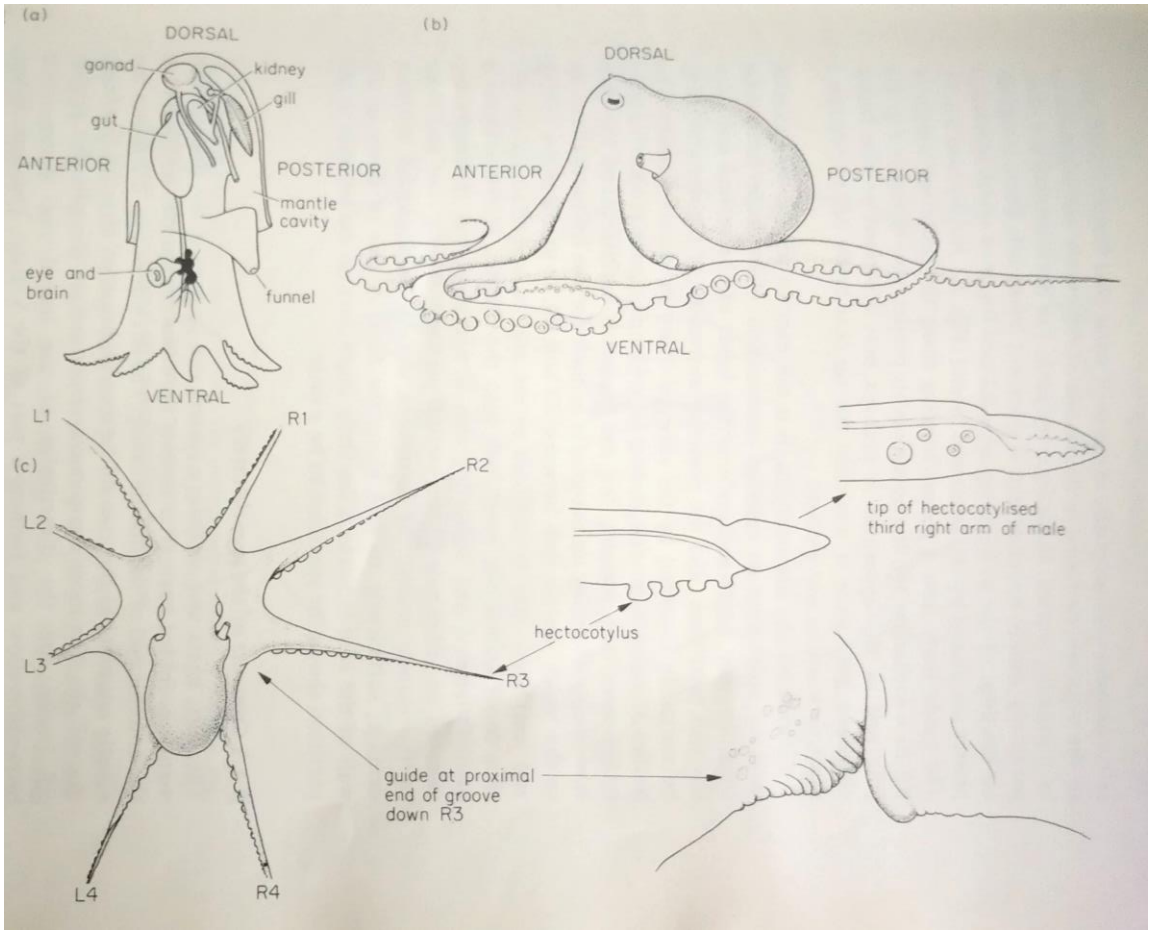

Figure 2.1: Diagrams of octopuses (a) Classic orientation of a cephalopod (b) typical orientation of an ocotpus (c) dorsal view of octopus showing the arm numbering and specialized sex organ of male octopuses. Image taken from Wells (1978).

As stated, octopuses are bilaterally symmetrical along their dorso-ventral axis. Unlike most molluscs, they do not possess a shell (See Figure 2.1). Thus the “body” or mantle, is fused to the back of the octopus's head as a visceral hump. This bulbous mass houses most of the octopus’ vital organs or as Mather et al. (2010, p. 13) states, “the muscular mantle is wrapped around the animals’ insides.”

The gills are present in the mantle cavity which receives oxygen-rich ocean water through an aperture. The water comes into the mantle via the radial muscles in the mantle wall. The mantles wall contracts, allowing the water to circulate in the cavity, absorbing oxygen before the circular muscles direct the water out through a tube-like funnel called a siphon (Mather et al. 2010; Courage, 2013). This contraction and

expulsion of water also allows the octopus to propel itself through the ocean as well as remove sand and small rocks from its den (Wells, 1978; Schmidt-Nielsen, 1997; Courage, 2013).

Octopuses are poikilothermic i.e.. their internal body temperature fluctuates to conform with their external environment. They have a closed circulatory system with three hearts. One heart is systemic, circulating viscous haemocyanin or copper-rich blood around the body. This heart tends to remain inactive while the octopus swims, making it spend more energy at a rapid rate. Hence, octopuses prefer to crawl on the ocean floor, only swimming to escape predators. The other two hearts are branchial and pump the blood through each of the two gills. Unlike most invertebrates, octopuses have arteries, capillaries and veins that are lined with a cellular endothelium. Haemocyanin dissolves in the plasma of the octopus, giving its blood a blue tint. The haemocyanin blood is more efficient in transporting oxygen than haemoglobin in cold conditions. This allows octopuses, like the GPO, to live at depths of almost 2000 m in the cold Pacific North-West Waters (Wells, 1978; Wells and Smith, 1987; Courage, 2013).

Figure 2.2: Eye of the GPO which is situated on top of its head. It has horizontal pupils. Image taken from Flory, (2007).

Octopus's head tends to be rather high so that they may see through their two eyes. This position of the eyes gives the octopus a “panoramic perspective” (Courage, 2013, p. 180). This visual acuity helps it capture prey as well as escape from predators (Courage, 2013). The eyes have a structure similar to that of fish (Courage; 2013). Both their eyes have photoreceptors, almost circular lenses and a clear gel that fills the space between the retina and lens in the eye called the vitreous body. However, unlike in fish, the octopus’s photoreceptors are directly behind the lens and no additional interfering tissues. Due to this physiology, octopus do not have any blind spots in the eye. They have horizontal pupils that become round when dilated. During the day, the pupils constrict to slits, limiting the amount of light from entering the eye (Schwab, 2003). All visual information passes through the optic nerve to the octopuses rather large optic lobe in the main brain that is situated between the eyes inside the head in a cartilaginous capsule (Wells, 1978; Courage, 2013).

The GPO is one of the largest octopus species in the world. They can weigh from around 35 lb to more than 100 lb with arm spans of 14ft to more than 20ft respectively (High, 1976). The head and mantle of the octopus are surrounded by its eight arms. These appendages have “flexible skin webs between them” (Mather et al. 2010, pp 13) and are even named. If the octopus is positioned with its eyes forward (anterior) and mantle behind (posterior), the four arms to the right are counted as R1, R2, R3 and R4 while those on the left are L1, L2, L3 and L4 (Figure 2.1). Figure 2.1 highlights the sexual dimorphism in octopuses by displaying the R3 arm in males. Known as the hectocotylus, it is shorter than the L3 and is the specialized organ used to transfer spermatophores into females (Wells, 1978).

Two arms right in the rear are usually used to ‘walk’ on the seabed while the remaining six are used to do everything from catching prey to opening bottles. As they have no skeletal structure, they are able to squeeze through the smallest of gaps and spaces. They are limited only by the size of their beak, the only hard structure they possess. Even the GPO, weighing over 100 lbs and with an arm span of 20 feet, can fit through a hole as small as 7 cm in diameter, so long as its beak can fit through it (Courage, 2013). Octopuses are supported and move via muscular hydrostats (Wells,

1978; Courage; 2013). Muscular hydrostats is a muscular organization where obliquely-striated muscle cells are packed tightly and arranged in transverse, oblique and longitudinal groups. When the muscles contract, their volume remains constant, rendering the arm to decrease in length while it increases in diameter and vice versa. (Wells, 1978; Cianchetti et al. 2011).

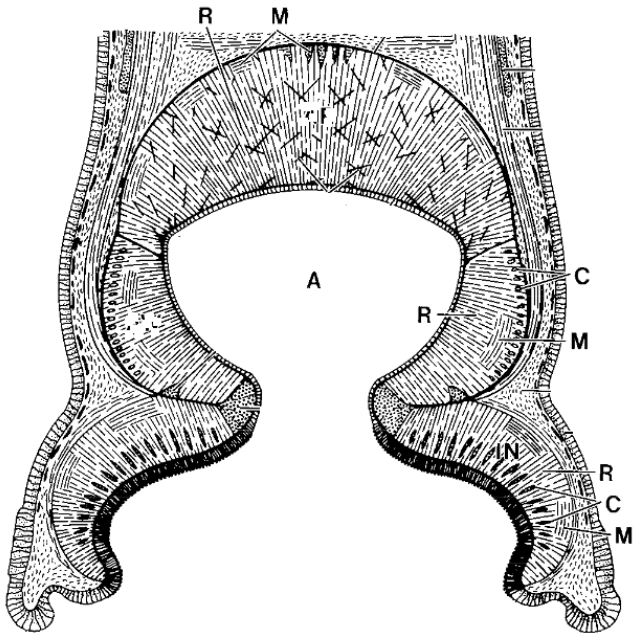

Figure 2.3: The transverse section of an octopus sucker. A-Acetabulum; C-Circular muscle; IN-Infundibulum; M-Meridional muscle; R-Radial muscle. Image taken from Kier and Smith (1990).

The nerve cords of the arms contain about two-thirds of the octopus's neurons. This helps the octopus' arms to conduct various complex reflex actions independent of one another, even with no signal from the brain (Wells, 1978). These arms are lined with sets of two circular, bowl-like suckers on their underside. The suckers are adhesive which helps the octopus to grab and manipulate prey and items, anchor and pull itself across surfaces and conduct cleaning maneuvers. The suckers also help the octopus sample and recognize objects as well as creatures through chemotactile recognition (Wells, 1978; Packard et al. 1988). There are two parts to the sucker: the infundibulum and the acetabulum (See Figure 2.2). The infundibulum is the outer shallow cavity that is lined with papillae (hooks) that provide adhesion while the acetabulum is the inner deeper cavity. The suckers are controlled by the radial muscle, circular muscles and

meridional muscles allowing for the attachment and detachment by reducing and increasing the pressure respectfully in the acetabulum (Wells, 1978; Kier and Smith, 1990). The surface of the infundibulum has touch and chemoreceptors, allowing the octopus to not only feel but also “taste” anything they grab onto (Wells, 1978; Mather et al. 2010).

Octopuses have a thin outer cell layer (epidermis) with mucous and sensory cells along with a connective tissue. Within this epidermis are also many sacs filled with red, brown and yellow pigment called chromatophores. Muscles around these chromatophores expand to open the sacs and release the pigments, displaying them on the skin of the octopus. When the muscles relax, the pigment disappears from sight. The octopus can also change the texture of its skin using a different set of dermal muscles, making it look either very smooth or very bumpy due to the little peaks called papillae. All these dermal activities are controlled by the nervous system (Wells et al. 1965; Wells, 1978; Mather et al. 2010; Courage; 2013).

2.3 Intelligence

Octopuses have one of the highest brain-to-body-mass ratios amongst all invertebrates. They have a complex nervous system with one-third of their neurons in the main brain, located between the eyes. The remaining two-thirds of their neurons, as mentioned in the previous section, are distributed in each of its eight arms. Thus, reflex or local neurons control the movement of these arms based on the information it receives from the suckers. The issue with such a decentralized nervous system is that the octopus may not be aware of the position of their own body (Mather et al. 2010; Courage, 2013).

Octopuses have been recognized as the most intelligent invertebrate (Anderson, 2005; Mather et al. 2010; Courage, 2013). They are capable of astounding intellectual feats such as remembering visual patterns (Wells, 1978), differentiating shapes (Sutherland and Carr, 1963) and changing their colour, texture and patterns very quickly as a response to certain conditions (Warren et al. 1974). At aquariums, GPOs have been observed to recognize different people based on how the individual interacts with

them. A GPO's response to an individual can be observed by monitoring their respiration as well as their skin color and texture (Anderson et al. 2010)[7]. They can avoid people they find irritating by not participating in feed and enrichment programs. Aquaria arrange enrichment programs and activities for the GPO to keep them engaged and test their problem-solving skills. They are capable of opening bottles, using tools and solving simple puzzles. They are also notorious for escaping their tanks and making a mess of labs and aquaria (Wood and Anderson, 2004; Courage, 2013).

2.4 Predator and Prey

GPOs are ambush predators that can eat fish, crustaceans, abalone, clams, snails and even other octopuses. They hide in dens and crevices or camouflage with their surroundings, waiting for prey to come by them. They can also crawl along the seafloor, spreading their arms and covering objects like an umbrella (Courage, 2013). Upon grabbing the prey, the arms bring it to the octopus's mouth where its chitinous beak bites into the meal. Like other molluscs, GPOs have a radula, a tongue-like structure with tiny chitinous serrated teeth. They use this structure to drill into the shells of their prey and scrape the meat off inside. If necessary, the octopus can even dissolve the shells by secreting a special acid Octopuses inject a paralytic and digestive venom into their prey to keep it from escaping. This venom is generated in special glands situated behind the brain and then mixes with the octopus's saliva (Wells, 1978; Courage, 2013).

Though a brilliant predator, the octopus is also prey to many marine species. These species include sharks, moray eels, scorpionfish and even orcas (Courage, 2013). The octopus' first line of defense is their ability to camouflage. If the potential predator (or unsuspecting scuba diver) get closer, the octopus may suddenly change colour and texture, making itself look bigger and more intimidating. This tactic may

[7] Roland C. Anderson was a biologist and leading expert on the Giant Pacific Octopus at the Seattle Aquarium. He was the one who started the Octopus Survey Week and Octopus Week programs there. He passed away in 2014.

startle the predator enough to stop its advances and swim away. However, if the predator is undeterred, the octopus unleashes its signature evasive technique: ink.

The ink is rich in melanin[8] and is produced in the ink gland. The gland is situated at the base of the ink sac which, in turn, is found below the digestive gland of the octopus. Once produced, the ink is stored in the ink sac from where it is released, discharged from a duct near the octopus' anus (Courage, 2013; Derby, 2014). The octopus first becomes pale all over, releases the ink and then jets away to the next hiding spot (Courage, 2013).

2.5 Lifecycle

The lifespan of a GPO is three years on average but can live up to be five years old. While they can breed throughout the year, the optimal spawning conditions are in the winter. Females mate with several males while males only mate with one female. As terminal breeders, octopuses don't live long after copulating. The male enters senescence, becoming listless and losing a considerable amount of body mass. In the wild, they get eaten by harbour seals and sea otters. In captivity they slowly waste away and die. The females however, live until their eggs hatch (Anderson et al. 2002; Courage, 2013).

Female GPOs have one ovary and two oviducts. The openings of each oviduct are found midway along the mantle cavity. Upon copulation, the females store the spermatophores from the male in an organ called the spermatheca, situated near the oviducts, until they lay their eggs (Wells, 1978). The average time between spermatophore collection and laying fertilized eggs is uncertain. After copulating with a male, a female at an aquarium had stored the spermatophores for almost seven months before laying her fertilized eggs (Courage, 2013). Another female was observed to have laid eggs four months after copulation (Wells, 1978). They can lay between 120,000 and 400,000 eggs in grape-like clusters, attaching them to the ceilings of dens and crevices where she will spend the remainder of her life protecting, grooming and aerating them.

[8] Melanin is a dark brown or black pigment that gives the octopus ink its classic colour. Humans have used the ink of the octopus, as well as other cephalopods, for art and writing (Courage, 2013).

For almost 6 months to about a year, she starves herself, guarding and aerating the eggs, becoming more and more listless and losing almost half of her body mass.

Cooler water temperatures lengthen incubation time as it delays the development of the embryo. When they hatch, the offspring are no bigger than grains of rice (High, 1976; Wells, 1978; Anderson et al. 2002; Courage, 2013). At this stage, octopus larvae are extremely vulnerable and preyed upon by almost everything, from zooplankton to juvenile marine organisms. For the first three months of hatching, the octopus larvae float as plankton in the ocean. After this stage the juvenile octopus descend to the benthos where they grow at an extremely rapid rate. Of the thousands of offspring hatched from one brood, only a handful of individuals per brood would survive to adulthood (Anderson et al. 2002).

2.6 Habitat and Distribution

Octopuses are found all over the world, from tropical to temperate oceans. They can live in intertidal zones, coral reefs, open ocean and at great depths (Wells, 1978; Mather et al. 2010; Courage, 2013). The GPO are usually found in the tidal pools of the Pacific North-West of America, Russia, Japan and the Korean peninsula. They are found at an average depth of 110 m, although they can range from waters only 20m deep to up to 1,500 m deep. In the wild, GPOs live in dens in crevices of rock services or under boulders. Optimal water temperatures for GPO range between 7 and 9.5°C (High, 1976; Scheel et al. 2007).

2.7 Conservation

Currently, the GPO is registered as Least Concern under the International Union for Conservation of Nature (IUCN) Red List (Allcock, 2020). There is an overall lack of research and assessment on GPO population and abundance. One organization working to fix this data gap is the Reef Environmental Education Foundation (REEF). They collect data on GPO sightings and distribution with the help of expert and mature SCUBA divers (Reef.org. n.d.).

In Washington, the Washington Fish and Wildlife Department banned the harvest of GPOs in seven sites in the Puget Sound (Washington Department of Fish and Wildlife, 2013). This ruling came soon after an incident where a legal GPO harvest caused public outrage (Associated Press, 2013).

As mentioned in the previous sections, GPOs thrive in temperatures between 7 and 9.5 degrees C (Scheel et al. 2007). GPO population has also been observed to be affected by upwelling, the phenomenon of cooler, denser and nutrient-rich water rising to the ocean surface due to wind. This upwelling increases the amount of biomass produced in the ocean which in turn affects the GPO. This is highlighted in the relationship between GPO abundance and sea surface temperature (SST): with a decrease in SST, there is an increase in octopus abundance and vice versa. This dependency on SST and upwelling limits their habitat range and makes them susceptible to the increasing SST due to climate change (Scheel, 2015).

Recently, the GPO population has disappeared from Washington's Hood Canal. This is because when SST increases, phytoplankton abundance increases. Once the phytoplankton die, they decompose and use up most of the oxygen in the water, creating dead zones which are uninhabitable for GPOs as well as other creatures. Because of this, GPOs have to migrate or else perish. The rising SST also has a negative impact on their spawning. Warmer ocean temperatures reduce the incubation period of their eggs, causing them to hatch earlier and get eaten by other members of the food web. This early hatching can also have an impact of their food, hatching at a time when their food is limited (Andre et al. 2010; Mather et al. 2010). It has also been suggested that urbanization may also impact GPO abundance though the impact may differ with water depth of urbanization (Heery et al. 2018).

Further research needs to be conducted on octopus population size and the impact of anthropogenic activities on their abundance and behavior.

Summary

The Giant Pacific Octopus (GPO) is one of the largest octopuses in the world. They have eight arms and three hearts. GPOs also have what some consider to be nine brains because, along with the main brain in the head, each arm contains neurons that enable them to move independently of each other. Their sensory organs are complex and can respond on reflex. Like most octopuses, GPOs can change their color and texture in response to external stimuli. As ambush predators, they feed on fish, crustaceans and other mollusks. The beak, which is the only hard part in their body, is made of chitin and can crack open the calcareous shells of their prey.

GPOs are terminal breeders. Males die soon after copulating while females live long enough to protect their eggs, only to die of starvation once the eggs hatch. These hatchlings grow at a rapid rate but only a few of the thousands that hatch will survive to adulthood. They are found in the temperate waters of the Pacific North-West as well as Russia, Japan and Korea.

Studies have shown that GPOs are affected by sea surface temperature and upwellings making them vulnerable to climate change and other related anthropogenic stressors.

Chapter 3: Octopus and Humans

"Why didn't the octopus come out of his den to greet his visitors?
He was too Octo-pied to care!" *~Manjari Misra*

Introduction

When asked about an octopus, a common theme surrounding it is 'alien on earth' (Wells, 1978; Mather et al. 2010; Courage, 2013). The fascination with these creatures dates back millennia, evidenced in old scriptures and tales. Stories of awe-inspiring gods and malevolent beasts have permeated into the modern age, transfigured into curiosity and fascination. This chapter provides these anthrozoological[9] examples in an effort to highlight the octopuses impact on the human psyche.

3.1 Historical Records and Tales

3.1.1 Monsters

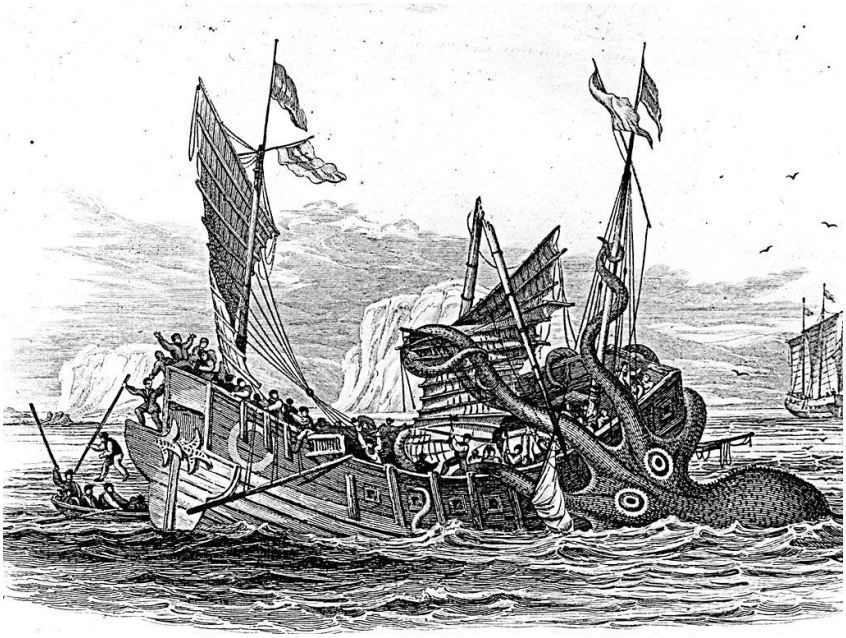

Figure 3.1: Sketch of Kraken attacking a ship made by French naturalist Pierre Denys de Montfort in 1810. Image from Ellis (1994).

The octopus's reputation as a monstrous creature from the unknown ocean depths is classic and perhaps the most common imagery it conjures. One of the most

[9] Anthrozoology is a subset of ethnobiology that focuses on the interactions between animals and humans. Jess O' Toole's 2020 graduate thesis for the School of Marine and Environmental Affairs, *Anthrozoology and Public Perception: Humans and Great White Sharks (Carchardon carcharias) on Cape Cod, Massachusetts, USA,* explains this field in greater detail.

popular iterations of this facet is, of course, the Kraken[10] (Figure 3.1). Scandinavian folklore describes this creature as a massive cephalopod (add footnote on octo-vs.-squid) terrorizing sailors off the coast of Norway and Greenland (Lee, 1883). The legend of the Kraken has been reimagined several times since ancient times. One of the first literary records of this creature dates back to an 1180 manuscript by King Sverre of Norway who describes it as a massive beast capable of sinking ships (Salvador and Tomotani, 2014).

Two thirteenth-century texts, the Icelandic tale Saga of Örvar-Oddr, and the Norwegian encyclopaedia Konungs Skuggsjá, describe two sea monsters who are also large and sink ships. Due to these similarities, the monsters have been classified as Krakens as well (Salvador and Tomotani, 2014). However, the descriptions of these monsters are rather vague and can be used to describe any other mythic sea creature. That is why, until the eighteenth century, the Kraken was depicted as not just a cephalopod-like creature but also a crustacean and serpent (Ashton, 1890; Salvador and Tomotani, 2014).

Formal naval records and texts from the eighteenth-century have sailor's accounts of their encounters with the monsters. These accounts also show the evolution of the Kraken from being a giant omnifarious monster to the monstrously large cephalopod. It would even develop new skills like sinking ships not only with its tentacles but also by conjuring storms (Hamilton, 1839; Ashton, 1890; Salvador and Tomotani, 2014).

Works like that of Lord Alfred Lord Tennyson's *The Kraken* and Jules Verne *Twenty Thousand Leagues Under the Sea* highlight the monster's lingering popularity in the nineteenth century. Even the twenty-first century has the Kraken still depicted in popular culture like in Disney's *Pirates of the Caribbean: Dead Man's Chest* where the monster follows the bidding of the infamous pirate Davy Jones.

[10] There are several variants of the word Kraken including Krake, Krabben and Kraxen (Lee, 1883; Ashton, 1890; Salvador and Tomotani, 2014). It first originated from the Old Norse word kraki. In modern German, krake means ocotopus.

Figure 3.2: Painting of Akkorokamui tentacles coming out of the water. Image taken from yokai.com (n.d.).

The horrifying depictions of octopuses are not limited to the Western world. According to Ainu and Shinto folklore from Japan, there is an enormous part-human-part- octopus creature called Akkorokamui living in Funka Bay in Hokkaidō (Batchelor, 1901; Srinivasan, 2017). Legend has it that once, a part-spider-part-human creature named Yaoshikepu, had been rampaging in a village, destroying homes and bathing the streets in sanguine blood in her wake. The sea kami[11] heard the villager's cries of terror and transformed her into a part octopus, throwing her into the ocean.

Her story did not end there, however. Upon her banishment to the sea, Akkorokamui grew to a monstrous size and began devouring whales and ships without discrimination. The sea kami heard the cries of the humans trapped in the creature's stomach and poisoned her to free them. Akkorokamui soon adapted and harnessed the

[11] Kami is the Japanese word for god, diety, spirit or divinity (Batchelor, 1901).

poison as her own toxin to use on her prey (Batchelor, 1901; Murakami and Mizuki, 2015).

In a time of superstition and navigational uncertainty, ancient people struggled to comprehend the naval mishaps that frequently befell them. Blaming their misfortunes on demons and monsters beneath the waves was a way for them to cope and made for great stories. Even the most benign of encounters with strange and/or unknown creatures were embellished to fit a more fantastical narrative (Ashton, 1890; Salvador and Tomotani, 2014). In the case of the octopus, these narratives were not limited to just horror and tragedy.

3.1.2 Deities

Octopuses have not just been feared but also revered. Many cultures, from the Pacific Northwest and Polynesian Islands to South America, have worshipped octopuses as spiritual guides and deities. In fact, even the Akkorokamui, described in the previous section, is worshipped in Shinto temples in Japan (Murakami and Mizuki, 2015; Srinivasan, 2017).

In the Gilbert Islands in the Pacific Ocean, there is the octopus-god Na Kika. Locals believe that he pushed up the Earth from the bottom of the ocean using many arms, creating the islands we have today (Courage, 2013). Then we have Kanaloa, one of four major deities in ancient Hawai'i mythology[12]. What one gathers from oral traditions and the few written records is that Kanaloa is associated with many things. He is associated with sunsets, the ocean currents and wind, the Southern Hemisphere and a teacher of the arcane arts. According to Au (2018, p. 33), a graduate student of Religion at the University of Hawai'i at Mānoa, Kanaloa "is ka he'e hauna wela—the octopus dwelling in the hot foul depths."

In this octopus form, he is considered to be a deity of healing, a facet strengthened by his association with fresh water that can heal emotional and physical

[12] According to Au (2018) there are four major Hawaiian deities: Kāne. Kanaloa, Kū, and Lono. Kanaloa is usually associated with Kāne, who is the god of procreation and associated with dawn, sun and the sky.

maladies as it is rich with minerals (Au, 2018). The octopus is also considered to be the last remnant of the previous, more ancient, incarnation of this universe (Courage, 2013).

According to Tahitian lore, the supreme god of creation Ta'aroa, brings forth the foundation of the earth and heavens, which turns into an octopus and then the ocean. All other octopuses are considered to be shadow forms of this foundational being. They also link the octopus to compasses and navigation as its eight arms are associated with the navigation directions on a typical compass (Au, 2018).

Like the ocean, these deities are neither considered benevolent or malicious, they simply do as they please. Their deeds have only recently been put to ink in academia and begun to inspire a new generation of humans.

3.2 Modern Fiction and Fascination

3.2.1 Fiction

Figure 3.3: The Great Old One Cthulhu, High Priest of the Great Old Ones, The Great Dreamer and, The Sleeper of R'lyeh. Image credit to Disse86 on Deviantart.

One cannot go further without introducing one of the Great Old Ones within the Lovecraftian pantheon: Cthulhu. This malevolent cosmic deity first appears in H. P. Lovecraft's[13] short story *The Call of Cthulhu* in 1928. He describes it as a kind of

[13] H.P. Lovecraft was a brilliant writer but troubled individual. He is well known for his anti-Semitism and incorporated those views into many of his literary works. More often than not, the hostile human elements

chimaera with the features of an octopus, dragon and human. The story goes that this pantheon came from the cosmos and ruled the Earth, only to fall in a death-like slumber, restrained and yet existing outside of our universe.

In the short story, Cthulhu is imprisoned in the underwater city of R'lyeh, in the South Pacific. Even when trapped, he influences the minds of humans, causing anxiety and madness. His activities lead to the formation of several disturbed cults all around the world who believe that he would one day rise again. Lovecraft's other works only reference Cthulhu but he is still a central aspect of many of these tales. The horror genre definitely evolved with Lovecraft's contributions and creation of the cosmic horror sub-genre. His work with Cthulhu touched upon one of the keystones of this genre, the helplessness and insignificance of man in the face of an all-powerful and considerable unknown entity (Lovecraft, 2014).

Figure 3.4: Doctor Octopus using his robotic arms to constrict Spider-Man. Image taken from Marvel Entertainment (n.d.).

in his stories were non-White individuals. Nevertheless, his stories are worth the read, despite the aforementioned questionable elements.

Other works of fiction depicting octopuses in the West include Disney's *The Little Mermaid,* where the antagonist of the story is a part-octopus-part-woman who plots to take over the seven seas. The mad-scientist, Dr Otto Octavius or Doctor Octopus (or Doc Oc) is one of the main villains of *Marvel Comic's* web-slinging superhero, Spider-Man and member of the antagonistic group the Sinister 6. He has four mechanical arms attached to his spine that aid him in the battle against his foe. Many Spider-man cartoons and movies have portrayed their own version of the character, one even being a woman. The symbol of HYDRA, the authoritarian paramilitary organization and antagonist to the hero Captain America, is that of a skull with octopus tentacles (Marvel Entertainment. n.d.)

Many science fiction books and shows base the designs their hostile aliens on the octopus. The slimy tentacles and bulbous head have akin it other-worldly and filmmakers are always eager to monopolize on this reputation. In Disney's *Star Wars*, there were the extra-terrestrial cephalopod-like monsters called Ranthars that were responsible for killing the gangsters after Han Solo and Chewbacca. H.G. Wells' *War of the Worlds* introduced the slimy tentacle invaders. Blockbuster movies like *Prometheus* and *Arrival* along with popular TV shows like *Futurama* and *The Simpsons* are among the many properties that have used octopus-like aliens.

Figure 3.5: Octopus Pokémon Octillary, a Water-type Pokémon. Image taken from Pokémon (n.d.)

However, not all fictional works depict octopus's as monsters and villains. In the early 2000s, the children's cartoon *Oswald* was about the life of the titular character who was a round, blue octopus. In Japan, various anime have their own interpretations of the octopus, like Octillery and Grapploct in the ever-so-popular *Pokémon* franchise.

Then there is the pornographic genre, that was inspired from the arms of the octopus, referred to as tentacle erotica (footnote on hentai). The origins of this genre have been traced back to the nineteenth century where the artist Hokusai, made a wood-block print of a curvaceous woman entrapped in the arms of an octopus and partaking in a rather graphic sexual act. This piece is called *Tako no Ama* in Japanese or *The Dream of the Fisherman's Wife* (Courage, 2013; Godfrey-Smith, 2016). When early Europeans came across this piece, they perceived it to depict a form of non-consensual pornography, even though that is not the case as evidenced by the Japanese text accompanying the art. Nonetheless, this initial perception without context has influenced and thus created a more violent and questionable sub-genre of Shokushu Goukan or "tentacle rape", depicting these acts with predominantly women.

But that is not to say that all works in the overall genre are graphic and violent. Courage (2013) remarks on the American works that have more subtle forms of tentacle erotica like *The White Goddess* from 1930 where an octopus has been depicted with its arms suggestively around a woman with limited apparel.

One has to commend the human mind for its ability to produce an eclectic range of literature and art just from the octopus. However, with the advent of scientific advancements in the field of zoology, there is now more research on the octopus's behaviour and mechanics that are now gaining more traction amongst the scientific community.

3.2.2 Science and Technology

The arms of the octopus have been instrumental in inspiring the tales mentioned in the previous sections of this chapter. In Chapter 2, the biomechanics of the arms in relation to the main brain is explained in more detail. This mechanism is currently being reproduced by engineers and roboticists.

One such study was conducted by the Advanced Robotics Technology and Systems Laboratory, Italian Institute of Technology and Centre of Research in Microengineering Laboratory in Italy. The study remarks on how the octopus's arms have the ability to bend in all possible directions and can elongate and stiffen at rapid rates. These features fascinate the scientists and drive them to design an artificial muscular hydrostat structure (See Chapter 2) with the hopes to use it to develop a prototype arm (Laschi et al. 2009). Another study conducted by The BioRobotics Institute in Italy actually developed a "general geometrically exact steady-state model" of an octopus arm that could be manipulated through the use of by-cables (Renda et al. 2012, p. 11).

Then there was a collaboration between The BioRobotics Institute in Italy and the Department of Neurobiology at the Hebrew University of Jerusalem in Israel. In their study, they developed a functioning eight-armed soft robot and put it through a series of trials to test its dexterity and locomotion. The robot walked on land as well as underwater in a manner similar to that of an actual octopus. It was even able to grasp

various kinds of objects (Cianchetti et al. 2015). The octopus's suctions cups are also acutely studied to develop polymer composites that can attach to human skin so as to record and monitor biosignals for human purposes (Chun et al. 2018).

These studies are just a few examples of how scientists beyond the field of biology were inspired by the octopus to enrich their own fields. Of course, as stated in the previous section, the fascination with octopus anatomy is not limited to just scientists.

3.2.3 Local and Tourist Attraction

Over the years, octopuses have worked their way to stardom and not just due to its notorious reputation in fiction. Scientific documentaries like *Octopus: Making Contact* on PBS and *Blue Planet II* on BBC have caught the attention of the average watcher and have made them more curious and enthusiastic about the octopus. *The Octopus in My House* on BBC was especially gripping as it tells the story about an octopus living with a professor who studies the creature within the comfort of his home, all the while developing an exceptional relationship with it. There are even books specifically about these creatures like *The Soul of an Octopus* by Sy Montgomery where the author brilliantly describes her interactions with different octopuses and how enthralled she is by each one (Montgomery, 2015).

Figure 3.6: Paul the oracle octopus predicting Germany's win against England in the FIFA World Cup of 2010. Image taken from The Guardian.

Many aquariums have made the octopus one of their top attractions for visitors. The Monterey Bay Aquarium has a whole aisle dedicated to the various kinds of cephalopods in the ocean, including the Giant Pacific Octopus (GPO) and the Red Octopus (Montereybayaquarium.org. n.d.). Paul the Common Octopus at the Sea Life Oberhuasen, an aquarium in Western Germany, was another such attraction, albeit for rather unexpected reasons. This octopus was famous for his divination abilities during the 2010 FIFA World Cup where he would correctly predict the outcome of many football matches. He even prompted a book and documentary about his life and skills (Mather et al. 2010; Ronay, 2010; Courage, 2013). Then there are of course the GPOs of the Seattle Aquarium who garner attention from every visitor, especially during the annual Octopus Week (See Chapter 1).

Octopuses are also famous for being extremely intelligent (See Chapter 2) and notorious escape artists. There have been several instances of captive octopuses escaping their enclosures in rather inexplicable and astounding manners. One such octopus was Inky at the New Zealand Aquarium who was able to squeeze through a small gap between the tank and its lid, slither across the aquarium floor and down a 50-meter pipe to get to the ocean (Bilefsky, 2016). There have also been many viral videos

of similar escapes in other aquariums and even on boats that garner thousands of views online. A study found that different species of octopuses show differences in escape behaviour. The study states that the GPO and Common Octopus are more likely to escape than some of the other species, though other biological and environmental factors may play a part in this behaviour (Wood and Anderson, 2004).

The Scuba diving community is also enthralled by the creature, describing their encounters with it as the highlight of their dives and thus, rather protective of it (Mather et al. 2010; Godfrey-Smith, 2016).

3.3 Traditional and Exotic Food

Humans have been hunting and devouring octopuses for thousands of years. They are captured using spears, nets, clay pots, and even bare hands (Wells, 1978; Mather et al. 2010; Courage, 2013). They are extremely popular in East Asian countries like China and Japan, the Pacific Islands and in Europe. The dishes that are produced, as a result, vary from place to place. Japan's octopus dishes include the ever-famous sushi as well as Takoyaki, a kind of pancake ball with bits of octopus inside and served with special sauces and toppings (Allrecipes. n.d.).

In Malta, they are a rather delectable pizza toping while in Spain they are grilled with onions, paprika and lime. For most of these dishes, the initial directions are the same. As the octopus is made of pure muscle (See Chapter 2), recipes dictate that one must tenderize the meat by beating it for an extended period of time using a mallet or rubbing it with salt and daikon. This is an exception when eating it raw like many do in Korea, where the octopus is directly taken out of its tank, cut up and served immediately to customers, even while the arms still move (Mather et al. 2010; Courage, 2013; Allrecipes. n.d.).

Despite the octopus being a common traditional meal in many cultures, the harvest of it is not favourably looked at, especially in the United States. This was exhibited when a diver at Alki Point in Seattle, caught and killed an octopus for food. While he had the necessary permits to do so, the public, especially the Seattle diving community, were not pleased as this hunt involved the diver beating the octopus to

death in the water. This incident resulted in a restriction to octopus hunting in popular dive sites (Associated Press, 2013).

Summary

Humans have always considered octopuses to be other-worldly. Their ancient depictions of monsters and gods definitely highlight this belief. Even in the modern age, where the octopus is better understood and even studied for its various attributes, people still akin it to monsters at both a local and cosmic level. Some depictions that are more kid-friendly and benign, as well as the real-life versions, are garnering more attention every day as aliens on earth. Then there is, of course, the more graphic content surrounding the octopus as well as its centuries-long reputation as a delectable food item. One way or another, humans have always and will continue to be fascinated by these animals and will be drawn to octopus related media and programs. As such, this thesis intends to study the octopus-related programs at the Seattle Aquarium in greater detail so as to provide the public with more opportunities to engage with these creatures.

4. SWOT Analysis

"Business strategy tools are not just useful, they are fan-Tactic!" ~Manjari Misra

Introduction

This chapter focuses on the basics and history of the analytical tool, widely used in the business world, known as SWOT analysis[14]. To further assist in explaining the use and benefits of this tool, this chapter will also provide a few case studies that are relevant to the thesis topic.

4.1 What is SWOT Analysis?

When one wants to determine if a venture, be it business, academic or otherwise, can be undertaken, they must inspect their capabilities and exploit any favorable conditions they come across. The results of the inspection are used to make and successfully execute a plan to make the venture a reality (Cole, 2006). This process is also known as a business strategy and it is commonplace when firms are trying to increase their competitive standing in the market (Panagiotou, 2003).

According to Samejima (2006), for the strategy to be valuable and constructive, the interested party must go through a series of steps. They must first research any changes in the environment, be it of the society, industry, competitor's or otherwise. The next step uses the previous research to set a proper strategy as a response to those environmental changes. Upon executing the strategy, one must then extract and analyze any effect or other information regarding the strategy through various media. This is used to determine the market position of the organization or party and their competitors. Based on the previous steps, the strategy is either verified to be greenlit or scraped in favor of a better one. This process is extremely long and data-heavy and so, in order to systematically and efficiently conduct such a task, organizations and analysts use various strategic and market sensing tools. One such tool is the SWOT analysis.

[14] This thesis is not the first at the School of Marine and Environmental Affairs that used a SWOT analysis. See *Exploring Business Opportunities in Marine Affairs: A feasibility study for submersible research tourism* by Alexander W. Adams, 2011.

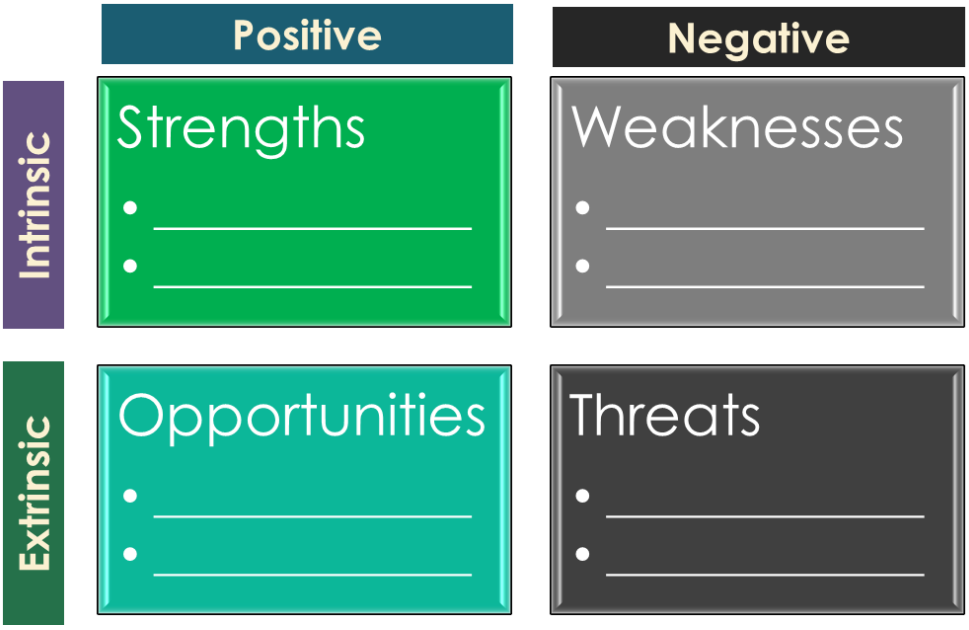

Figure 4.1: 2x2 SWOT matrix that is used to represent the results of the analysis in a clear and concise manner. Generated by author.

The acronym SWOT stands for "Strengths, Weaknesses, Opportunities and Threats." As previously stated, SWOT is a tool used by various businesses and institutions to determine their internal and external environments. The tool helps them use this information to develop efficient and effective strategies to improve their position in their market. It can be used by both academics and individuals in commerce, several of whom have (Lewis and Littler,1997; Panagiotou, 2003; Leigh, 2009; Sammut-Bonnici and Galea, 2015; Živković, et al. 2015). The following paragraphs contain several iterations of the definition SWOT analysis. These definitions were generated by various academics across the commerce and humanities fields, providing their own unique understanding of the tool.

According to a Leigh (2009, p. 1089), a Professor at the Graduate School of Education and Psychology, Pepperdine University, SWOT analysis is:

> "an approach to considering the inhibitors and enhancers to performance that an organization encounters in both its internal and external environments. Strengths are enhancers to desired performance while weaknesses are inhibitors to desired

> performance, with both being within the control of an organization. Opportunities are enhancers and threats are inhibitors to desired performance, though these are considered outside of an organization's control."

At the University of Malta, Sammut-Bonnici and Galea (2015, p. 1), a professor of Strategic Management and a Senior Laboratory Officer from the Built Environments defines the internal and external factors a bit more. They state that a SWOT analysis:

> "evaluates the internal strengths and weaknesses, and the external opportunities and threats in an organization's environment. The internal analysis is used to identify resources, capabilities, core competencies, and competitive advantages inherent to the organization. The external analysis identifies market opportunities and threats by looking at competitors' resources, the industry environment, and the general environment."

Živković, et al. (2015, p. 200), researchers at the Technical Faculty in Bor, University of Belgrade provided a definition that includes the popular SWOT matrix (Figure 4.1). They state that:

> "SWOT analysis is a decision support tool and it is used as a tool for internal analysis as well as the analysis of the organizational environment. The obtained information can be systematically represented in a matrix, different combinations of the four factors from the matrix can aid in determining strategies for long-term progress."

Each of the definitions highlights the importance of diagnosing the internal and external environments of an organization. Thus, based on the aforementioned definitions, for the purposes of this thesis, SWOT analysis *is an analytical tool commonly utilized to systematically and comprehensively diagnose internal and external factors relating to any product, program or service provided by a firm or an institution*.

SWOT is an extremely popular tool used across various fields and industries. Panagiotou (2003, p. 8), the Principle of the London School of Science and Technology, even stated that SWOT analysis:

> "may well be used more than other management techniques in the process of decision making."

It is a relatively inexpensive tool to use, allowing for quick and easy data collection and analysis. The ease of use and the resulting matrix makes data handling and analysis easier to comprehend and interpret. It also assists firms in making rapid strategic decisions to compete in an ever-changing market landscape (Everett, 2014). As such, The Oxford Handbook on Strategy (Faulkner and Campbell, 2006, p. 43) claims that:

> "the best and most familiar example of an organizing framework is SWOT analysis."

However, unlike other analytical tools and models, SWOT is a more foundational tool upon which other more sophisticated models and tools are built upon. The need for SWOT analysis is more to establish a baseline strategic and market position of the firm or institution. It can be taken further based on what is required by interested parties (Everett, 2014).

4.1.1 Internal Factors

When one talks of the internal factors, they talk about competence (or lack off) of the organization or party for whom the SWOT is conducted. These internal factors are unique to that specific group and can be directly managed to increase its strengths and/or decrease its weakness to gain a competitive advantage and standing they need in the market SWOT evaluates the resources and capabilities that either need to be sustained, removed or developed (Lewis and Littler,1997). Table 4.1 lists a few examples of an organization or party's internal factors.

Table 4.1: List of examples of internal factors

Some common internal factors include
Raw materials
Premises
Human Capital
Equipment
Finance
Network (for supplies and sales)
Brand loyalty and equity
Technology

The resources and capabilities of an organization or party can only be provided by their own internal sources. These sources include websites, annual reports, financial statements and interviews with key staff. It covers the strength and weakness boxes in the matrix (Figure 4.1).

4.1.2 External Factors

External factors are generally those that influence the organization or party from the outside. They are usually the same for everyone in the same market, for example, competition. Using these factors, the group identifies, and grasps hold of key opportunities while avoiding any threats to enhance and secure their standing in their specific market (Lewis and Littler,1997). Table 4.2 contains a list of external factors that are specific to the competition and industry along with some additional miscellaneous but equally important ones.

Table 4.2: List of examples of internal factors

Some common external factors include	
Competitor	Raw materials
	Premises
	Human Capital
	Equipment
	Finance
	Network (for supplies and sales)
	Brand loyalty and equity
Industry	New entries
	Rivalries
	Substitutes
Other	Politics
	Socio-economic factors
	Legal
	Environmental/Climate factors
	Ethical
	Social Media

The evaluation of external factors requires more research across various media. The competition's information generally comes from their own websites and publicly

available documents. Information regarding the industry and other factors can come from the news, stakeholders, government documents and other miscellaneous sources.

4.2 A Brief History of SWOT Analysis

There tends to be conflicting documentation regarding the origins of SWOT analysis. A popular one seems to be that in the 1950s, two professors of business policy from the Harvard School of Business were looking into how much a firm's business strategy corresponds to its external, competitive environment (Hill and Westbrook, 1997; Humphrey, 2005; Leigh, 2009). Allegedly, these professors assigned their students the task to determine whether the companies in their case studies had the policies in place to deal with competition in the industry (Ghemawat, 2002). Within the decade, the practice of analyzing a company's internal competence in accordance with its external environment became a staple part of the business program (Leigh, 2009). By the 1960s, the term SWOT analysis had been given to this practice and had begun to slowly seep into other academic departments as well as in actual businesses as part of their strategic planning methodology (Ghemawat, 2002).

Another origin story starts at Stanford University at the Stanford Research Institute (SRI) around the 1960s (Humphrey, 2005; Everett, 2014). According to Humphrey (2005), the author took part in a 10 year-long study by Fortune 500 companies to improve corporate planning methods. However, the literature to support this story is at best scarce as there are no academic mentions of this study. As such, this origin story seems to be less credible.

Then, according to Kraus and Kauranen (2009), SWOT analysis was a major component strategic management model known as the "Design School Model" which was proposed by Mintzberg. This model categorized the concept of strategic management into different schools of thought each with their own unique strategic planning process. Under what is known as the prescriptive school, lay the design school model that followed the SWOT pattern. That is, the model focused on assessing the internal strengths and weaknesses of the company while identifying key environmental

opportunities and threats (Selznick, 1957; Kraus and Kauranen, 2009; Sarbah and Otu-Nyarko, 2014).

By the 1980s, SWOT analysis had permeated into the business world and was used to create and develop not only business plans, but marketing plans as well (Gürel and Tat, 2017). The TOWS Matrix (Section 4.3 and Figure 4.2) was also introduced during this time which enabled analysts to match the organization's strengths and weaknesses to its environmental opportunities and threats (Figure 2) (Weihrich, 1982). A decade later, SWOT analysis had become more popular, but its shortcomings had become more visible in the process.

4.3 What is a TOWS Matrix?

Figure 4.2: 2x2 TOWS matrix displaying different strategies. Figure generated by author.

TOWS is an acronym for 'Threats, Opportunities, Weaknesses and Strengths'. It is a conceptual framework that was developed by Weihrich (1982) to extend the SWOT analysis by providing actionable tactics as a response to the determined factors. The TOWS examines the results of the SWOT i.e. the group's external threats and opportunities against their weaknesses and strengths. This analysis forms the basis to develop TOWS strategies and to form actionable tactics. According to Ravanavar and Charantimath (2012, p. 87), a Professor & Dean at the Bahubali College of Engineering, and a Professor at KLS' Institute of Management Education & Research, Belgaum:

> “TOWS Matrix provides means to develop strategies based on logical combinations of factors relate to internal strengths (or weaknesses) with factors related to external opportunities (or threats).”

These “logical combinations” (Ravanavar and Charantimath, 2012. pp 87) have been set as four distinct groups (Figure 4.2). Strength-Opportunity (SO) strategies incorporate the identified internal strengths with the external opportunities where the organization or party uses these strengths to take advantage of their opportunities. Strength-Threats (ST) strategies are those where the organization or party uses their strengths to avoid or overcome external threats. When an organization or party uses a strategy where their external opportunities to reduce their internal weakness, it is known as the Weaknesses-Opportunities (WO) strategy. Last but not least is the Weaknesses-Threats (WT). These strategies are more defensive in nature as these are recommended and undertaken in order to reduce the internal weaknesses and external threats of the organization or party (Weihrich, 1982; Weihrich, 1999; Ravanavar and Charantimath, 2012).

While this matrix helps list and prioritize actionable strategies, there is a limitation to this method as not all factor combinations are taken into account. For example, strategies that aim to mitigate internal weaknesses using internal strengths (SW) (Ravanavar and Charantimath, 2012).

Advantages of SWOT Analysis

4.4 Drawbacks of SWOT Analysis

Despite its wide use amongst businesses and within academia, there are some justifiable criticisms. To start with, SWOT analysis is static in nature. When the tool was initially developed, the external conditions influencing organizations were not as mercurial as they are today. The globalization of businesses, changes in societal structure and new developments in technology, as well as the changes and issues with the natural world, all affect the various entries in the analysis (Kew and Stredwick, 2010; Sarbah and Otu-Nyarko, 2014). One paper proposed a means to overcome this issue

for a SWOT analysis for regional ecosystems environmental models where they use a software to conduct the SWOT analysis with fuzzy cognitive maps. (Jasinevičius and Petrauskas, 2008).

SWOT analysis is generally qualitative in nature (See Appendix 1). This method does not usually provide quantifiable data on the identified and target factors and thus does not tend to go beyond defining the factors themselves. This gives a more general perspective of the situation and thus, can mostly provide general solutions and strategies (Wheelen and Hunger, 2002; Sarbah and Otu-Nyarko, 2014). This also enables one to determine which factor should be prioritized over another or provide insight into resolving conflicting factors. To this end, the literature regarding SWOT always recommends using additional analytical methods that assist with multiple criteria decisions such as the Analytic Hierarchy Process (AHP) and Simple Multi-Attribute Rating Technique (SMART). These methods assign rankings or weight to the factors as well as verify the resulting suggestions during a SWOT analysis (Kajanus, et al. 2012). A major issue is that these additional methods are rather time and resource consuming.

As SWOT on its own is qualitative in nature, there is a chance for subjectivity and bias to be involved in the analysis. Categorizing certain factors can be a challenge as they can fall under multiple boxes. For example, a factor that is a strength can also be a weakness if not identified and sustained properly. It is important that before one initiates the SWOT analysis, one must clearly define the purpose of the analysis and establish the client. Such actions define the boundaries of the analysis, making categorizing factors easier (Kajanus, et al. 2012; Sarbah and Otu-Nyarko, 2014).

Since its conception, SWOT has been popular with businesses as it helps direct their business plans in a manner that is relevant to their vision and goals. Despite its drawbacks, SWOT is an invaluable analytical tool for various organizations and parties. It helps provide baseline information regarding their current status as an entity and in their specific market SWOT helps provide the starting line to the path that, through the right additional analysis and strategies, can lead the organization or party to a higher

standing in its market (Hill and Westbrook, 1997; Panagiotou, 2003; Sammut-Bonnici and Galea, 2015; Živković, et al. 2015).

4.5 Relevant Studies involving SWOT Analysis

In standard business applications, SWOT is usually used to help organizations and parties improve their profit margins and market standing (Panagiotou, 2003). With SWOT being so popular and useful in the business world, it is no surprise that it has infiltrated the academic world. Recent studies have shown how adaptable SWOT is with different industries and research. These applications of SWOT are more socially minded. In the context of this thesis, there have been many studies utilizing SWOT to understand and plan better tourism models (Goranczewski and Puciato, 2010; Sariisik et .al. 2011; Reihanian et al. 2012; Bhatia, 2013; Wong et al. 2014) as well as undergo more holistic environmental protection plans (Leskinen et al., 2006; Pezdevsek et al., 2012).

4.5.1 SWOT Analysis for a Tourism Project

SWOT analysis have been used by brokers (See BLT Model in Chapter 1) in the tourism industry for a few decades now. The following example on Wine Tourism in Sicily highlights the methods and beneficial results the analysis has rendered for the players in their respective BLT models.

Carra' et al. (2016) examines how potential "cultural tourism" can improve the economies of rural communities. "Cultural tourism" refers to "the movement of persons to cultural attractions away from their normal place of residence, with the intention to gather new information and experiences to satisfy their cultural needs" (Richards, 1996, P. 24). In this study, they chose to look at wine tourism in Sicily, specifically the Etna Wine Route (EWR). Wine tourism has been steadily growing in the region for the last 20 years due to a rise in interested parties who are classified as individuals with "medium-high level of education and income" (Carra' et al. 2016, p. 707). The Etna vineyards and EWR have been credited in bringing back the wider agriculture industry in the region after a rather long dry spell. The study aimed to further increase tourism in the region so

that it may help boost the local economy as well as support and sustain local traditions, culture, historical sites and territories.

With their objective clearly defined, the study undertook a Strategic Orientation Round (SOR) analysis. The SOR is based on the SWOT analysis where the internal and external factors are listed and categorized. It then goes a step further than the SWOT by asking relevant stakeholders to rate and compare the factors based on priority (Kajanus et al. 2004; Kangas and Kangas, 2005). The analysis rendered several "practical strategic options" (Carra' et al. 2016, p. 710) which were placed in a matrix based on the relationships between the strengths, weaknesses, opportunities and threats that were uncovered. Based on the point system, the study showed more priority was given to strategies that focused on the strengths and opportunities. These included improving communication channels for better coordination between the various tourism brokers and having private-public partnerships to help promote tourism in the region. Overall, these strategies are meant to create and sustain tourism products and services of the highest quality. The study showcased how SWOT along with additional analysis enticed and encouraged stakeholder participation in developing an action plan for their industry. However, for these strategies to become actual implementable plans, additional analysis, such as feasibility analysis, will be necessary to undertake. Nevertheless, the study provided a legitimate starting point for the various brokers and well as locals involved in the EWR (Carra' et al. 2016).

4.5.2 SWOT Analysis for Conservation projects

Many SWOT analysis dealing with wildlife conservation involve the management of protected areas such as wildlife parks, sanctuaries and reserves. The following is an example of such a study from the Anzali Wetlands of Iran.

Iran's Anzali Wetland is an important ecological site, highlighted by its rich avian biodiversity (Mansoori, 2009) and is internationally recognized protected area under the Ramsar Convention on Wetlands of International Importance and Bird Life International Organization. This fact coupled with the site being in close proximity to human habitation, one would assume this site to have high tourist turnout rates. Unfortunately,

that is far from reality. As such, Ganjali et al. (2014, p. 156) conducted a SWOT analysis to study the wetland's potential as an ecotourism site by looking into the various internal and external factors influencing the "development of nature tourism" in the wetland. As stated in Chapter 1, ecotourism has the potential to promote wildlife conservation as well as have a positive impact on the socio-economic status of the local communities (Kara et al. 2011).

A more extensive SWOT analysis was executed for this study where experts were asked to give weight to different factors identified during the analysis. These numerically assigned weights were used to form Internal Factor Evaluation matrix and External Factor Evaluation matrix. This form of analysis showed that the greatest strengths the wetland has was its biodiversity and delineated protected areas. What it lacks is internal management and advertising tools and plans. With these results, the study highly recommends focusing on improving the internal mechanisms of the wetlands. In regard to the external factors, positive changes to the local's socio-economic condition was found to be one of the greatest opportunities to grasp. The major threats identified were political and economic in nature. The study recommends that in order for a truly effective plan to be implemented, every sector across the country needs to participate and coordinate strategies (Ganjali et al. 2014).

Summary

This chapter introduced and elucidated the concept of SWOT analysis. While a qualitative analysis of an organization or party's Strengths, Weaknesses, Opportunities and Threats regarding various projects and programs, the analysis serves as a base study. Many businesses and researchers attach additional tools to the SWOT to develop strategies based on expert opinions and feasibility.

As such, this thesis is a study on the potential for the Seattle Aquarium to combine their two Octopus Conservation Tourism programs: The Octopus Survey program in October and Octopus week in February. The study will comprise of the simple SWOT analysis to provide the initial information for the Aquarium to take forward with other potential analysis that they may want to use to develop actionable strategies

to improve their internal mechanisms and take advantage of their external environments.

Chapter 5: Methodology

"What happened to the diver in the water during an algal bloom? They couldn't Seattle!" *~Manjari Misra*

Introduction

The following sections in this chapter provide background information about the study area i.e. the Seattle area, as well as the "client" of the thesis, Seattle Aquarium. The data was collected from the target groups through semi-structured interviews and focus groups. For more information about the method of data collection, including the justification for the use of a qualitative approach as well as the sampling process, please see Appendix I.

5.1 Study Area

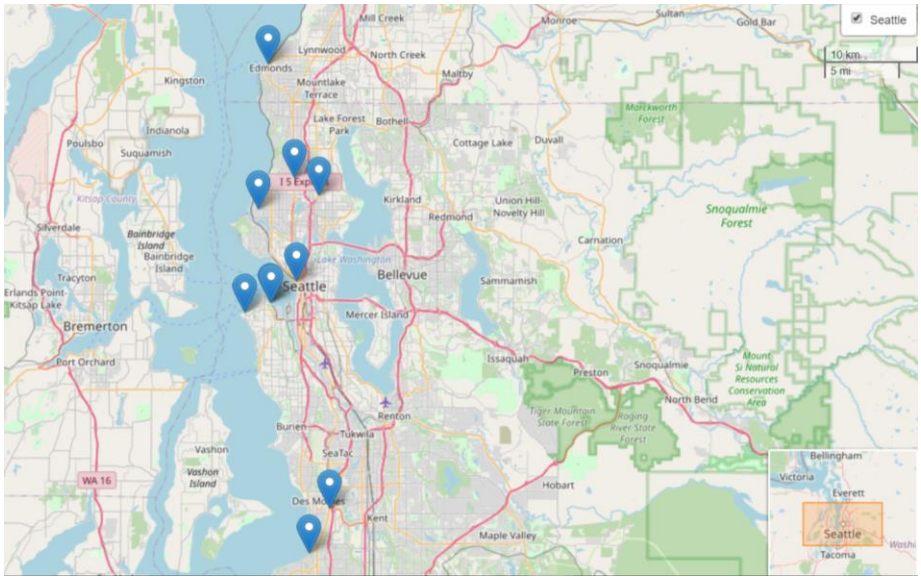

Figure 5.1: Map of study area with markers of study sites. Figure generated by author in RStudio

This thesis was conducted in Seattle and its neighboring cities, Des Moines and Edmond along the Puget Sound in the state of Washington, USA (Figure 5.1). Seattle is a seaport city located on the West Coast of the United States in King County, Washington, with a land area of approximately 83.9 square miles. Des Moines is situated on the eastern shore of Puget Sound in King County. It is approximately halfway between Seattle and the city of Tacoma with a land area of almost 6.5 square miles. Edmonds lies in the southwest corner of Snohomish County. With a land area of

8.9 square miles, it is north of Seattle and Puget Sound with the Olympic Mountains to its west (Bureau, n.d.).

The study area has a unique topography and hydrology that are remnants of its glacial past. Over 15,000 years ago, during the Vashon Glaciation, ice sheets about 3,000 ft thick covered this region. The ice covered the lowlands between the Olympic and Cascade mountain ranges and reached all the way south of Olympia to near Tenino. Over the course of the next 3,000 years, the ice retreated, eroding the landscape and creating the drumlin hills we have today (Easterbrook, 1992). The ice also caused a series of depressions in the land, resulting in the various basins found in the Puget Sound. When the ice started to recede, the depressions rebounded but not before sea level rose in wake of the receding ice age. As a result, the Sound bed was alternately fresh and with sea water. These geological processes have also influenced the fauna and flora diversity within the Sound (Troost and Booth, 2008).

The ever-present underwater fjords and shallow banks have provided ample habitat for coral reefs and multiple kelp species, predominantly bull kelp and eelgrass. These coupled with the many steel and wooden wrecks have created a safe and rich habitat for various mega and micro fauna. With its water temperature fluctuating between 45 and 60 degrees and sights including harbor seals and anemone gardens, the Emerald Sea is paradise for scientists and recreational divers alike. As such, there are more than 75 shore-diving sites within an hour of Seattle along with several access points to launch boats and catch fish (Seattle.gov, n.d.).

5.1.1 Locations

The locations selected for this thesis included local dives sites, dive shops, nearby businesses and the Seattle Aquarium. These sites were based on recommendations from the Seattle Aquarium as well as their accessibility in relation to the University of Washington Seattle Campus. As stated in the previous section, Seattle and its neighboring cities are privy to several scuba diving sites that are easily accessible from the shores along the Puget Sound (Figure 5.1).

Figure 5.2: Seacrest Park Cove 2 where groups of divers preparing to go under. Image taken by author.

Seacrest Park is one of the most popular shore-diving sites in the area. Situated on the western shores of Elliot Bay, the site is protected by the Washington State Department of Natural Resources and can be easily reached by car or by the King County Water Taxi from pier 55 (Seattle.gov, n.d.). Known as “Alki Cove 2” or “Cove 2”, this dive site is teaming with divers during the day as well as night (Figure 5.2). It is filled with organisms such as Plumose Anemone, Kelp Greenlings, Vermilion Rockfish, Red Irish Lords, Lingcods, Harbor Seals and of course the Giant Pacific Octopus (GPO). One such octopus used to live underneath the hull of an old fishing boat wreck on the site, becoming a popular attraction. Next to Cove 2 is The Marination Ma Kai, a popular asian-fusian restaurant for divers and other visitors (Seattle.gov).

Alki Beach Park is another dive site on Elliot Bay as well as a sought after beach destination for locals and tourists. The site is known for its eelgrass beds and man-made reefs. It is home to an array of creatures including the Brown Rockfish, Quillback Rockfish, Painted Greenlings, Plumose Anemone, Red rock Crab, Tube Snouts, Northern kelp crab, White-lined dirona. GPOs are rare in this area but divers have spotted the Red Pacific Octopus amongst the coral. There are several restaurants and bars that are open and available for visitors (Seattle.gov).

Edmonds Underwater Park is found North of Seattle, along the Puget Sound coastline, near Edmonds-Kingston Ferry Landing. The Park covers 27 acres of shoreline and open sea, half of which has been developed with a variety of features and underwater trails for scuba divers. These features include artificial reefs and sunken vessels that are connected by a network of guide ropes that are around 2.5 miles long. It was established as a Marine Preserve and Sanctuary in 1970. While GPOs are present in this Park, the more common marine life include Lingcod, Cabezons, Spotted Ratfish, Greenlings Sea Urchins, Nudibranchs and Moon Snails (Edmondswa.gov. n.d.)

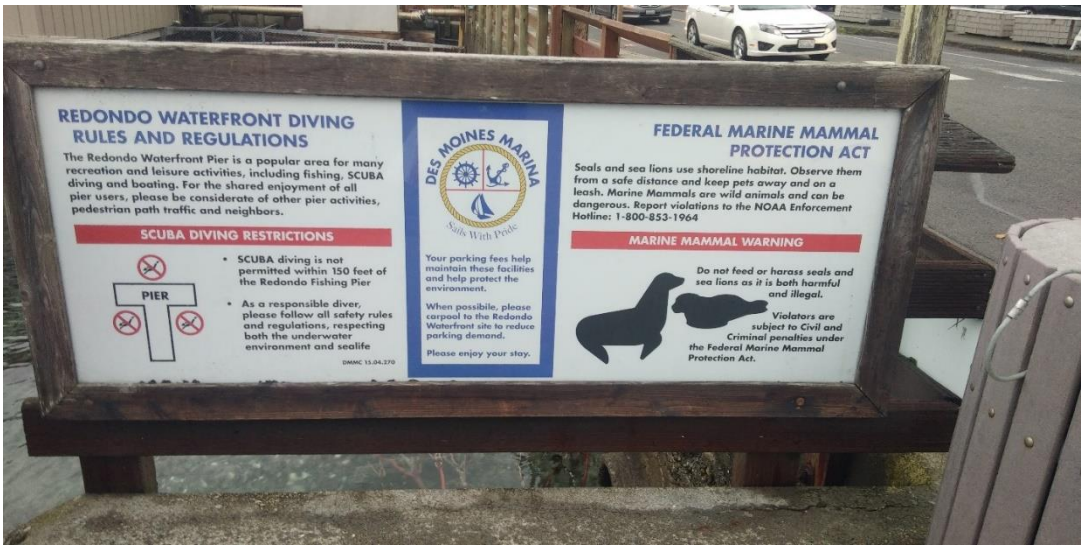

Figure 5.3: Rules and Regulations sign at Redondo Beach. Image taken by author

Redondo Beach was the last dive site visited situated just south of Seattle. There are two diving areas at this site. One is near the MaST Aquarium and the other a little north from Salty's restaurant. Both areas have many underwater vessels, artificial reefs and eelgrass beds. This site is home to many iconic organisms like the GPO and the Red Pacific Octopus. Divers have also found Copper rockfish, Buffalo sculpin, Stubby Squid, Tube Snouts and a variety of crab (Desmoineswa.gov. n.d.).

Dive shops and Dive clubs: To provide for Seattle's ever-growing dive community, the city is home to more than a dozen dive shops that provide the

necessary gear and instructors to assist both the experienced and the novice divers into Seattle's underwater world. Divers usually gravitate towards shops they are familiar with and even sign up to work with them once they get enough dives under their belt. Along with the dive shops, there are several clubs where divers from all walks of life and levels can congregate and share their love for the sport. Dive clubs help solo divers find dive buddies, organize large dive events and many times promote sustainable practices.

5.1.2 Seattle Aquarium

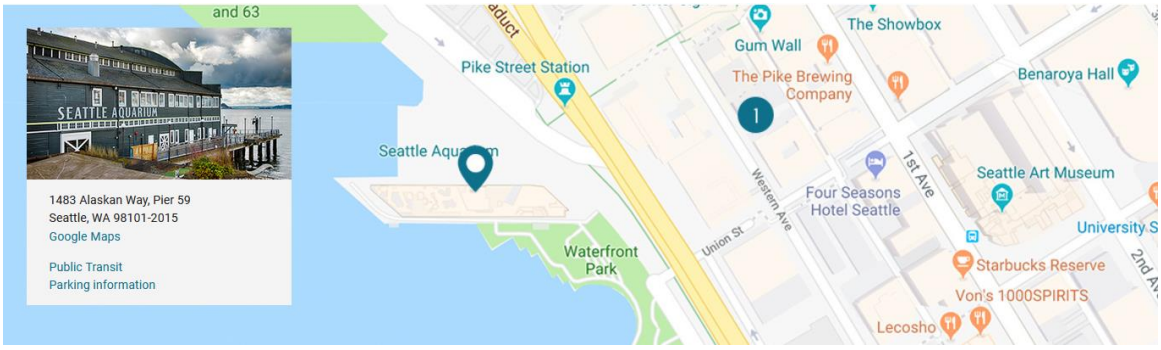

Figure 5.4: Seattle Aquarium is located in Downtown Seattle near Pike's Place Market. Image from Seattleaquarium.org

"Inspiring Conservation of Our Marine Environment", the mission statement is what is heard reiterated and seen being practiced at the Seattle Aquarium. Established in 1977, the Aquarium is famous for its interactive exhibits and events, drawing in around 25 million visitors in a year (Seattleaquarium.org. n.d.). Accredited by the Association of Zoos and Aquariums, it is the 9th largest aquarium in the United States and is home to an array of marine invertebrates and vertebrates.

One of its most iconic exhibits is the 120,000-gallon Window on Washington Waters, showcasing the ocean life in the depths of the Puget Sound. The Life on the Edge exhibit however, is what the Aquarium is known for. This area holds two large touch pools, the Inland and Outer Coasts, as well as the Giant Pacific Octopus (GPO). Other exhibits include the Pacific Coral Reef, Birds & Shores, the Underwater Dome and Marine Mammals.

Until 2010, it had been owned and operated by the City of Seattle Department of Parks and Recreation. It is now under the management of the Aquarium and is running

as a non-profit organization via an agreement with the City of Seattle Department of Parks and Recreation (Seattleaquarium.org. n.d.).

5.1.3 Geographical Coordinate System

For the purposes of this thesis, the geographical locations of the interviews were recorded as per the WGS 84 Web Mercator coordinate system. WGS 84 stands for the World Geodetic System 1984. It is a geodetic datum with a surface of an oblate spheroid and an origin at the center of Earth's mass. It was established by the National Geospatial-Intelligence Agency in 1984 and later revised in 2004. Web Mercator is a variant of the Mercator projection that is primarily utilized in Web-based mapping programs (Esri.com. n.d.). The location data was used to develop a map in the software RStudio (Figure 5.1) and ArcGIS Pro (Figure 5.5). For more maps and additional data visualization techniques, see Appendix 6.

Figure 5.5: Proportional symbols map of study area, interview sites and number of interviews per sight. Generated by author in ArcGIS Pro.

[15]Table 5.1: X and Y coordinates of all the locations of the dive shops, dive sites and dive clubs where the data collection took place.

S no.	X Coordinate	Y coordinate	Location Name	Number of Interviews
1	47.58751	-122.378	Cove 1	25
2	47.58869	-122.38	Cove 2	20
3	47.57827	-122.416	Alki Beach	4
4	47.34884	-122.325	Redondo Beach	2
5	47.68901	-122.31	Lighthouse	2
6	47.39187	-122.295	TLSea	3
7	47.60778	-122.343	Seattle Aquarium	30
8	47.6764	-122.396	Marker Buoy	5
9	47.70623	-122.345	Underwater sports	1
10	47.56731	-122.367	Seattle Dive Tours	5

5.2 Research Questions

In Chapter 1, there was but a short list of the questions addressed by this thesis. To thoroughly retrieve the answers to those questions, one can break them down into sections asking for specific comments and factors to fill the SWOT Analysis.

[15] This data was used to generate the maps in Appendix 6.

5.2.1 SWOT Analysis 1

SWOT Analysis 1 examines the status of the Octopus Survey Week Program (See Chapter 6, Section 6.4).

Table 5.2: Questions asked for Octopus Survey Week SWOT analysis to address the corresponding categories

Question No.	Question	Categories
1	Have you heard of the Octopus Survey Week program? [If no, provide a brief summary of the program]	Awareness of Program (Chapter 6 Section 6.3)
2	How do you think this program is useful or beneficial?	• Strengths (if asking Aquarium staff and volunteers) • Opportunities (if asking local divers and shop owners)
3	Is there anything you want to improve about the program?	• Weaknesses (if asking Aquarium staff and volunteers) • Threats (if asking local divers and shop owners)

5.2.2 SWOT Analysis 2

SWOT Analysis 2 examines the status of the Octopus Week program (See Chapter 6, Section 6.5).

Table 5.3: Questions asked for Octopus Week SWOT analysis to address the corresponding categories

Question No.	Question	Categories
1	Have you heard of the Octopus Week program? [If no, provide a brief summary of the program]	Awareness of Program (Chapter 6 Section 6.3)
2	How do you think this program is useful or beneficial?	• Strengths (if asking Aquarium staff and volunteers) • Opportunities (if asking local divers and shop owners)
3	Is there anything you want to improve about the program?	• Weaknesses (if asking Aquarium staff and volunteers) • Threats (if asking local divers and shop owners)

5.2.3 SWOT Analysis 3

SWOT Analysis 3 examines the potential to unite Octopus Survey Week and Octopus Week (See Chapter 6, Section 6.6).

Table 5.4: Questions asked for SWOT analysis examining the potential to combine Octopus Survey Week with Octopus Week. The questions address the corresponding categories

Question No.	Question	Categories
1	Do you think it is a good idea to combine the two programs?	Number of Interviewees who agree to Union (Chapter 6 Section 6.6.1)
2	What kind of benefits do you think can come out of such a union?	• Strengths (if asking Aquarium staff and volunteers) • Opportunities (if asking local divers and shop owners)
3	Are there any concerns or barriers that would prevent such a union?	• Weaknesses (if asking Aquarium staff and volunteers) • Threats (if asking local divers and shop owners)

5.3 Mixed Methods Research

This thesis used mixed methods research which, according to a Professor in the Department of Counseling and Instructional Sciences at the University of South Alabama and an affiliate of Sam Houston State University (Johnson et al. 2007, p. 123), is a type of research where:

> "a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration."

Table 5.5: A break-up of all the methods used in this thesis.

Qualitative Research Methods	Quantitative Research Methods
Semi-structured Interviews	SWOT Analysis
Focus Groups	
MECE[16]	
TOWS Analysis	

Along with the methods tabulated in Table 5.2, the interviewees were sampled according to purposive and snowballing principles. For more information about the various qualitative methods used in this thesis, please see Appendix 1.

5.4 Data Collection

Data collection for this thesis was conducted between October and December of 2019. The initial period of data collection coincided with Octopus Survey Week which was from 5 -13 October 2019. Data collection was done through a series of semi-structured interviews and focus groups at the Seattle Aquarium as well as at local accessible dive sites, dive shops and dive clubs (Table 1). The interviews lasted between 15-25 minutes covering questions regarding the individual programs and then the potential to combine those programs.

5.4.1 Target Groups

Ninety-five individuals from the Seattle Aquarium and their various stakeholders were targeted for the data collection. According to Freeman (1984, p. 46) stakeholders are “any group or individual who can affect or is affected by the achievement of the organization’s objectives”. Clarkson (1995) further categorized stakeholders into two types: the primary and secondary. Primary stakeholders are those “without whose continuing participation the corporation cannot survive as a going concern” (Clarkson, 1995, p 106). This group of stakeholders would include everyone from employees, shareholders, customers, investors, and public organizations. The secondary groups are defined as “those who influence or affect, or are influenced or affected by the corporation, but they are not engaged in transactions with the corporation and are not

[16] See Chapter 6 Section 6.2 on MECE or Mutually Exclusive, Collectively Exhaustive.

essential for its survival" (Clarkson, 1995. pp 106). For this thesis, the primary stakeholders were the employees while the secondary stakeholders were all the individuals that did not work for the Aquarium.

When looking at the stakeholders through the Broker-Local-Tourist (BLT) model (See Chapter 1), the Seattle aquarium a civil society broker. The dive shops and local businesses are private sector brokers and people who interact with the program are tourists or locals that live in the area.

The 'S' and the 'W': As discussed in Chapter 4, the strengths and weaknesses represent the internal positive and negative factors that affect the development and competitive position of a business or an institution (Goranczewski and Puciato, 2010). As such, thirty-six individuals part of the Seattle Aquarium's primary stakeholder group were interviewed: six staff members and thirty volunteers. While the volunteers are not paid and have certain restrictions, they have been integral to the daily function of the Aquarium since 1977. As stated on the Seattle Aquarium website (Seattleaquarium.org. n.d.), "Volunteers significantly contribute to the Aquarium's mission, *Inspiring Conservation of Our Marine Environment*, by serving as conservation leaders while gaining knowledge and developing new skills." As such, they have significant insight into the internal environment of the institution and the programs.

The 'O' and the 'T': The external positive and negative environmental factors that could assist or hinder a business or an institution are its Opportunities and Threats (See Chapter 4). To gather information on these factors, forty-eight individuals across Seattle Aquarium's various secondary stakeholders were approached. In the context of this thesis, this group comprises the local dive sites, clubs, shops and businesses (See previous sections).

Summary

The thesis took place in Seattle and greater Seattle area from October to December 2019. Interviews were conducted at five dive sites, two local businesses, two dive shops, two dive clubs and at the Seattle Aquarium. Individuals were a questioned about the current state of the two GPO marine conservation tourism programs at the

Aquarium. They were also asked if the programs should be combined and run as a single program once a year. All the data collected can be found in Appendix 4 and 5. The results of these interviews are reported in Chapter 6 and explained in Chapter 7.

Chapter 6: Data Analysis and Results

"If at first you don't succeed, call it Version 1" *~Manjari Misra*

Introduction

This chapter shall examine how the collected data was analyzed and highlight the results of the analysis. The factors were first defined based on the answers received from the interviews. They were then categorized using the MECE principle and placed in the SWOT matrices. Meanwhile, data regarding whether the interviewees knew of the program before the interview was also collected and analyzed. Lastly, all the data related to whether the two programs should be combined and the possible strategies was also analyzed. For full dataset, see Appendix 4 and 5.

6.1 Defining Factors

Once all the interviews had been completed, all the notes and recordings were compiled and analyzed. Data collected from the staff and volunteers at the Seattle Aquarium were categorized as the 'SW' while that from divers, dive shops, dive clubs and local businesses were categorized as 'OT'. There were keywords and phrases that were written down for each interview. Many of these were repeated across several interviews in each category. Going through the notes again, these phrases and keywords, as well as a few quotes, were then used to construct the factors to be placed in the SWOT matrix (Figure 6.1).

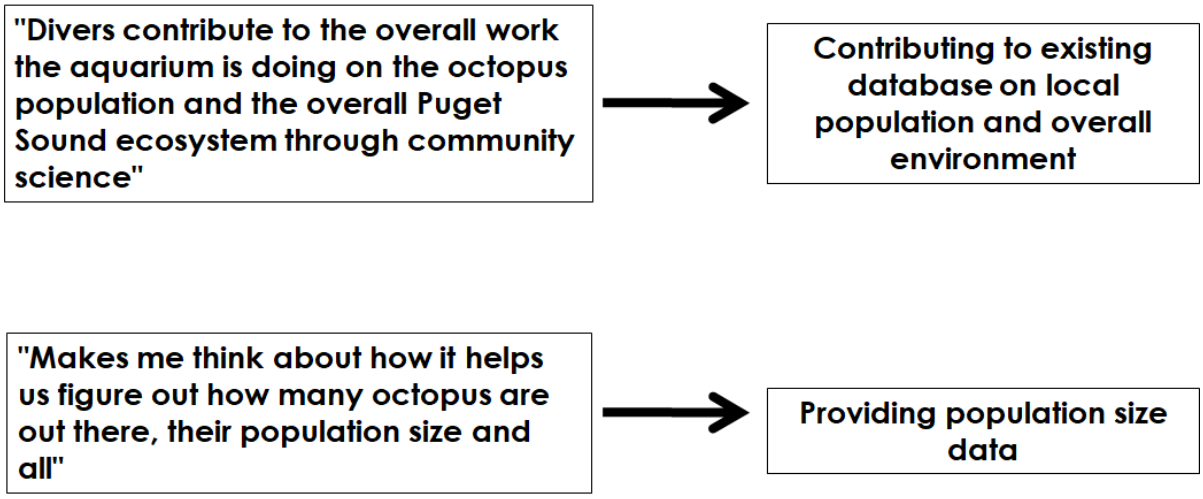

Figure 6.1: Keywords, phrases and quotes being converted to factors for the Strengths of the Octopus Survey Program SWOT matrix.

6.2 MECE

Once all the factors for the Strengths, Weaknesses, Opportunities and Threats headings were defined, some were noted to be rather similar in nature. For example, under the strengths of the Octopus Survey Week, “Contributing to existing database on local population and overall environment”, “Providing population size data”, “Providing population range”, “Providing comparative baseline” and “Providing consistent data as dive sites are listed for the survey” were all related to one another.

This led to the use of a principle known as MECE. MECE or Mutually Exclusive Collectively Exhaustive, is

“a grouping principle for segmenting a set of elements into subsets that are mutually exclusive (ME) and collectively exhaustive (CE). In particular, ME aims at reducing complexity by avoiding overlaps (i.e. no overlaps among the subsets) while CE aims at ensuring a comprehensive collection without leaving alternatives (i.e. no gaps among the sub-sets)” (Lee and Chen, 2018. pp 964).

In this thesis, there was an exhaustive list of factors and, while they may be related to one another, there was no overlap in what each factor attempts to address. Thus, going back to the aforementioned factors, “Providing population size data”, “Providing population range”, “Providing comparative baseline” and “Providing consistent data as

dive sites are listed for the survey" can all be nested under "Contributing to existing database on local population and overall environment". This sub setting is because all these factors related to contributing to some form of data, be it population size or range, that the Seattle Aquarium has been maintaining for several years. The following raw SWOT matrices showcase all the defined factors and their final nests (Tables 6.1, 6.3, 6.5).

6.3 Awareness of Programs

The data on the number of individuals who were aware of both program's existence was tallied in Microsoft Excel. This data was then used to develop bar graphs (Figure 6.2, 6.3 and 6.6).

6.3.1 Internal Awareness of Programs

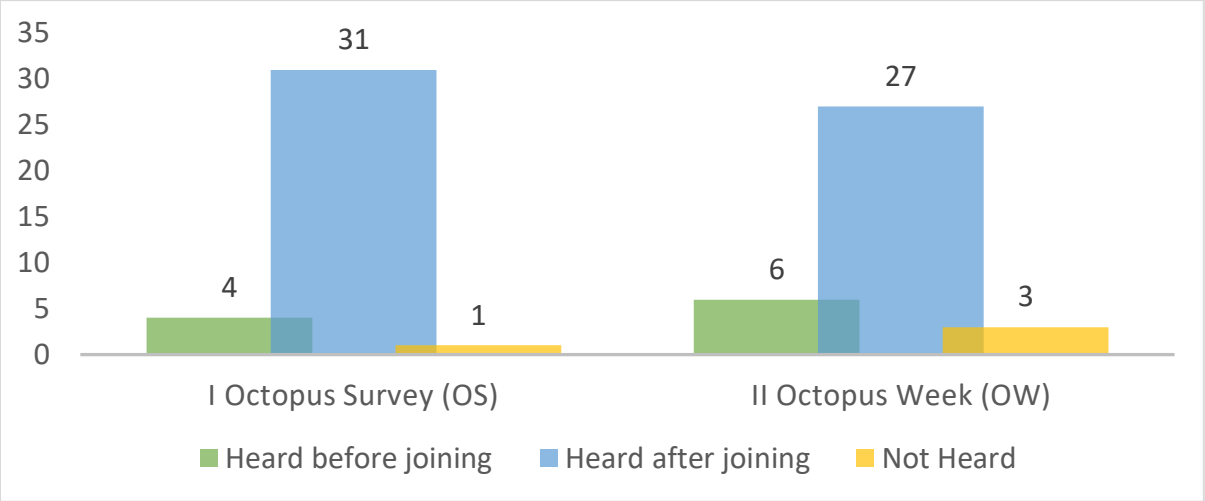

Figure 6.2: Bar graph showing number of internal interviewees who had either heard of the two programs before joining the Aquarium, after joining the Aquarium or had not heard of them until being asked about it in the interview. Bar graph was generated by the author in Microsoft Excel.

As seen in Figure 6.2, a majority of the 36 Seattle Aquarium staff and volunteers that were interviewed had not heard of neither Octopus Survey Week nor Octopus Week until after joining the Aquarium.

When asked about Octopus Survey Week, 31 interviewees learnt about the program's existence only after they joined the Aquarium (~86% of interviewees). While

4 interviewees had heard about the program before joining the Aquarium, 1 interviewee had not ever heard of the program at all until the interview.

In regard to, Octopus Week, 27 interviewees found out about the program's existence after they joined the Aquarium (~75% of interviewees). 6 interviewees had heard about the program prior to becoming part of the Aquarium and 3 interviewees, until the interview, had not heard of the program.

6.3.2 External Awareness of Programs

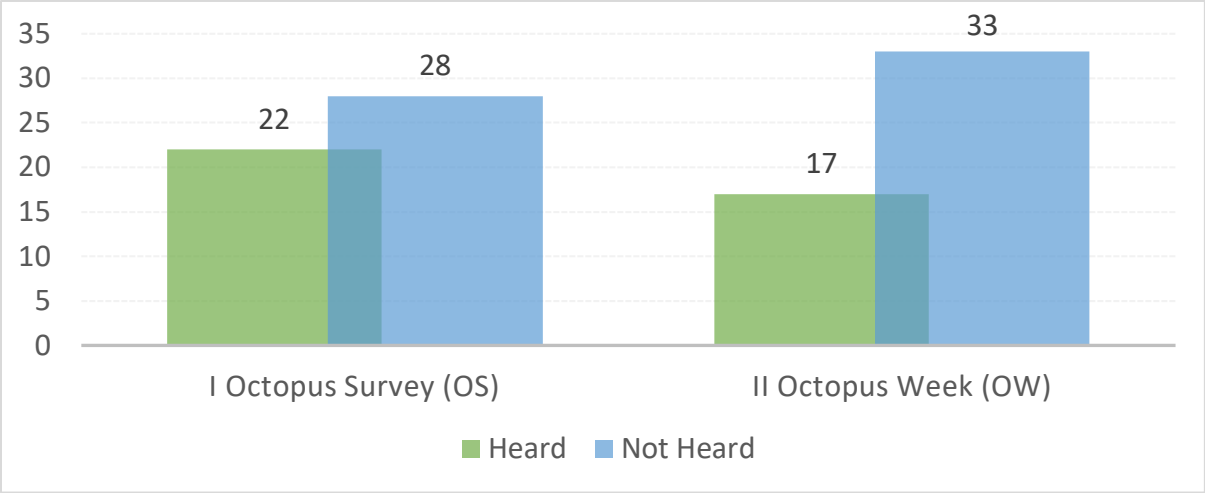

Figure 6.3: Bar graph showing number of external interviewees who had either heard of the two or not heard of them until being asked about it in the interview. Bar graph was generated by the author in Microsoft Excel.

Figure 6.3 shows that of the 50 divers, dive shop owners, dive club members and business owners that were interviewed, the majority had not heard of either Octopus Survey Week nor Octopus Week until being interviewed about them.

Breaking down the Octopus Survey Week results, 22 interviewees (~42% of interviewees) were aware of the existence of the program while 28 interviewees were not. For Octopus Week, 17 interviewees knew of the program (~34% of interviewees) while 33 did not.

6.4 Octopus Survey Week

6.4.1 SWOT Matrix

Table 6.1 is the raw version of the Octopus Survey Week SWOT analysis matrix. Under Strengths, at 24, “Existing relationship with divers, dive shops and dive clubs” is the highest stated factor amongst the internal interviewees. It is followed by “Contributing to existing database on local population and overall environment” which is at 10. However, when combined with its subsets, the total tally comes to be 24 as well. Then there is “Generating awareness” which, when alone is 3 and combined subset tally is 40. “Helping octopus conservation effort” and “Focusing on an iconic and charismatic species” are at 8 and 5 respectively. The rest of the raw data is read in a similar manner.

In regard to the Weaknesses, the highest tallied factor is “Inadequate amount of advertising and outreach to generate awareness on program and its goals” at 26. This is followed by “Limited information provided to staff and volunteers about program and results” at 14 and “No training provided for interested parties” at 10. “Inconsistencies in data recording” is at 8 while the remaining factors are below 5.

The highest tallied under Opportunities is “Generate Awareness” at 26. When all its subsets are combined and added up, the tally goes up to 49. “Collect data that indicates health of local environment” was individually tallied to be 17 while collectively its 29. “Engage and network with local divers, dive shops, dive clubs” comes to be 15.

Finally, “Lack of awareness regarding the existence of the program” is the highest tallied under Threats at 40 individually and 46 collectively. 15 was the tally for “improper data collection which then increased to 44 with the other subsets. “Barriers to diving” only came to be 6.

Table 6.1: Raw SWOT Matric of Octopus Survey Week showing factors under their main heading and all that are nested under said heading. Table was generated in Microsoft Excel.

OS_Strenghts				OS_Weaknesses			
Main Theme_OS_Strenght	Main heading_OS_Strenght	Nest_OS_Strenght	Tally_OS_Strenght	Main Theme_OS_Weakness	Main heading_OS_Weakness	Nest_OS_Weakness	Tally_OS_Weakness
Networking	Existing relationship with divers, dive shops and dive clubs		24	Awareness	Inadequate amount of advertising and outreach to generate awareness on program and its goals		26
Data collection	Contributing to existing database on local population and overall environment		10		Limited information provided to staff and volunteers about program and results		14
		Providing population size data	8	Data collection	No training provided for interested parties		10
		Providing population range	1		Inconsistencies in data recording		8
		Providing comparitive baseline	3		Limited to conditions suitable for diving		4
		Providing consistent data as dive sites are listed for the survey	2		Limited number of non-aquarium particapants		4
Awareness	Generating awareness		3	Timing of program	Insufficient number of surveys in a year (one is not enough)		4
		Generating awareness through community science	10		Time of year is not desirable		1
		Interesting community outreach program	11				
		Generating interest and awareness among non-divers	8				
		Engaging educational talking point to guests	7				
		Engaging non-scientists in scientific research	1				
Other	Helping octopus conservation effort		8				
	Focusing on an iconic and charasmatic species		5				

OS_Oppertunities				OS_Threats			
Main Theme_OS_Opportunity	Main heading_OS_Opportunity	Nest_OS_Opportunity	Tally_OS_Opportunity	Main Theme_OS_Threat	Main heading_OS_Threat	Nest_OS_Threat	Tally_OS_Threat
Networking	Engage and network with local divers, dive shops, dive clubs	Engage and network with local divers, dive shops, dive clubs	15	Awareness	Lack of awareness regarding the existence of the program	Lack of awareness regarding the existence of the program	40
Data collection	Collect data that indicates health of local environment	Collect data that indicates health of local environment	17			Lack of follow-up with divers regarding results of survey	4
		Generate baseline population size	11	Diving	Barriers to diving	Barriers to diving	6
		Gather data on octopus population	1	Data collection	Improper data collection	Improper data collection	15
Awareness	Generate awareness	Generate awareness	26			Not enough surveys in a year	19
		Promote Puget Sound ecology and conservation	10			Lack of training and direction	9
		Involve individuals who are not scientists in interesting scientific research	10			May harrass octopus as divers actively look for them	1
		Promote an an iconic animal	3				
Other	Generate unique identity of Aquarium	Generate unique identity of Aquarium	2				

The main heading factors with the highest number of tallies were then placed in the final version of the SWOT matrix (Figure 6.4).

Figure 6.4: Final SWOT Matric of Octopus Survey Week showing main heading factors from the Raw SWOT Matric of Octopus Survey Week. The factors in bold are the highest tallied factors. Figure was generated by the author in Microsoft Powerpoint.

6.4.2 TOWS Matrix

Using the factors in Figure 4, the following table (Table 6.2) was developed with the various remarks and suggestions the interviewees provided for Octopus Survey Week. These quotes have been placed in specific boxes in the table to show how the suggestions can utilize the Aquarium's Strengths, Weaknesses, Opportunities and Threats to improve the program.

Table 6.2: TOWS Matrix of Octopus Survey Week showing the various strategies that can be used under the various factor combinations. Table was generated in Microsoft Excel.

Strengths-Opportunities	Weaknesses-Opportunities
"Get the word out by putting up posters, flyers in dive shops, dive clubs"	"Usually population surveys are done in partnership with other entities"
	"Maybe use other outlets like schools to advertise the event"
	"It would be really interesting if we could let visitors somehow be involved in the survey like if we could live stream dives that were happening during the survey to the Aquarium, that would be really cool"
	"Having some video of a survey dive would be really neat"
Strengths-Threats	**Weaknesses-Threats**
"Maybe provide instruction on how to properly record parameters via local dive clubs"	"Entice more people into joining by giving them incentives like discounts, special T-shirts, diving merchandise…things like that"
"You need to provide results of the survey to the particapating dive clubs"	"We need a better marketing story for this where we can have octopus tie in with human some how"
	"Set up a way for divers to maintain current skills and learn new ones to help during survey and other diving activities"
	"Reef.org has better octopus survey data and collects thourghout the year. Maybe do something similar for the octopus survey as 1 week is not enough time to survey"

6.5 Octopus Week

6.5.1 SWOT Matrix

The raw Octopus Week SWOT analysis matrix (Table 6.3) reveals that the highest tallied under Strengths, is "Starting a conversation on marine conservation" at 24 separately and 28 collectively. "Educating people on and celebrating the octopus" comes next at 17 but when combined with its nest, comes to 29. "Generating media publicity" comes next, which, when alone is 2 but when combined with its subsets is 28.

The highest collectively tallied factor is "Limited number of enrichment activities for people" at 36 (otherwise was individually only 4). This is followed by "No additional volunteer training for the program" at 6 and 10 individually and collectively respectively. "Inadequate amount of advertising and outreach" is at 9 and "Admission costs are too expensive for people" is at 8 while the remaining factors are below 5.

Under Opportunities, "Generate awareness on octopus" is at 31. The tally goes up to 54 when all its subsets are combined and added up. This factor is followed by "Generate awareness on marine conservation" at 19 and then "Engage families" at 5.

The highest tallied Threat at 32 was “Lack of awareness regarding the existence of the program” followed by “Guest attendance limited by ticket price” at 5.

Table 6.3: Raw SWOT Matric of Octopus Week showing factors under their main heading and all that are nested under said heading. Table was generated in Microsoft Excel.

OW_Strenghts				OW_Weaknesses			
Main Theme_OW_Strenght	Main heading_OW_Strenght	Nest_OW_Strenght	Tally_OW_Strenght	Main Theme_OW_Weakness	Main heading_OW_Weakness	Nest_OW_Weakness	Tally_OW_Weakness
Conservation	Starting a conversation on marine conservation		24		Limited number of enrichment activities for people	Limited number of enrichment activities for people	4
		Highlighting the complexity of the invertebrates of Puget Sound	4			Limited use of video technology	10
Education	Educating people on and celebrating the octopus		17			Removal of old activities that volunteers and visitors miss	9
		Helping change perception of a species not well understood by most	8			Limited attention to other cephalopds in the aquarium	7
		Focusing on an iconic and charasmatic species	4			Time of year does not coincide with school break	5
Publicity	Generating media publicity		2			Challenging to come up with new content each year	1
		Evolving constantly to keep visitors engaged	3		No additional volunteer training for the program	No additional volunteer training for the program	6
		Engaging activities to watch and paricapate in like the releases	13			Inadequate crowd management during activities	2
		Having the old yet memorable association with Valentine's Day	10			Ocotpus exhibit area is too small for public viewing	2
					Inadequate amount of advertising and outreach	Inadequate amount of advertising and outreach	9
					Admission costs are too expensive for people	Admission costs are too expensive for people	8
					Extremely staff intensive event	Extremely staff intensive event	3
					Limited to once in a year	Limited to once in a year	1

OW_Oppertunities				OW_Threats			
Main Theme_OW_Opportunity	Main heading_OW_Opportunity	Nest_OW_Opportunity	Tally_OW_Opportunity	Main Theme_OW_Threat	Main heading_OW_Threat	Nest_OW_Threat	Tally_OW_Threat
	Generate awareness on marine conservation	Generate awareness on marine conservation	19		Lack of awareness regarding the existence of the program	Lack of awareness regarding the existence of the program	32
	Generate awareness on octopus	Generate awareness on octopus	31		Guest attendence limited by ticket price	Guest attendence limited by ticket price	5
		Change perception on octopus	21		Lack of use of technology	Lack of use of technology	2
		Highlight an iconic animal	2				
	Engage families	Engage families	5				
	Generate revenue for the aquarium	Generate revenue for the aquarium	1				

The main heading factors with the highest number of tallies were then placed in the final version of the SWOT matrix (Figure 6.5).

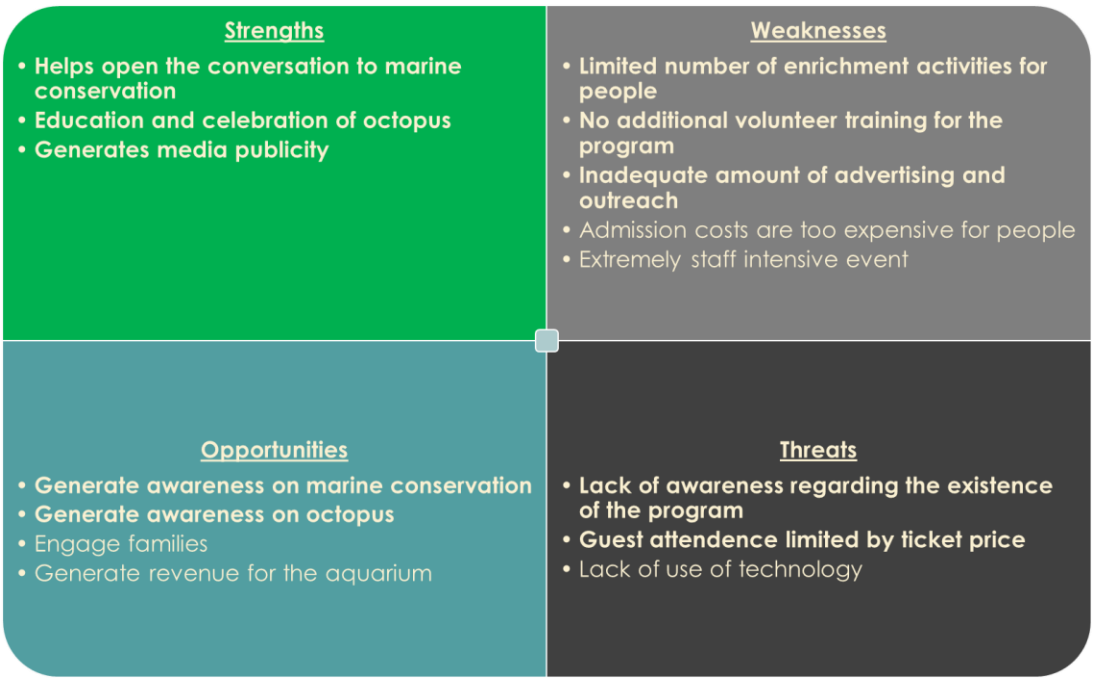

Figure 6.5: Final SWOT Matric of Octopus Week showing main heading factors from the Raw SWOT Matrix of Octopus Week. The factors in bold are the highest tallied factors. Figure was generated by the author in Microsoft PowerPoint.

6.5.2 TOWS Matrix

The TOWS matrix for Octopus Week (Table 6.4) was generated using the factors in Figure 6.5. As with Table 6.2, the strategies are quotes provided by various interviewees when asked for suggestions on how to improve the program. The suggestions have been placed according to their specific factor combinations.

Table 6.4: TOWS Matrix of Octopus Survey Week showing the various strategies that can be used under the various factor combinations. Table was generated in Microsoft Excel.

Strengths-Opportunities	Weaknesses-Opportunities
"You should involve divers more in octopus week, like have them give talks"	"You should have the program more than once a year so that people have more opportunities to bond with octopus"
"Include more octopus research and stories in the event"	"Maybe have a separate workshop for divers on more advaced octopus topics"
Strengths-Threats	**Weaknesses-Threats**
"What would be cool is if you could livestream or record octopus releases"	"Kids that are 13 years and above are asked to pay adult prices which should not happen as teenagers should have easier access to the aquarium"
	"You should invite more youth groups and students"

6.6 Combining Octopus Survey Week and Octopus Week

6.6.1 Number of Interviewees who Agree to the Union

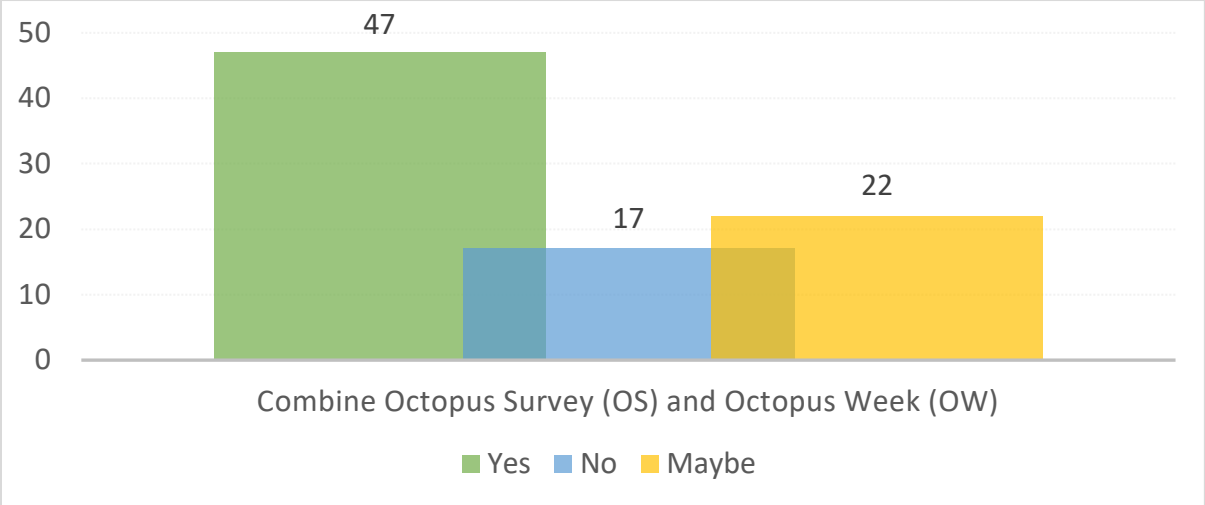

Figure 6.6: Bar graph showing number of both internal and external interviewees who agree or disagree with combining Octopus Survey Week and Octopus Week. Bar graph was generated by the author in Microsoft Excel.

Looking at Figure 6.6, the majority of the 86 internal and external interviewees agree with combining the Octopus Survey Week and Octopus Week program.

47 interviewees agree with the idea of combining the two programs (~55%) while 17 disagreed. 22 interviewees were unsure but considered combining favorably.

6.6.2 SWOT Matrix

The raw version of the Combine Program SWOT analysis matrix (Table 6.5) showcases the Strengths the Seattle Aquarium possess that would make the union of the programs possible. “Has ability to make one big event promote the octopus in a more concentrated and in-depth way” is the highest stated factor amongst the internal interviewees, tallying in at 18 individually and 45 collectively. The next factors are “Existing relationship with divers, dive shops and dive clubs” and “Generating impact on community” tally in at 14 each. Then there is “Generating interest and awareness among non-divers” at 6. The rest of the factors tally in at and less than 3.

The highest tallied factor under Weaknesses that could internally hamper the union of the programs is “Logistical challenge for staff and volunteers” at 18 individually

and 39 when combined with the other nested factors. This other factor at 5 is “May reduce the number of attendees and participants”. Collectively, the tally for this factor comes to 6.

There are then the external Opportunities that the Seattle Aquarium can utilize to make the union possible. “Bring different communities together” is tallied to be 5. Once its nested factors are added up, the total tally comes out to be 31. “Generate awareness” was individually tallied to be 2 while collectively tallied to be 28.

Finally, the external Threats to inhibit the union of the two programs have several factors. “Workload and logistics” are tallied to be 18, followed by “Timing the event with octopus availability” at 14. The other factors are tallied to be at 2 or less.

Table 6.5: Raw SWOT Matrix of possible union of Octopus Survey Week and Octopus Week showing factors under their main heading and all that are nested under said heading. Table was generated in Microsoft Excel.

COSW_Strenghts				COSW_Weaknesses			
Main Theme_COSW_Strenght	Main heading_COSW_Strenght	Nest_COSW_Strenght	Tally_COSW_Strenght	Main Theme_COSW_Weakness	Main heading_COSW_Weakness	Nest_COSW_Weakness	Tally_COSW_Weakness
	Has the ability to better intermingle ideas and outreach		3		Logisitcal challenge for staff and volunteers		18
	Existing relationship with divers, dive shops and dive clubs		14			Coordinating time in the year	14
	Has ability to make one big event promote the octopus in a more concentrated and in-depth way		18			Lack of time to prepare sruvey results	5
		Promoting the survey	3			Data logging in real-time may be a challenge	2
		Existing aquarium data on local environment to educate people about it	1		May reduce the number of attendees and particapants		4
		Exisisting media connections to promote event and aquarium	12			Limits public attention to octopus to only once a year	1
		Connecting aquarium visitors to events occuring in the water in real-time	11				
	Free from limitations of any specific holiday		1				
	Increasing number of guests		1				
	Generating impact on community		14				
	Generating more revenue than having the programs separate		1				
	Generating interest and awareness among non-divers		6				
OW_Oppertunities				OW_Threats			
Main Theme_COSW_Opportunity	Main heading_COSW_Opportunity	Nest_COSW_Opportunity	Tally_COSW_Opportunity	Main Theme_COSW_Threat	Main heading_COSW_Threat	Nest_COSW_Threat	Tally_COSW_Threat
	Bring different communities together		5		Workload and logistics		18
		Streghten relationship between divers and the aquarium	8		Timing the event with octopus availibility		14
		Could provide more media coverage and diver engagement	11		Funds		2
		To get non-divers interested in diving	3		Limits octopus event to only one a year		2
		Improve citizen scientist numbers	4		Slow data collection		1
	Generate awareness		2				
		Promote the octopus in a more concentrated and in-depth way	17				
		Generate awareness on octopus	1				
		Generate more awareness in community	8				
	Attract more tourists into the aquarium		1				

These factors are shown in the final version of the SWOT matrix (Figure 6.7).

Figure 6.7: Final SWOT Matrix of the possible union of Octopus Survey Week and Octopus Week showing main heading factors from the Raw SWOT Matrix. The factors in bold are the highest tallied factors. Figure was generated by the author in Microsoft PowerPoint.

6.6.3 TOWS Matrix

Table 6.6 is the TOWS matrix for the possible union of Octopus Survey Week and Octopus Week, generated using Figure 6.7. The strategies are quotes provided by various interviewees when asked for suggestions on how to improve the program. The suggestions have been placed according to their specific factor combinations.

Table 6.6: TOWS Matrix of Octopus Survey Week showing the various strategies that can be used under the various factor combinations. Table was generated by the author in Microsoft Excel.

Strengths-Opportunities	Weaknesses-Opportunities
"The programs should also include workshops or talks regarding octopus and current issues like climate change etc."	"Look for collaboration with students in high schools and universities (biology) as well as staff"
"Include more people in the dive community in the events. Maybe reach out to PADI, SDI to promote events and programs on the newsletter"	
Strengths-Threats	**Weaknesses-Threats**
"Have survey all year round then promote it with Octopus week"	"Have Octopus week and survey week closer together"
	"If you need to keep them separated, then just make the events are closer together and connect them better"

Summary

After the data was collected, it was reviewed and collated in Microsoft Excel under defined factors. These factors were tallied and placed in the SWOT matrix using the MECE principle to assist with creating a concise and clear matrix. A majority of interviewees were not aware of either Octopus Survey Week or Octopus Week. However, they kept referring back to the factor on generating some form of awareness around marine conservation and octopus conservation. Many interviewees were concerned over lack of additional training for the two programs. The majority also agreed to have these events combined into one program, though expressed concern over logistical and workload challenges.

Chapter 7: Discussion

"How did the octopus survive his business meeting? He came well-armed"
~Manjari Misra

Introduction

Marine conservation tourism (MCT) comprises various models that aim to assist in the preservation of the natural world through tourism-related activities. According to Buckley (2010), these models are usually commercial in nature. However, there have been non-commercial models in the field (See Chapter 1). This thesis aimed to determine whether the commercial models could be infused with an overlay of non-commercial models and yet, be viable if not more viable To determine this viability, two representative programs at the Seattle Aquarium (Octopus Survey Week and Octopus Week) were analyzed to verify if they could be combined into one program using SWOT analysis.

This chapter will breakdown the results of the analysis (See Chapter 6) and recommend actionable strategies to the Seattle Aquarium for their Octopus Survey Week and Octopus Week programs. The chapter will also recommend the steps to take regarding the union of the two programs. In the end, the limitations of the thesis will be addressed as well as how this thesis fits into the wider conservation tourism field.

7.1 SWOT and TOWS Analysis Breakdown

7.1.1 Octopus Survey Week

The majority of interviewees voiced concern on the overall state of the program. The SWOT matrix (See Chapter 6, Figure 6.4) highlighted various factors that internally inform and externally impact Octopus Survey Week. The TOWS matrix (See Chapter 6, Table 6.2) used logical combinations of these factors to place the various quoted recommendations.

A key strength of the program was that the Aquarium has an existing relationship with the dive community. This strength can be used to take advantage of two identified opportunities. The opportunity to engage with more individuals in the dive community and the opportunity to generate more awareness. Several interviewees recommended

that there should be more outreach done through the dive shops and clubs that the Aquarium is familiar with. The outreach could help further build the unique identity the Aquarium has in the Seattle area.

Another way to build on the strength is by trying to mitigate the identified threats. One such threat is the general lack of awareness regarding the program's existence. Even if people do know about it, they are not sure how to go about collecting survey data in an efficient and sustainable manner. While outreach to the dive community may help, interviewees also recommended training workshops for interested participants as another way to tackle these issues. The workshops would also help reduce the identified weaknesses as well and improve the quality of the survey database, by reducing inconsistencies in data collection. The workshops (if promoted well) could also increase the number of participants by providing them with the tools and confidence they need to count the number of octopus in the ocean while diving. And, in turn, the sample size of the data would increase which would make the results more reliable. These workshops would also help strengthen the community, building off old relationships with the public and creating new ones

The interviewees recommended several other ways to generate awareness regarding the program and increase its participants. They recommended reaching out to not just members of the dive community, but also individuals that are part of various educational institutions (i.e. schools, universities). Sharing the results of the survey is a one such manner of reaching out and getting more individuals involved. However, individuals may not be too keen to participate unless there are incentives involved. The divers believe that some form of incentive, be it a discount or recognition, would bring more individuals to report their dives to the Aquarium during Octopus Survey Week. Additionally, conducting the survey in partnership with these institutions as well as other organizations would also help promote the program more.

7.1.2 Octopus Week

The majority of interviewees were aware and familiar with the Octopus Week and generally satisfied with how it is being conducted. The SWOT analysis for this program

(Chapter 6, Figure 5), highlighted the strengths of the program. The internal interviewees praise the program for promoting the Giant Pacific Octopus and starting a conversation regarding life in the Puget Sound and the need to conserve it. The program has also helped establish the Aquarium as a key tourist attraction in Seattle. During the week, several media outlets promote and cover the program, which generates more awareness around it and the octopus itself.

Both internal and external interviewees have professed interest in learning more about not just the octopus but octopus related research done by the Aquarium and other scientists. They also expressed interest in having more diver talks to hear about their experiences with octopuses in their natural habitats.

Despite the positive feedback surrounding the program, there is still a lack of awareness regarding the program amongst the external interviewees. One point to note is that most of the internal interviewees had not heard about the program until joining the Aquarium. To take advantage of the opportunity at hand, as well as mitigate the weaknesses and threats to the program, the interviewees recommended more outreach to schools and youth groups. Some have stated that the expensive ticket prices dissuade people from coming to the Aquarium and have suggested providing special discounts for school children, even the ones above the age of twelve.

Several interviewees have stated that there was limited use of video technology which would enrich the experience of both the organizers and the participants. They recommended livestreaming the Giant Pacific Octopus tanks and making the videos of the octopus releases be available on the Aquarium website. This could also help with the affordability issue for certain groups of people because it costs nothing to watch live streams, for example, in a public library.

Some of the internal interviewees have stated that they are not prepared for the increase of visitors during the program and are unable to manage the crowds efficiently. They said that they would like the Aquarium to provide an additional training workshop on the matter as well as teaching the volunteers about the octopus and other cephalopods in greater detail for the program.

7.1.3 Combining Octopus Survey Week and Octopus Week

When all the interviewees (internal and external) were asked about whether Octopus Survey Week and Octopus Week should be combined, the majority agreed. They stated that the Aquarium has the capability to undertake such a project. In this SWOT matrix, the factors defined for the strengths of the individual programs are reiterated. The interviewees state that the Aquarium's existing network of divers, its current ability to generate awareness, media connections and its existing octopus survey data would help set up this new, all-encompassing program. Creating such a program would generate even more awareness amongst both divers and non-divers and thus get more individuals to participate in the survey.

Despite this, many of the interviewees recognized that undertaking such a project would involve a lot of manpower and logistical coordination which would be a challenge for the staff and volunteers of the Aquarium. They would also have to time the event in accordance with the availability of octopuses in the ocean and the optimal time to dive in the year. As discussed in Chapter 2, GPOs, while available throughout the year, thrive in temperatures between 7 and 9.5°C (High, 1976; Scheel et al. 2007). According to local divers, the optimal time to dive in the year is between September and January. This is because once the temperature starts to rise, the visibility in the Puget Sound decreases due to algal blooms.

To compensate for these weaknesses and threats, the interviewees suggested that if the union of the two programs was not possible, they should at least be connected in some form. Involving the dive community in the Octopus Week event, especially those that took part in the Octopus Survey Week, would educate the visitors more about octopuses and the marine life in the Puget Sound. Some even suggested moving the two events closer together in the year. Many wished to see the survey happen all year round as seen with other population surveys like those done by REEF (Reef.org. 2020).

7.2 Recommendations

Based on the results reported in Chapter 6 and the breakdown of said results in Section 7.1, the following is a list of Recommendations (Rs) that the Aquarium could consider undertaking for each program.

7.2.1 Octopus Survey Week

R1 Invest in outreach to promote the program amongst members of the dive community

- Place posters and advertisements in local dive shops, dive clubs as well as shops and restaurants near popular dive sites in the Seattle Area
    - Pon Flur de Cana and Sunfish Fish and Chips near Alki Beach have expressed interest in assisting in the promotion of the program
- Partner with or reach out to scuba diving certification agencies like the Professional Association of Diving Instructors (PADI, 2020) and Scuba Diving International (SDI | TDI | ERDI | PFI, 2020).
- Partner with or reach out to other institutions that conduct population surveys like REEF (Reef.org. 2020)
- Provide incentives to divers to participate in the survey such as discounts to visit the aquarium and/or gift vouchers for the aquarium gift shop

R2 Offer training workshops to interested parties to teach them how to find octopuses, record the relevant data and submit the data through the Aquarium website or any alternative means

R3 Share the results of the survey with all the participants as well as staff and volunteers at the Aquarium

- Conduct a talk at the local dive clubs where the speaker can present the year's results, compare them to the previous year's data as well as recommend better data collection and recording strategies
    - Marker Buoy Dive Club and TLSea expressed great interest in learning about the results of the surveys they participated in
- Send an email blast or provide another interactive medium to the staff and volunteers regarding the survey and its results.
- Provide a more detailed talk or workshop about the survey results to the Aquarium volunteers

R5 Screen or livestream videos of survey data collection in progress in the Aquarium and on the Aquarium website

R6 Conduct the survey for an extended period of time, either for the whole month of October or throughout the year, thereby increasing the range and validity of the data.

7.2.2 Octopus Week

R7 Invest in outreach to promote the program at public and private schools as well as youth groups in the Seattle Area

R8 Provide capacity building workshops to volunteers on octopus information and crowd management

7.2.3 Combining Octopus Survey Week and Octopus Week

R9 If possible, combine two programs into one big program where the divers are conducting the survey in the Puget Sound while the Aquarium conducts various visitor engagement activities around the Giant Pacific Octopus and other cephalopods

- If the union of the two programs is not possible then
    - Organize events during Octopus Survey Week and Octopus Week where divers that participated in the survey engage with visitors and share their experiences in the water

- During Octopus Survey Week, set up a scoreboard that shows the divers that have found the highest number of octopuses in their dives
- During Octopus Week, set up a leader board with the top three or five divers who found the highest number of octopuses in their dives
- During Octopus Week, have screenings of dives during Octopus Survey Week

7.3 Limitations of the Thesis

This thesis followed sound qualitative methodologies to conduct the SWOT analysis and develop the TOWS matrices (See Appendix 1). However, there were foreseen and unforeseen limitations.

7.3.1 Data Collection

There were several practical and logistical issues that may have affected the quality of the data. The thesis was conducted on a part-time basis and, data collection demands competed with institutional, professional and personal demands. The interview locations spanned across the Seattle area and were challenging to reach, especially without personal transportation and additional resources. Ideally, this kind of research would take place with financial and transportation support as well as additional manpower. Such assistance would have helped reduce the sample frame bias. The sample for this thesis was selected based on the available time and resources. Octopus Survey Week took place in the first week of October and was a suitable time to commence data collection. This restricted the sample for external stakeholders to mostly divers. In theory, the data collection would have continued into Octopus Week, interviewing the visitors to the Aquarium as well as other Aquarium stakeholders like their media partners.

7.3.3 Data Analysis

Qualitative research heavily relies on not only the researcher's skill but also their rigor and objectivity. Personal biases and idiosyncrasies can compromise the quality of the research. The researcher is also ever-present during data collection (ie.

interviewing) and direct interaction with the subjects can also affect the quality of the data. In the presence of the interviewer, the interviewee may respond to question based on not what they believe but what they consider the interviewer wants to hear (Anderson, 2010). These issues can be mitigated by the interviewer. They have to be alert and open to all possibilities and perspectives (Fine, 1994). The interviewer must also limit themselves from interrupting the flow of the conversation, providing subtle encouragements and not unwanted verbalizations that would inhibit unbiased and influenced information (Keats, 1993).

Another limitation of qualitative research is the quantity of the collected data. Qualitative data can be voluminous in nature and thus, it is a rather time-consuming task to analyze, interpret and present it (Anderson 2010). Interpreting and analyzing the data in qualitative research can be a challenge. For this thesis, the interview data was used to define the various SWOT matrix factors. These factors were defined based on the context of the thesis and the response the interviewee provided to questions about the programs. There is a possibility that the factors were not clearly defined and may have overlapped with others (See Chapter 4). To complete the thesis in a timely manner, the 86 interviews were not transcribed, rather just used to take notes. Thus, to temper the issues around the factors, the interviews were analyzed multiple times to make informed judgements on the final definitions of the factors.

Summary

In this chapter, the results reported in Chapter 6 were analyzed and interpreted in detail. Based on the analysis of the data, there are several recommendations that the Seattle Aquarium can consider undertaking. While not all recommendations may not all be implemented, some would greatly benefit the Aquarium, the local community and the conservation efforts focussed on the Giant Pacific Octopus.

To overcome the limited advertisement and lack of awareness regarding both Octopus Survey Week and Octopus Week, the Aquarium should focus more resources on outreach and awareness. This can be done by building through the network they currently possess as well as potential new connections. Incentives such as discounts

could be a useful tactic to improve participant numbers as well. To improve the quality of the data collected by the participants of Octopus Survey Week as well as the capabilities of the volunteers assisting in Octopus Week, special training workshops should be provided for interested parties.

While the majority of the interviewees stated that they want to see the two programs combined, they understood why logistics and workload may not allow that to happen. Thus, they would like the two programs to be better connected as they both focus on the Giant Pacific Octopus and overall marine ecology of the Puget Sound.

Even with these results, one must be wary of the limitations of the thesis. Despite the techniques used to curb them, there is always room to improve the methods and analysis.

Looking Forward and Concluding Remarks

The factors defined and collated into the SWOT matrices as well as the recommendations can be presented to the Seattle Aquarium who can take the next strategic and actionable steps. As stated in Chapter 4, the Aquarium could use the Analytical Hierarchy Process (AHP) to rank the defined factors in the SWOT matrices and the recommendations based on pre-determined criteria or priorities such as feasibility, communication and increase in program participants (Wickramasinghe and Takano, 2009; Oreski, 2012).

SWOT analysis is a dynamic form of qualitative research that can be used to inform the Seattle Aquarium on the current state of their other programs and provide them with the tools to design and launch new ones. As discussed in Chapter 4, several protected areas have used this tool to enhance their infrastructure and by extension, their business and conservation practices. However, the SWOT analysis is not limited to commercial models of conservation tourism. They can be used to study the efficiency of non-commercial models like the viability of research projects using tourist's data collectors.

Wildlife conservation practices are not effective unless they have been planned according to not just the available scientific data but also the available and effective use of capital, human resources and human capabilities. This thesis highlights this fact as factors like the lack of awareness regarding the program negatively impacts their effectiveness. Moving forward, business strategy tools can be extremely useful to conceive and plan not just conservation tourism programs but other forms of conservation programs as well. One hopes that this thesis influences students and practitioners in marine and environmental affairs to look beyond their current curricula and integrate business strategy practices into their work. This integration would help these individuals make actionable recommendations and decisions to move forward and create a bigger impact in the global environmental movement.

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Chapter 1

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Appendices

Appendix 1: The Qualitative Methods

This thesis was undertaken with a mixed methods approach. The single quantitative method used was the SWOT analysis (see Chapter 4). This Appendix is a supplementary material which explains the qualitative methods used in data collection.

Introduction

No matter what the field, scientific studies have always been defined by the use of a quantitative approach. Newman et al. (1993, p. 3), Professors from the Education departments from the University of Akron and University of Dayton, stated that:

> "The quantitative approach is used when one'-begins with a theory (or hypothesis) and tests for confirmation or disconfirmation of that hypothesis."

Another, more verbose definition of the approach was proposed by Creswell and Creswell (2017, p. 18), professors of family medicine at the University of Michigan and psychology at Carnegie Mellon respectively. They stated that:

> "A quantitative approach is one in which the investigator primarily uses postpositivist claims for developing knowledge (i.e., cause and effect thinking, reduction to specific variables and hypotheses and questions, use of measurement and observation, and the test of theories), employs strategies of inquiry such as experiments and surveys, and collects data on predetermined instruments that yield statistical data."

To break it down, quantitative approaches are formal, objective and elementary means to answer a particular question or tackle a topic of interest. They are highly comprehensive and supported by statistical imagery generated from collected data. They are not only popular with scientists but also business strategists and market researchers. Its elementary methods tend to be financially feasible and allow for swift results, making it more appealing to conduct and participate in. When utilizing large

sample sizes, quantitative research provides a clear understanding of the market performance of a business or product (Winter, 2000).

For examples, quantitative methods such as surveys and questionnaires, ask all participants identical questions in the same order to maintain uniformity and replication. The responses are usually selected from categories that are close ended. This method allows for easy and meaningful comparison of responses across both participants and study sites.

In comparison, Newman et al. (1993, p.3) states that

> "The qualitative, naturalistic approach is used when observing and interpreting reality with the aim of developing a theory that will explain what was experienced."

Creswell and Creswell (2017, p. 18) further define the qualitative approach as:

> "one in which the inquirer often makes knowledge claims based primarily on constructivist perspectives (i.e., the multiple meanings of individual experiences, meanings socially and historically constructed, with an intent of developing a theory or pattern) or advocacy/participatory perspectives (i.e., political, issue-oriented, collaborative. or change-oriented) or both."

To put it simply, a qualitative approach seeks out an understanding with the assumption that reality is a fluid social construct (Firestone, 1987). When conducting qualitative research, like quantitative research, you conduct an investigation to answer a particular question with a set of predefined methods to collect and analyze evidence to produce previously undetermined findings. A qualitative approach adds a holistic view to the research by including local context and perspectives of the various parties involved. Thus, it is effective in acquiring information regarding behavior, opinions, social norms and practices of populations of interest i.e. intangible factors (Mack, 2005).

Unlike quantitative, qualitative research is rather flexible and informal (Mack, 2005). There is a factor on spontaneity involved in the research which allows one to dive deeper into their investigation. It also allows for quick adaptation and probing during interactions between the researcher and study participant. For example, when conducting qualitative research like interviews, the interviewer would ask mostly open-ended questions. These questions that would be tailor-made to each interviewee based on their professional, social and cultural background as well as any additional cues. Open-ended questions allow for more complex responses, providing the interviewer with the opportunity to further probe and delve into the interviewee's perspective on the topic of interest.

For years, there has been a dichotomy between qualitative and quantitative research strategies, especially when dealing with social sciences. Since the approaches are so different, there is a preconceived notion that they are incompatible. That is far from reality.

Take the flexibility of an approach. It is not a gauge that determines one from the other and how more scientifically rigorous they are to one another. In both quantitative and qualitative research, there is a range of flexibility among the various methods they apply. This flexibility is more about how the problem is being dissected rather than the methods used to test it. As such we can say that during an investigation into a problem or topic, the two approaches can be used as an isolated means to get to the solution or can be used in tandem (Newman et al 1993). For example, one can modify quantitative research questions using the feedback loops in qualitative analysis, probing for more in-depth answers, thus, providing quantitative and qualitative results. However, this depends on the research question and how constant it is with the research design.

1.1 Qualitative Approach to Conservation Research

Conservation is steeped in quantitative research which leaves out a critical aspect required in this field: human engagement. For holistic and net positively significant results, conservation research should incorporate social sciences (Phillipson et al. 2009). Several conservationists support these views and promote learning and understanding of local perceptions and beliefs with respect to both the local wildlife as

well as the current and proposed conservation initiatives (Meine et al. 2006; Jones et al. 2008; Drury et al. 2011). A qualitative approach needs to be taken to study the aforementioned topics, rather than a quantitative one.

Schenk et al. (2003) employed a qualitative approach to their research on landscape conservation in Switzerland. They conjectured that legislation and financial incentives are not enough to effectively conserve an area and many sustainable development plans were missing a key factor: public perspective and acceptance. Thus, they used problem-centric interviews developed by Witzel (1985) a now retired senior researcher of social sciences and interpretative methodology at the University of Bremen. This form of interview is used when the interviewees are knowledgeable on the subject matter in question. They interviewed 22 individuals who were known to be directly impacted by landscape and meadow conservation measures in Switzerland. The interviews were guided by a checklist with questions, themes and the overarching research questions:

> "How do economic factors affect the acceptance of nature conservation measures? Which other factors influence the acceptance of nature and landscape conservation measures?" (Schenk et al. 2003. pp 67).

They discovered that, while economic factors do play an important role in accepting conservation measures, it only generates a rather fleeting form of acceptance. A true acceptance of conservation plans and policies is based on the individual's values and convictions regarding the environment.

In July of 1999 and 2000, Campbell and Smith (2006) conducted a qualitative study on the volunteers that work with the Caribbean Conservation Corporation, at Tortuguero, Costa Rica. The aim was to determine the kind of values the volunteers place on the sea turtles and the environment as a whole. 31 volunteers were interviewed using in-depth interviews. This is a type of qualitative research technique where a small number of individuals are asked about a particular topic in a comprehensive manner (Boyce and Neale, 2006). The results showed that the

volunteers had several, complex values assigned to the sea-turtles. Most of these were associated with conservation and science but many even added aesthetics to the mix. This research can be utilised in further enhancing volunteer tourism around the world by improving training, management and program promotion.

Next is Cousins et al. (2008) who conducted a qualitative study on the various strengths, weaknesses and issues regarding private wildlife ranching as a way to effectively conserve wildlife in South Africa. In the context of this thesis, the study can be viewed as a proto SWOT analysis (See Chapter 4). A total of 40 semi-structured interviews were undertaken with the various stakeholders involved including government officials, individuals from conservation NGOs, and those involved in the ranching industry. The interviews give the impression that these wildlife ranches have a positive impact on wildlife conservation. However, the ranches are limited by tourist interests, game hunting and limited resources for proper conservation. The study was able to address these weaknesses along with other issues around the practice, not limited to the dichotomy of conservation and economic gain as well as the management of wildlife populations within the ranches. Based on their findings, Cousins et al. (2008) determined that ranchers required specific management and guidance to properly execute conservation practices along with assistance with resources.

Based on these examples, one can state that a qualitative approach to conservation research can provide valuable data for successful conservation management. As such, and due to the nature of this thesis and its objective, a qualitative approach was utilized. Through the qualitative research techniques, a framework was established to explore the various dimensions of the thesis question and anchor them with certain parameters to define and set the boundary. For future research into the thesis topic, quantitative research methods can be incorporated to determine more holistic results.

1.2 Interviews

A popular qualitative approach is through qualitative interviews (Brady, 1976; Weiss,1994; Britten,1995; Drury et al. 2011; Cassell, 2015). The accomplished interviewer and journalist Brady (1976, pp. 1-2) said that

> "like most pursuits of curiosity, interviewing is a craft and a profession; rarely a science, sometimes an art" and that they "present abstract ideas in human terms."

Weiss (1994, p. 3), a sociologist and educator, defined qualitative interviews as,

> "interviews that sacrifice uniformity of questioning to achieve fuller development of information."

This method of qualitative research can be utilised in different ways based on structure and across a variety of disciplines (Cassell, 2015).

According to Brady (1976), the practice of interviewing goes back millennia. From the 4,000-year-old Egyptian book called Instructions of Ptah-Hotep to Daniel Defoe's Review in the 1600s and then The New York Herold in the 1800s, this method of retrieving answers has undergone various changes. By the 19th century, interviewing was viewed as improper and immoral means to retrieve answers and garner fame. Yet with stories like *The New York Herold*'s coverage of a prostitute's murder in 1836 (Brady, 1976), reporters saw interviews as an opportunity to make their work more intensive and wholesome. The 1900s saw an explosion of interview-based pieces in journalism, and by the 1990s, even mainstream magazines like Playboy had joined the trend.

Interviews are a means to burrow into an individual's views on topics of interest by providing a window into their life experiences and beliefs (Seidman, 1998). According to Maccoby and Maccoby (1954, p. 449) formally, interviews are:

> "A face to face verbal interchange in which one person, the interviewer, attempts to elicit information or expressions of opinions or belief from another person or persons."

From a business standpoint, Macdonald and Helgren (2004, p. 264) two professors of management from the Management Schools of the University of Sheffield

and University of Linkoping address interviews as an expansion on empirical research, statin:

> "We take empirical research to be research-based on observation, distinguished from theoretical research by the efforts of the researcher to gather information in and about the world he is studying. The interview is a subset of empirical research and entails talking - usually face-to-face - with those knowledgeable about what is being studied."

An essential aspect of interviewing is the interviewer's ability to listen to and discern important points from the interviewee (Seidman, 1998). Each interviewee responds to a posed question in different ways. It is the interviewer's job to find common themes and interpret unsaid points. Many times the interviewer will have to probe further into a response to retrieve a satisfactory explanation. All the while, the interviewer must keep tabs on how the interview is progressing and whether all the questions and talking points are being addressed or not One also has to monitor the interviewee's behavior during their sessions, keeping a look out for as facial tics, changes in voice pitch, body language and overall mood which can provide valuable data.

There are a few ethical concerns surrounding interviews. These include the nature of the relationship between interviewer and interviewee and whether the interviewer is to directly intervene in the personal life of the interviewee. The one concern that is pertinent to this thesis is regarding confidentiality and whether the interviewer should disclose the interviewees' actual names. Interviewer Jon Krakaur once stated, "What I write could turn their lives inside out" (Boynton, 2005, p. 168). This is especially so in studies dealing with the internal workings of organizations and institutions. It is important for the interviewers to not place their interviewees in a position that might bring them any physical, emotional, social or economic harm (Gorden, 1987). Thus, many interviewers tend to omit the names of their subjects by either using monikers or just addressing them as part of the collective group they represent in an interview (Campbell 2006; Cousins et al. 2008). However, it is upto the

interviewer and their agreement (verbal or written) with the interviewee. Some interviews, especially those of prominent figures, do not keep participants anonymous for notoriety, economic or social purposes.

Based on the aforementioned definitions and aspects of interviews, for the purposes of this thesis, interviews are strategically planned and guided interactions between an interviewer and interviewee(s) that are intended to retrieve comprehensive and holistic information on a topic of interest. This thesis on marine conservation tourism utilized the semi-structured interviewing method. While the interviews were recorded and handwritten notes were used (with permission from the interviewees), the identity of the interviewees are not disclosed.

1.2.1 Semi-structured Interviews

Semi-structured interviews are:

> "conducted on the basis of a loose structure consisting of open-ended questions that define the area to be explored, at least initially, and from which the interviewer or interviewee may diverge in order to pursue an idea in more detail" (Britten, 1995., p. 251).

This form of interviewing is generally used when the interviewer only has one opportunity with the interviewee (Drury et al. 2011). Semi-structured interviews allow flexibility during questioning which helps cover an array of topics with the interviewee, hear their personal opinions on the subject matter and monitor their behavior during the interview (Dunn 2005, Longhurst 2003). Conservationists like Sandbrook (2006) and Drury et al. (2011) have used semi-structured interviews in their research regarding perceptions and conservation action. This form of interviewing was also utilized by Cousins et al. (2008), whose research is detailed in one of the previous sections (1.1).

The interview can start with an opening question to get some background on the person and make them feel more comfortable with the situation before delving into the main subject matter (Brady, 1976). During the thesis interviews, the interviewees were asked about their status and history as divers/ visitors/staff members. It was noted that

a majority reacted favorably to the question and even delved into a few anecdotes, setting a mostly enjoyable and easy-going tone to the interview. The crux of the interviews centered on the SWOT analysis itself with questions formulated in view of whether the interviewee was an internal or external player and their area of expertise.

These semi-structured interviews were mostly conducted face to face. However, for the convenience of the interviewee, based on time and location, some were conducted over the phone. Telephone interviews are more commonplace in quantitative research, specifically when collecting data for surveys (Aday, 1997; Bernard, 2017). For qualitative research however, telephone interviews, despite the convenience, are not viewed that favorably for various reasons. One issue is that the interviewer can no longer observe and note the body language and other non-verbal cues of the interviewee (Hensen et al. 1978; Groves, 1990). Another is that the interviews are shorter over the phone and are likely to be ignored or avoided as interviewees may forget or not want to participate in an interview in such an impersonal manner (Aday, 1997; Bernard, 2017). However, many interviewers have noted the benefits of telephone interviews. As stated earlier, the geographical and time convenience is a key reason to consider this mode of interviewing (Chapple, 1999; Sturges and Hanrahan, 2004). Other benefits include the safety of both parties, privacy and an easier time for the interviewer to take notes (Sturges and Hanrahan, 2004).

A few interviews were even conducted over Skype. In this new age of technology, there is another, more convenient mode of interviewing that improves upon telephone interviews: internet interviews in a synchronous environment. According to Berg (2007, p. 112), an internet interview in a synchronous environment takes place in:

> "real-time chat rooms, instant messenger protocols, and real-time threaded communications, such environments provide the researcher and respondent an experience similar to face-to-face interaction in so far as they provide a mechanism for a back-and-forth exchange of questions and answers in what is almost real time."

Modern day video conferencing software and applications have helped solve the issue regarding non-verbal cues in interviews. There is still an impersonal aspect to this kind of interview, however, this is most likely to change with improvements in technology (Fontana and Frey, 2008; Sullivan, 2012).

1.3 Focus groups

There were several instances during the thesis where there was more than one target person at a location to be interviewed. Individual interviews would have been more time consuming and impractical, especially for divers in between dives and exposed to the elements. To circumvent the situation, informal focus groups were initiated. According to Mack (2005, p. 51), focus groups are:

> "a qualitative data collection method effective in helping researchers learn the social norms of a community or subgroup, as well as the range of perspectives that exist within that community or subgroup."

Powell and Single (1996, p.499), researchers of the Department of Mental Health at the University of Exeter, define a focus group as a:

> "group of individuals selected and assembled by researchers to discuss and comment on, from personal experience, the topic that is the subject of the research."

Focus groups are a popular option in business, and marketing studies and research where one can determine how a product or service is received by a certain population. It is also used in research related to perception and social behavior (Burgess et. al. 1991; Mack, 2005). Unlike a one-on-one interview, the interviewee interviewer becomes the moderator that leads the discussions and gets in-depth responses to open-ended questions from the participants (Clifford et. al. 2016). If done well, focus groups can successfully retrieve a wide range of perspectives and views on a specific topic in a short period of time (Mack, 2005).

For this thesis, most of the dive site data was collected through focus groups. Divers often are in pairs due to the mandatory buddy system they follow. Some even, dive in bigger groups for a more community experience. They Divers also have limited time before, between and after dives due to gear and dive preparations. Focus groups helped manage their time as well as the interviewer's as there were multiple groups of divers to be interviewed in one dive site.

For this thesis, most of the dive site data was collected through focus groups. Divers often are in pairs due to the mandatory buddy system they follow. Some even, dive in bigger groups for a more community experience. They Divers also have limited time before, between and after dives due to gear and dive preparations. Focus groups helped manage their time as well as the interviewer's as there were multiple groups of divers to be interviewed in one dive site.

1.4. Sampling

Tuckett (2004, p. 1), a researcher from the School of Nursing in the University of Queensland once aptly, stated that:

> "sampling is a core concern determining the ongoing success of a research project."

Sampling in qualitative research is another factor that is not a rigidly set rule. Quantitative researchers aim to gather large quantities of concise and precise data to determine groups' mindsets and behaviors using statistics (Marshall, 1996). Qualitative researchers tend to do the opposite where they collect data from a smaller pool, allowing more thorough research on people's mindset and behaviour by studying their social setting, culture and subcultures, and more (Tuckett; Mack, 2005; Adler and Adler, 2012;). For valid and credible research, one does not require data from every member of the community, only a subset of it. The sample size is determined by the research objectives, characteristics of the study population (such as size and diversity) and feasibility (Mack, 2005).

In this thesis, the sample size was determined on the basis of a set criteria i.e. the individuals involved in the two Giant Pacific Octopus conservation tourism programs. A total of 80 individuals were interviewed, representing the various Seattle Aquarium staff, volunteers and their stakeholders. Most of these individuals were either approached once it was determined that they met the established criteria or were introduced to the interviewer by a previous interviewee.

1.4.1 Purposive Sampling

Purposive sampling is a rather common form of sampling. According to Patton (1990, p. 169),

> "the logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term purposeful sampling."

Essentially, the interviewer selects interviewees based on a predetermined criterion that is relevant to the research question. The sample size does not need to be fixed and depends on the amount of time and resources available to conduct the study. Usually, data collection stops when there are no new points being provided to address the research topic (Mack, 2005).

For the thesis, the criteria were that the interviewees were:

- Active participants in the two programs
- Organizers of the programs
- Providing additional resources (time, money, expertise) during the programs
- In the vicinity of where the programs were being conducted
- Had the potential to participate in the programs

1.4.2 Snowballing Sampling

Snowballing, or chain referral sampling, is one of the most popular forms of sampling amongst researchers (Mack, 2005; Noy, 2007). Noy (2007, p.330) defines snowballing as:

> "A sampling procedure may be defined as snowball sampling when the researcher accesses informants through contact information that is provided by other informants. This process is, by necessity, repetitive: informants refer the researcher to other informants, who are contacted by the researcher and then refer her or him to yet other informants, and so on."

Here, the interviewees who have already been contacted, assist in the data collection process by providing references of other potential interviewees to the interviewer. This helps the interviewer access individuals that they would not have been able to on their own (Mack, 2005).

During this thesis, several divers provided valuable intel regarding local dive clubs and even allowed access to dive club meetings. Other individuals provided valuable contact information and even transportation assistance for the interviews

Summary

This thesis used a mixed methods approach which involved both quantitative and qualitative methods. Qualitative methods are not usually used for scientific research as they can be rather subjective. However, these methods offer a more holistic picture on the research topic by adding human perspectives. One of the most common ways to do so is through interviews. The thesis specifically used semi-structured interviews which allowed for flexibility during the sessions. Data was also collected using focus groups which helped gather more data from several people at once. These individuals were identified based on their relation to the Seattle Aquarium through purposive sampling. At the end of the interviews, some interviewees would recommend other individuals to interview thus, helping in snowball sampling. The results of these interviews are listed in Chapter 6 and explained in Chapter 7.

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Appendix 2: Interview Questions for SWOT Analysis

In my interviews, I asked the interviewees a series of questions to retrieve the various factors that fall under Strengths, Weaknesses, Opportunities and Threats in the SWOT matrix (See Chapter 5, Section 5.2). Along with the main questions, I asked a few background questions as well (Question 1 of each of the following sections) however, the data was not analyzed in the thesis.

2.1 Questions for Divers, Dive Shop Owners and Dive Club Members

1) Are you a diver?
    a) If so, how long have you been diving?
    b) Are you affiliated with any dive clubs?
        i) If yes, what is the name of the club?
2) Octopus Survey Week
    a) Have you heard of the Octopus Survey Week program?

        [If no, provide a brief summary of the program]
    b) What are the top three things that pop in your mind when you think of Octopus Survey Week?
    c) How do you think this program is useful or beneficial?
    d) Is there anything you want to improve about the program?
3) Octopus Week
    a) Have you heard of the Octopus Week program?

        [If no, provide a brief summary of the program]
    b) What are the top three things that pop in your mind when you think of Octopus Week?
    c) How do you think this program is useful or beneficial?
    d) Is there anything you want to improve about the program?
4) Combining Octopus Survey and Octopus Week
    a) Do you think it is a good idea to combine the two programs?
    b) What kind of benefits do you think can come out of such a union?
    c) Are there any concerns or barriers that would prevent such a union?

Any final remarks or comments you want to make about the two programs or their possible union?

2.2 Questions for Business Owners

1) Are you a diver?
    a) If so, how long have you been diving?
2) Octopus Survey Week
    a) Have you heard of the Octopus Survey Week program?

        [If no, provide a brief summary of the program]

    b) What are the top three things that pop in your mind when you think of Octopus Survey Week?
    c) How do you think this program is useful or beneficial?
    d) Is there anything you want to improve about the program?
3) Octopus Week
    a) Have you heard of the Octopus Week program?

        [If no, provide a brief summary of the program]

    b) What are the top three things that pop in your mind when you think of Octopus Week?
    c) How do you think this program is useful or beneficial?
    d) Is there anything you want to improve about the program?
4) Combining Octopus Survey and Octopus Week
    a) Do you think it's a good idea to combine the two programs?
    b) What kind of benefits do you think can come out of such a union?
    c) Are there any concerns or barriers that would prevent such a union?

Would you be keen to promote these two programs at your business?

Any final remarks or comments you want to make about the two programs or their possible union?

2.3 Questions for Aquarium Staff and Volunteers

1) Are you a diver?
    a) If so, how long have you been diving?
    b) Are you a volunteer diver at the Aquarium?
    c) Are you affiliated with any dive clubs?
        i) If yes, what is the name of the club?
2) Octopus Survey Week
    a) Did you hear about the Octopus Survey Week program before or after joining the Seattle Aquarium?

        [If they have not heard of it at all, provide a brief summary of the program]

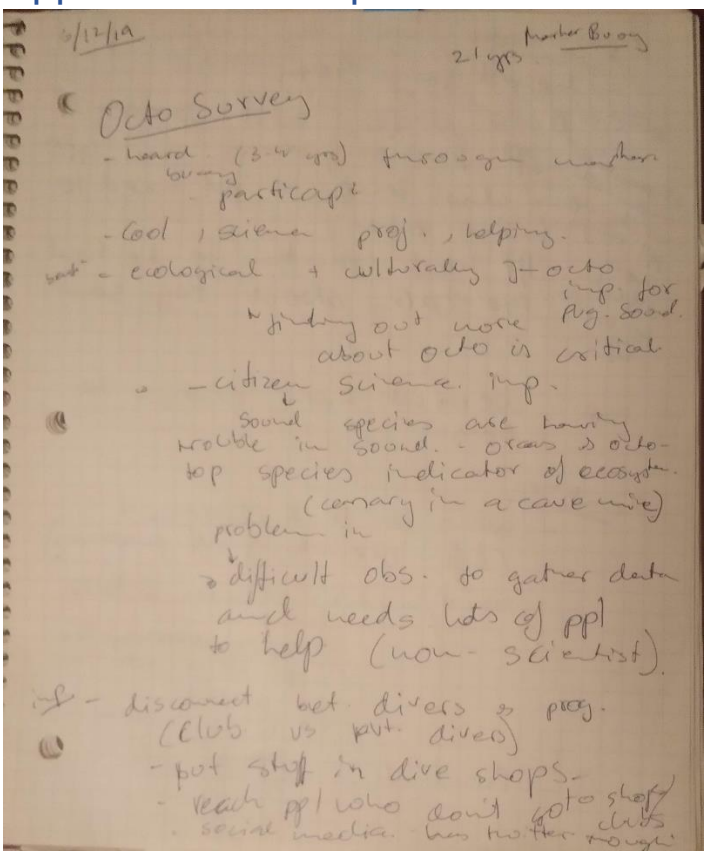
    b) What are the top three things that pop in your mind when you think of Octopus Survey Week?
    c) How do you think this program is useful or beneficial?
    d) Is there anything you want to improve about the program?
3) Octopus Week
    a) Did you hear about the Octopus Week program before or after joining the Seattle Aquarium?

        [If they have not heard of it at all, provide a brief summary of the program]

    b) What are the top three things that pop in your mind when you think of Octopus Week?
    c) How do you think this program is useful or beneficial?
    d) Is there anything you want to improve about the program?
4) Combining Octopus Survey and Octopus Week
    a) Do you think it's a good idea to combine the two programs?
    b) What kind of benefits do you think can come out of such a union?
    c) Are there any concerns or barriers that would prevent such a union?

Any final remarks or comments you want to make about the two programs or their possible union?

Appendix 3: Example of Interview Notes



Octo week

- heard from SOM.

about Octo imp. - cult. & eco.
characteristic ppl focus on orcas. but GPO
around is also imp & ppl need to
which imp know that.
ppl pay
more ppl need something to be tied
attention to care about Pug. Sound
to, make
it

- doesn't know enough to
say

Combine
- seems to be a disconnect.
(diff crowds & diff purposes)
- social media - creates a buzz
↓
media coverage for
ppl going into the
survey.
- publicity, makes sense
- Practicality - diff things.

- maybe get divers more
involved in Octo week.
↳ live data feed
(board - no. of octo
- avg. no.
- loc. etc.)
↓
sort of
like a sport competition.

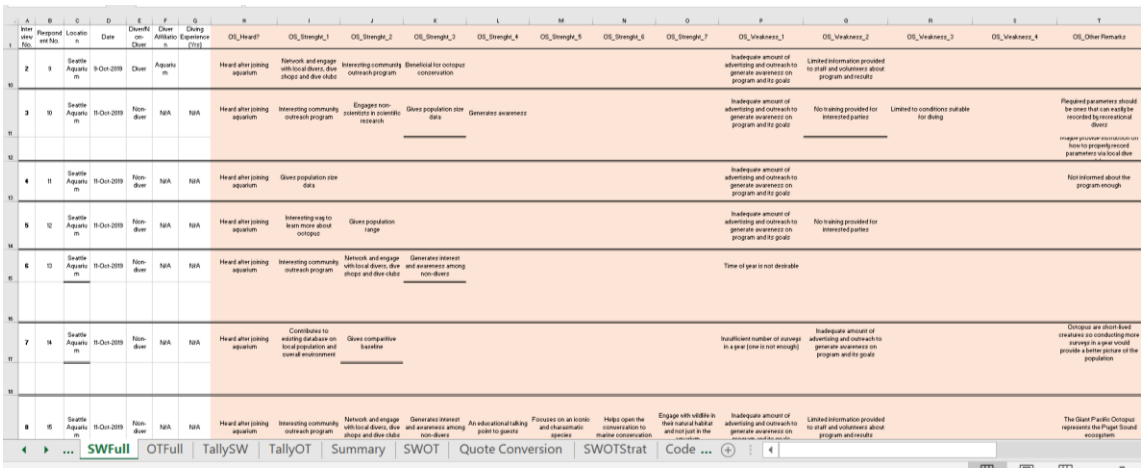
↳

Appendix 4: Full strengths and Weaknesses Table

4.1 Octopus Survey Week (OS) Data

Interview No.	Respondent No.	Location	Date	Diver/Non-Diver	Diver Affiliation	Diving Experience (Yrs)	OS_Heard?	OS_Strenght_1	OS_Strenght_2	OS_Strenght_3	OS_Strenght_4	OS_Strenght_5	OS_Strenght_6	OS_Strenght_7	OS_Weakness_1	OS_Weakness_2	OS_Weakness_3	OS_Weakness_4	OS_Other Remarks
1	1	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Not heard	Network and engage with local divers, dive shops and dive clubs							Inadequate amount of advertising and outreach to generate awareness on program and its goals	No training provided for interested parties	Inconsistencies in data recording	Limited to conditions suitable for diving	Required parameters should be ones that can easily be recorded by recreational divers
1	2	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Network and engage with local divers, dive shops and dive clubs							Inadequate amount of advertising and outreach to generate awareness on program and its goals	No training provided for interested parties	Inconsistencies in data recording	Limited to conditions suitable for diving	Maybe provide instruction on how to properly record parameters via local dive clubs
1	3	Seattle Aquarium	9-Oct-2019	Diver	Pvt		Heard after joining aquarium	Network and engage with local divers, dive shops and dive clubs							Inadequate amount of advertising and outreach to generate awareness on program and its goals	No training provided for interested parties	Inconsistencies in data recording	Limited to conditions suitable for diving	There could be discrepancy in records between those that are novice divers and those that are expert divers
2	4	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Heard before joining	Network and engage with local divers, dive shops and dive clubs	Interesting community outreach program	Beneficial for octopus conservation					Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			
2	5	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Heard before joining	Network and engage with local divers, dive shops and dive clubs	Interesting community outreach program	Beneficial for octopus conservation					Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			
2	6	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Network and engage with local divers, dive shops and dive clubs	Interesting community outreach program	Beneficial for octopus conservation					Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			
2	7	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Network and engage with local divers, dive shops and dive clubs	Interesting community outreach program	Beneficial for octopus conservation					Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			
2	8	Seattle Aquarium	9-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Network and engage with local divers, dive shops and dive clubs	Interesting community outreach program	Beneficial for octopus conservation					Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



Interview No.	Respondent No.	Location	Date	Diver/Non-Diver	Diver Affiliation	Diving Experience (Yrs)	OS_Heard?	OS_Strenght_1	OS_Strenght_2	OS_Strenght_3	OS_Strenght_4	OS_Strenght_5	OS_Strenght_6	OS_Strenght_7	OS_Weakness_1	OS_Weakness_2	OS_Weakness_3	OS_Weakness_4	OS_Other Remarks
2	9	Seattle Aquarium	9-Oct-2019	Diver	Aquarium		Heard after joining aquarium	Network and engage with local divers, dive shops and dive clubs	Interesting community outreach program	Beneficial for octopus conservation					Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			
3	10	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Interesting community outreach program	Engages non-scientists in scientific research	Gives population size data	Generates awareness				Inadequate amount of advertising and outreach to generate awareness on program and its goals	No training provided for interested parties	Limited to conditions suitable for diving		Required parameters should be ones that can easily be recorded by recreational divers
4	11	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Gives population size data							Inadequate amount of advertising and outreach to generate awareness on program and its goals				Not informed about the program enough
5	12	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Interesting way to learn more about octopus	Gives population range						Inadequate amount of advertising and outreach to generate awareness on program and its goals	No training provided for interested parties			
6	13	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Interesting community outreach program	Network and engage with local divers, dive shops and dive clubs	Generates interest and awareness among non-divers					Time of year is not desirable				
7	14	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Contributes to existing database on local population and overall environment	Gives comparitive baseline						Insufficient number of surveys in a year (one is not enough)	Inadequate amount of advertising and outreach to generate awareness on program and its goals			Octopus are short-lived creatures so conducting more surveys in a year would provide a better picture of the population
8	15	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Interesting community outreach program	Network and engage with local divers, dive shops and dive clubs	Generates interest and awareness among non-divers	An educational talking point to guests	Focuses on an iconic and charasmatic species	Helps open the conversation to marine conservation	Engage with wildlife in their natural habitat and not just in the aquarium	Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			The Giant Pacific Octopus represents the Puget Sound ecosystem

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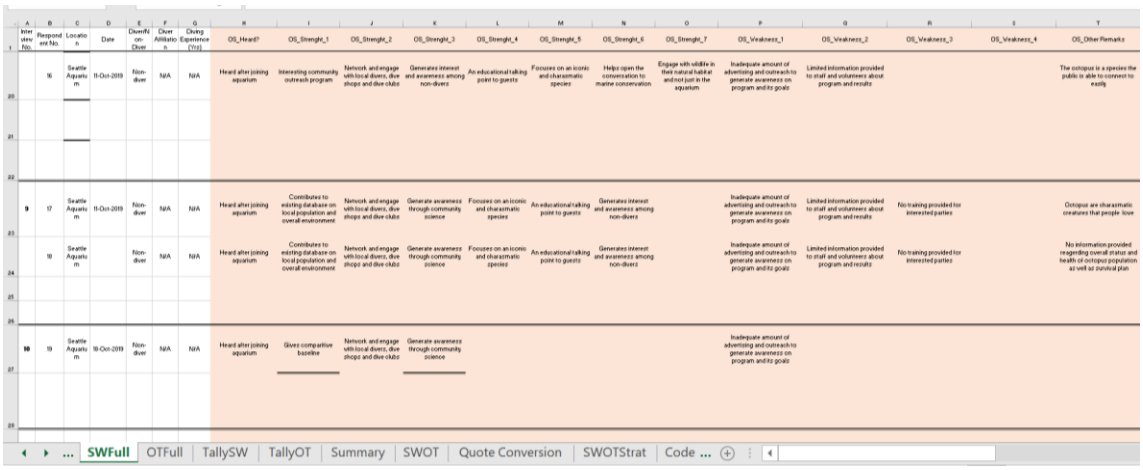
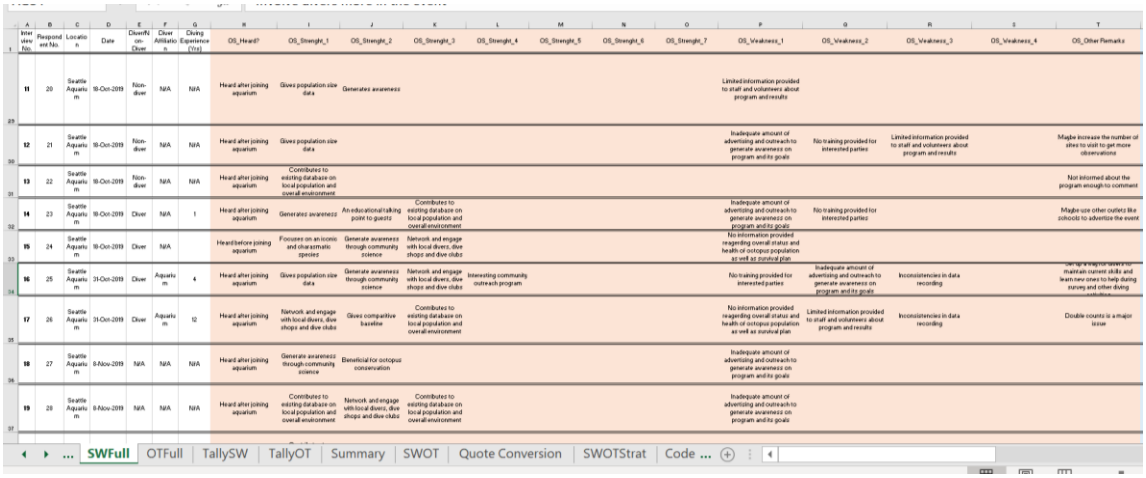
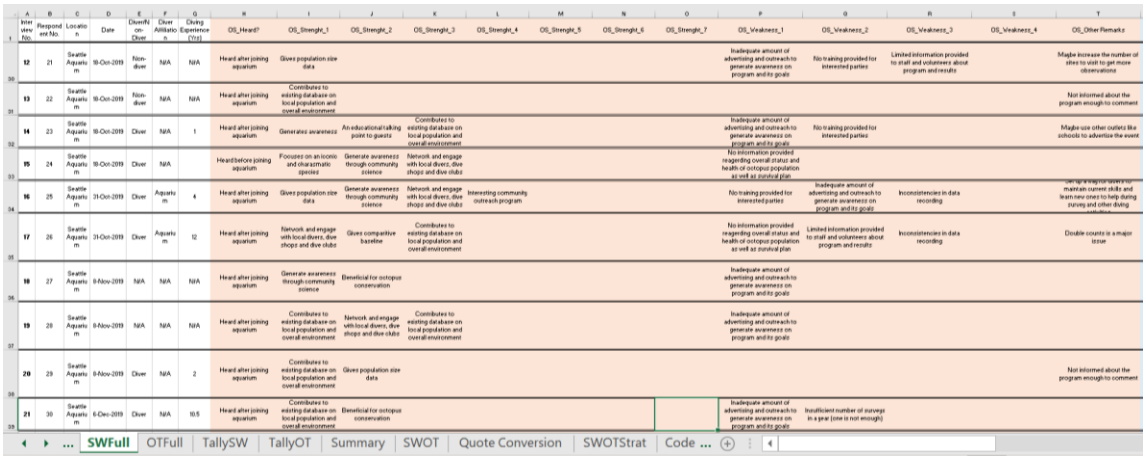
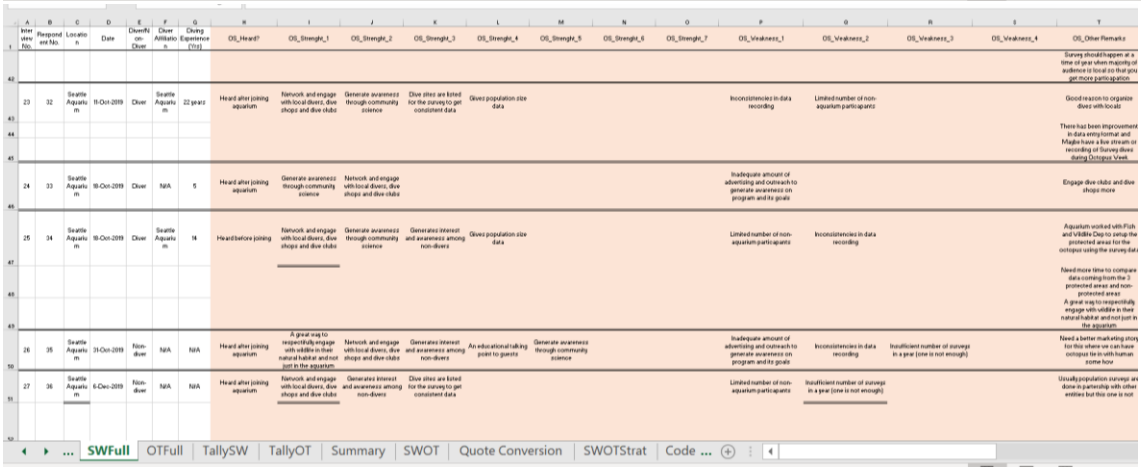


Interview No.	Respondent No.	Location	Date	Diver/Non-Diver	Diver Affiliation	Diving Experience (Yrs)	OS_Heard?	OS_Strenght_1	OS_Strenght_2	OS_Strenght_3	OS_Strenght_4	OS_Strenght_5	OS_Strenght_6	OS_Strenght_7	OS_Weakness_1	OS_Weakness_2	OS_Weakness_3	OS_Weakness_4	OS_Other Remarks
	16	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Interesting community outreach program	Network and engage with local divers, dive shops and dive clubs	Generates interest and awareness among non-divers	An educational talking point to guests	Focuses on an iconic and charasmatic species	Helps open the conversation to marine conservation	Engage with wildlife in their natural habitat and not just in the aquarium	Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results			The octopus is a species the public is able to connect to easily
9	17	Seattle Aquarium	11-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Contributes to existing database on local population and overall environment	Network and engage with local divers, dive shops and dive clubs	Generate awareness through community science	Focuses on an iconic and charasmatic species	An educational talking point to guests	Generates interest and awareness among non-divers		Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results	No training provided for interested parties		Octopus are charasmatic creatures that people love
	18	Seattle Aquarium		Non-diver	N/A	N/A	Heard after joining aquarium	Contributes to existing database on local population and overall environment	Network and engage with local divers, dive shops and dive clubs	Generate awareness through community science	Focuses on an iconic and charasmatic species	An educational talking point to guests	Generates interest and awareness among non-divers		Inadequate amount of advertising and outreach to generate awareness on program and its goals	Limited information provided to staff and volunteers about program and results	No training provided for interested parties		No information provided reagarding overall status and health of octopus population as well as survival plan
10	19	Seattle Aquarium	18-Oct-2019	Non-diver	N/A	N/A	Heard after joining aquarium	Gives comparitive baseline	Network and engage with local divers, dive shops and dive clubs	Generate awareness through community science					Inadequate amount of advertising and outreach to generate awareness on program and its goals				

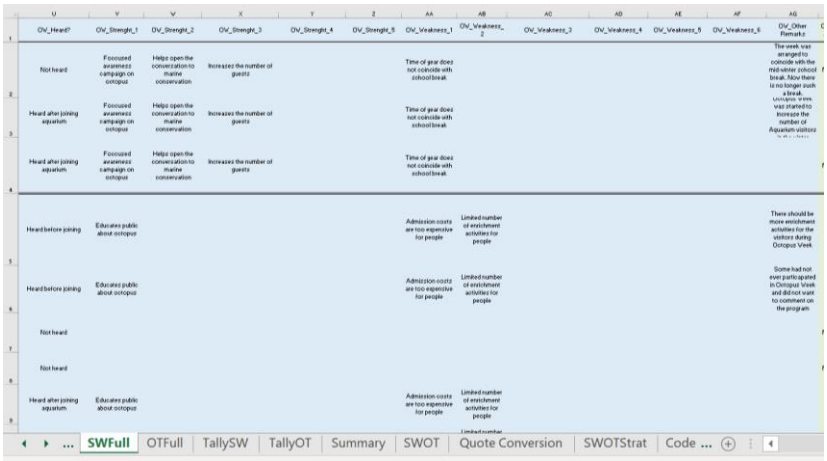
SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



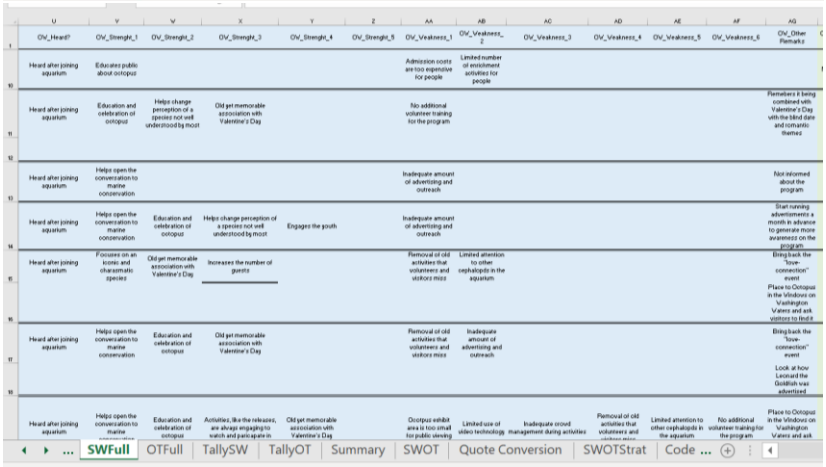




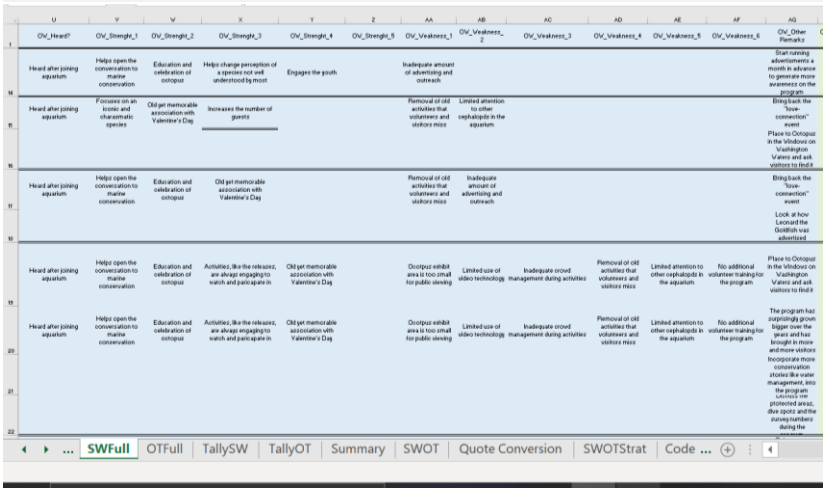
4.2 Octopus Week (OW) Data



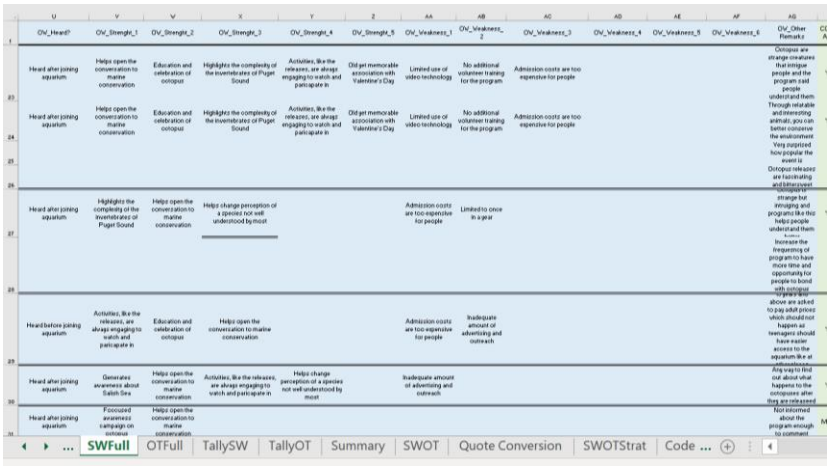
OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Not heard	Focoused awareness campaign on octopus	Helps open the conversation to marine conservation	Increases the number of guests			Time of year does not coincide with school break						The week was arranged to coincide with the mid-winter school break. Now there is no longer such a break.
Heard after joining aquarium	Focoused awareness campaign on octopus	Helps open the conversation to marine conservation	Increases the number of guests			Time of year does not coincide with school break						Octopus week was started to increase the number of Aquarium visitors
Heard after joining aquarium	Focoused awareness campaign on octopus	Helps open the conversation to marine conservation	Increases the number of guests			Time of year does not coincide with school break						
Heard before joining	Educates public about octopus					Admission costs are too expensive for people	Limited number of enrichment activities for people					There should be more enrichment activities for the visitors during Octopus Week
Heard before joining	Educates public about octopus					Admission costs are too expensive for people	Limited number of enrichment activities for people					Some had not ever participated in Octopus Week and did not want to comment on the program
Not heard												
Not heard												
Heard after joining aquarium	Educates public about octopus					Admission costs are too expensive for people	Limited number of enrichment activities for people					



OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Educates public about octopus					Admission costs are too expensive for people	Limited number of enrichment activities for people					
Heard after joining aquarium	Education and celebration of octopus	Helps change perception of a species not well understood by most	Old yet memorable association with Valentine's Day			No additional volunteer training for the program						Remebers it being combined with Valentine's Day with the blind date and romantic themes
Heard after joining aquarium	Helps open the conversation to marine conservation					Inadequate amount of advertising and outreach						Not informed about the program
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Helps change perception of a species not well understood by most	Engages the youth		Inadequate amount of advertising and outreach						Start running advertisments a month in advance to generate more awareness on the program
Heard after joining aquarium	Focuses on an iconic and charasmatic species	Old yet memorable association with Valentine's Day	Increases the number of guests			Removal of old activities that volunteers and visitors miss	Limited attention to other cephalopods in the aquarium					Bring back the "love-connection" event Place to Octopus in the Windows on Washington Waters and ask visitors to find it
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Old yet memorable association with Valentine's Day			Removal of old activities that volunteers and visitors miss	Inadequate amount of advertising and outreach					Bring back the "love-connection" event Look at how Leonard the Goldfish was advertised
Heard after joining aquarium	Helps open the conversation to marine	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day		Ocotpus exhibit area is too small for public viewing	Limited use of video technology	Inadequate crowd management during activities	Removal of old activities that volunteers and	Limited attention to other cephalopods in the aquarium	No additional volunteer training for the program	Place to Octopus in the Windows on Washington Waters and ask

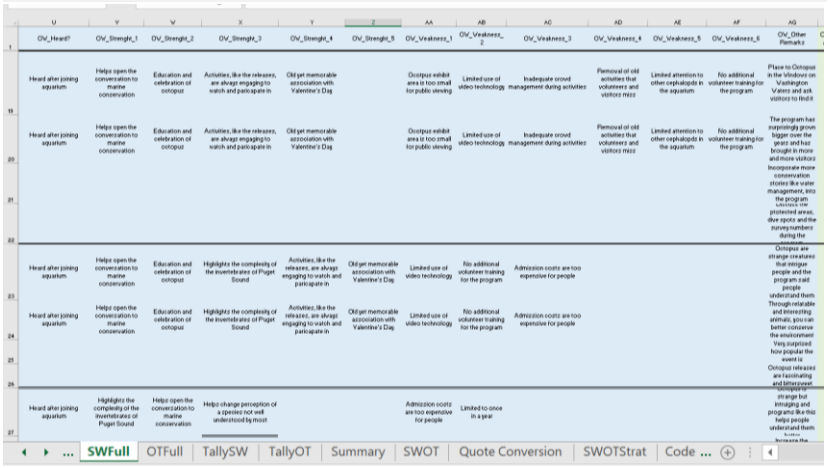


OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Helps change perception of a species not well understood by most	Engages the youth		Inadequate amount of advertising and outreach						Start running advertisments a month in advance to generate more awareness on the program
Heard after joining aquarium	Focuses on an iconic and charasmatic species	Old yet memorable association with Valentine's Day	Increases the number of guests			Removal of old activities that volunteers and visitors miss	Limited attention to other cephalopods in the aquarium					Bring back the "love-connection" event Place to Octopus in the Windows on Washington Waters and ask visitors to find it
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Old yet memorable association with Valentine's Day			Removal of old activities that volunteers and visitors miss	Inadequate amount of advertising and outreach					Bring back the "love-connection" event Look at how Leonard the Goldfish was advertised
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day		Ocotpus exhibit area is too small for public viewing	Limited use of video technology	Inadequate crowd management during activities	Removal of old activities that volunteers and visitors miss	Limited attention to other cephalopods in the aquarium	No additional volunteer training for the program	Place to Octopus in the Windows on Washington Waters and ask visitors to find it
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day		Ocotpus exhibit area is too small for public viewing	Limited use of video technology	Inadequate crowd management during activities	Removal of old activities that volunteers and visitors miss	Limited attention to other cephalopods in the aquarium	No additional volunteer training for the program	The program has surprisingly grown bigger over the years and has brought in more and more visitors Incorporate more conservation stories like water management, into the program (e.g.) are protected areas, dive spots and the survey numbers during the



OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Highlights the complexity of the invertebrates of Puget Sound	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day	Limited use of video technology	No additional volunteer training for the program	Admission costs are too expensive for people				Octopus are strange creatures that intrigue people and the program said people understand them
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Highlights the complexity of the invertebrates of Puget Sound	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day	Limited use of video technology	No additional volunteer training for the program	Admission costs are too expensive for people				Through relatable and interesting animals, you can better conserve the environment
												Very surprised how popular the event is
												Octopus releases are fascinating and bittersweet
Heard after joining aquarium	Highlights the complexity of the invertebrates of Puget Sound	Helps open the conversation to marine conservation	Helps change perception of a species not well understood by most			Admission costs are too expensive for people	Limited to once in a year					Octopus are strange creatures that intrigue people and the program said people understand them
												Increase the frequency of program to have more time and opportunity for people to bond with octopus
Heard before joining aquarium	Activities, like the releases, are always engaging to watch and participate in	Education and celebration of octopus	Helps open the conversation to marine conservation			Admission costs are too expensive for people	Inadequate amount of advertising and outreach					Organized trips above are acked to pay adult prices which should not happen as tweagers should have easier access to the aquarium like at
Heard after joining aquarium	Generates awareness about Salish Sea	Helps open the conversation to marine conservation	Activities, like the releases, are always engaging to watch and participate in	Helps change perception of a species not well understood by most		Inadequate amount of advertising and outreach						Any way to find out about what happens to the octopuses after they are released
Heard after joining aquarium	Focoused awareness campaign on octopus	Helps open the conversation to marine conservation										Not informed about the program enough to comment

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day		Octopus exhibit area is too small for public viewing	Limited use of video technology	Inadequate crowd management during activities	Removal of old activities that volunteers and visitors miss	Limited attention to other cephalopds in the aquarium	No additional volunteer training for the program	Place to Octopus in the Windows on Washington Waters and ask visitors to find it
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day		Octopus exhibit area is too small for public viewing	Limited use of video technology	Inadequate crowd management during activities	Removal of old activities that volunteers and visitors miss	Limited attention to other cephalopds in the aquarium	No additional volunteer training for the program	The program has surprisingly grown bigger over the years and has brought in more and more visitors
												Incorporate more conservation stories like water management, into the program
												protected areas, dive spots and the nursing numbers during the
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Highlights the complexity of the invertebrates of Puget Sound	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day	Limited use of video technology	No additional volunteer training for the program	Admission costs are too expensive for people				Octopus are strange creatures that intrigue people and the program said people understand them
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Highlights the complexity of the invertebrates of Puget Sound	Activities, like the releases, are always engaging to watch and participate in	Old yet memorable association with Valentine's Day	Limited use of video technology	No additional volunteer training for the program	Admission costs are too expensive for people				Through relatable and interesting animals, you can better conserve the environment
												Very surprised how popular the event is
												Octopus releases are fascinating and bittersweet
Heard after joining aquarium	Highlights the complexity of the invertebrates of Puget Sound	Helps open the conversation to marine conservation	Helps change perception of a species not well understood by most			Admission costs are too expensive for people	Limited to once in a year					Octopus are strange creatures that intrigue people and the program said people understand them
												Increase the frequency of program to have more time and opportunity for people to bond with octopus

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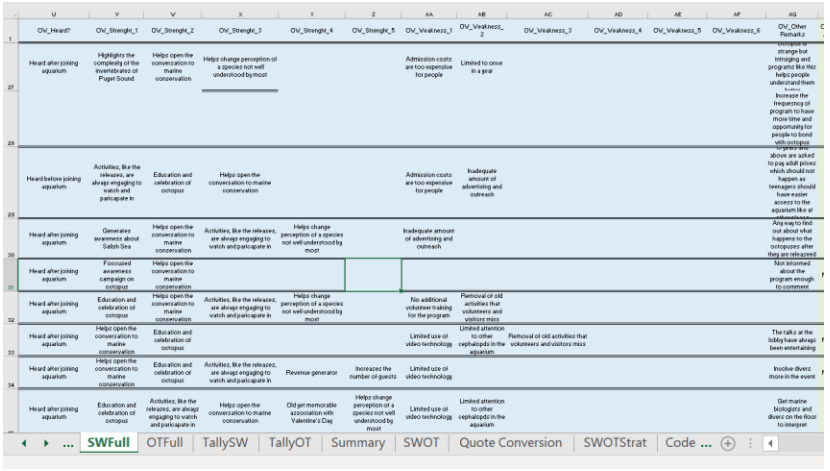
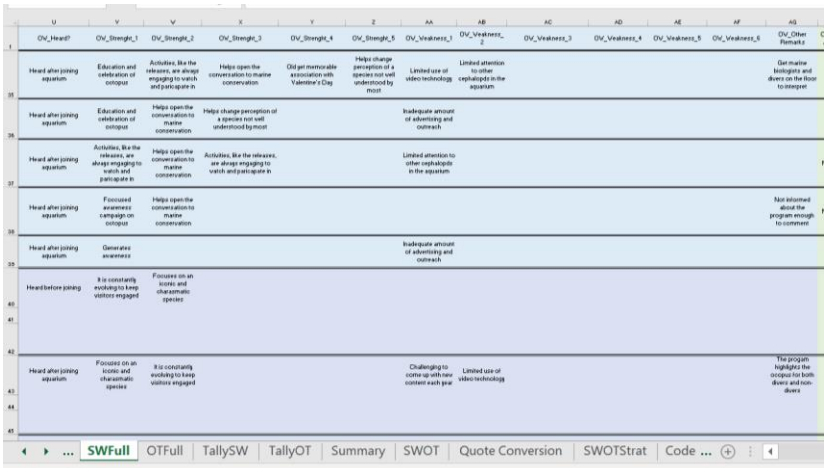


OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Highlights the complexity of the invertebrates of Puget Sound	Helps open the conversation to marine conservation	Helps change perception of a species not well understood by most			Admission costs are too expensive for people	Limited to once in a year					Octopus are strange creatures that intrigue people and the program said people understand them
												Increase the frequency of program to have more time and opportunity for people to bond with octopus
Heard before joining aquarium	Activities, like the releases, are always engaging to watch and participate in	Education and celebration of octopus	Helps open the conversation to marine conservation			Admission costs are too expensive for people	Inadequate amount of advertising and outreach					Organized trips above are acked to pay adult prices which should not happen as tweagers should have easier access to the aquarium like at
Heard after joining aquarium	Generates awareness about Salish Sea	Helps open the conversation to marine conservation	Activities, like the releases, are always engaging to watch and participate in	Helps change perception of a species not well understood by most		Inadequate amount of advertising and outreach						Any way to find out about what happens to the octopuses after they are released
Heard after joining aquarium	Focoused awareness campaign on octopus	Helps open the conversation to marine conservation										Not informed about the program enough to comment
Heard after joining aquarium	Education and celebration of octopus	Helps open the conversation to marine conservation	Activities, like the releases, are always engaging to watch and participate in	Helps change perception of a species not well understood by most		No additional volunteer training for the program	Removal of old activities that volunteers and visitors miss					
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus				Limited use of video technology	Limited attention to other cephalopds in the aquarium	Removal of old activities that volunteers and visitors miss				The talks at the lobby have always been entertaining
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Revenue generator	Increaces the number of guests	Limited use of video technology						Involve divers more in the event
Heard after joining aquarium	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Helps open the conversation to marine conservation	Old yet memorable association with Valentine's Day	Helps change perception of a species not well understood by most	Limited use of video technology	Limited attention to other cephalopds in the aquarium					Get marine biologists and divers on the floor to integret

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



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OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Education and celebration of octopus	Activities, like the releases, are always engaging to watch and participate in	Helps open the conversation to marine conservation	Old get memorable association with Valentine's Day	Helps change perception of a species not well understood by most	Limited use of video technology	Limited attention to other cephalopds in the aquarium					Get marine biologists and divers on the floor to interpret
Heard after joining aquarium	Education and celebration of octopus	Helps open the conversation to marine conservation	Helps change perception of a species not well understood by most			Inadequate amount of advertising and outreach						
Heard after joining aquarium	Activities, like the releases, are always engaging to watch and participate in	Helps open the conversation to marine conservation	Activities, like the releases, are always engaging to watch and participate in			Limited attention to other cephalopds in the aquarium						
Heard after joining aquarium	Focoused awareness campaign on octopus	Helps open the conversation to marine conservation										Not informed about the program enough to comment
Heard after joining aquarium	Generates awareness					Inadequate amount of advertising and outreach						
Heard before joining	It is constantly evoluing to keep visitors engaged	Focuses on an iconic and charasmatic species										
Heard after joining aquarium	Focuses on an iconic and charasmatic species	It is constantly evoluing to keep visitors engaged				Challenging to come up with new content each year	Limited use of video technology					The progam highlights the occopus for both divers and non-divers

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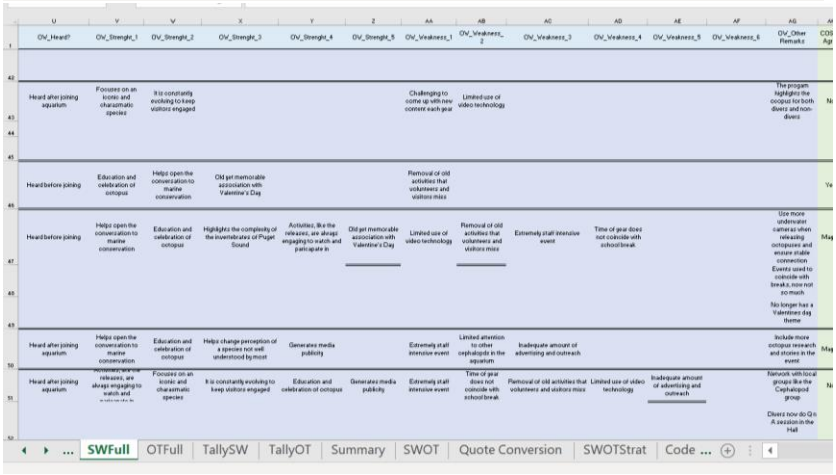
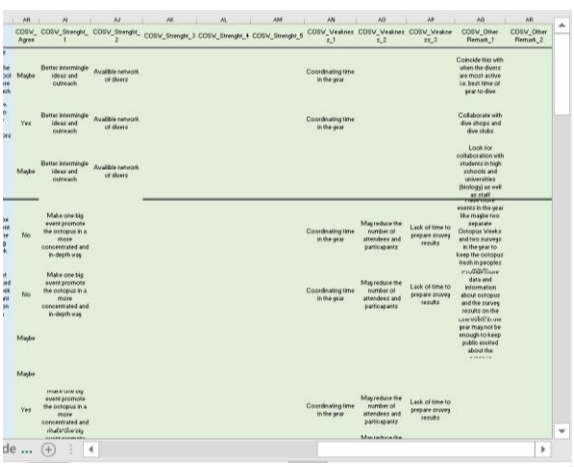
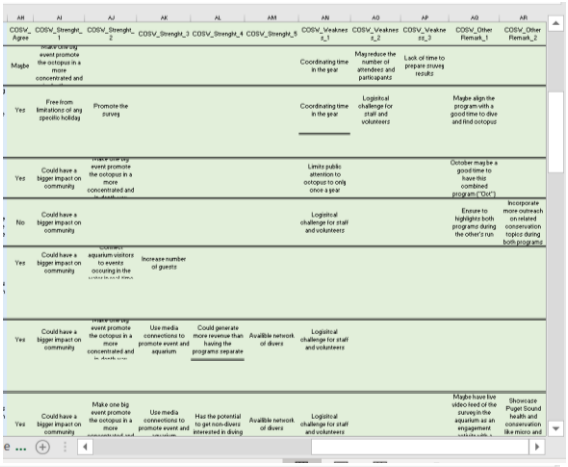


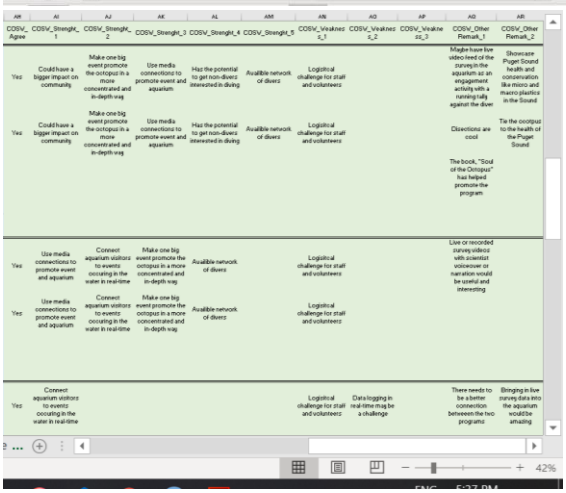
U	V	V	X	Y	Z	AA	AB	AC	AD	AE	AF	AG
OV_Heard?	OV_Strenght_1	OV_Strenght_2	OV_Strenght_3	OV_Strenght_4	OV_Strenght_5	OV_Weakness_1	OV_Weakness_2	OV_Weakness_3	OV_Weakness_4	OV_Weakness_5	OV_Weakness_6	OV_Other Remarks
Heard after joining aquarium	Focuses on an iconic and charasmatic species	It is constantly evoluing to keep visitors engaged				Challenging to come up with new content each year	Limited use of video technology					The progam highlights the occopus for both divers and non-divers
Heard before joining	Education and celebration of octopus	Helps open the conversation to marine conservation	Old get memorable association with Valentine's Day			Removal of old activities that volunteerz and visitors miss						
Heard before joining	Helps open the conversation to marine conservation	Education and celebration of octopus	Highlights the complexity of the invertebrates of Puget Sound	Activities, like the releases, are always engaging to watch and participate in	Old get memorable association with Valentine's Day	Limited use of video technology	Removal of old activities that volunteerz and visitors miss	Extremely staff intensive event	Time of year does not coincide with school break			Use more underwater camera so when releasing octopuses and ensure stable connection Events used to coincide with breaks, now not so much No longer has a Valentines day theme
Heard after joining aquarium	Helps open the conversation to marine conservation	Education and celebration of octopus	Helps change perception of a species not well understood by most	Generates media publicity		Extremely staff intensive event	Limited attention to other cephalopds in the aquarium	Inadequate amount of advertising and outreach				Include more octopus research and stories in the event
Heard after joining aquarium	Focuses on an iconic and charasmatic species	It is constantly evoluing to keep visitors engaged	Education and celebration of octopus	Generates media publicity	Extremely staff intensive event	Time of year does not coincide with school break	Removal of old activities that volunteerz and visitors miss	Limited use of video technology	Inadequate amount of advertising and outreach			Network with local groups like the Cephalopod group Divers now do Q in A session in the Hall

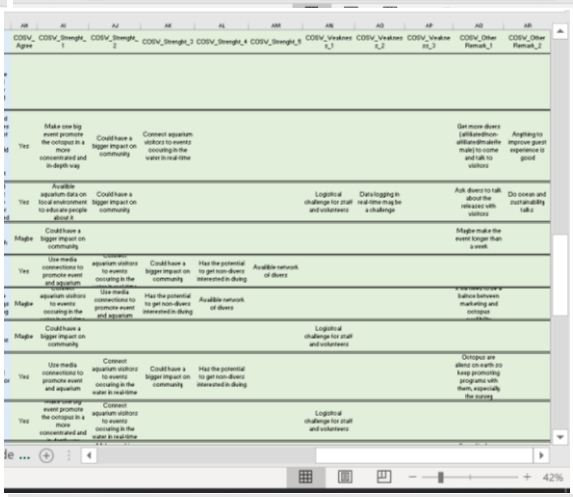
SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...

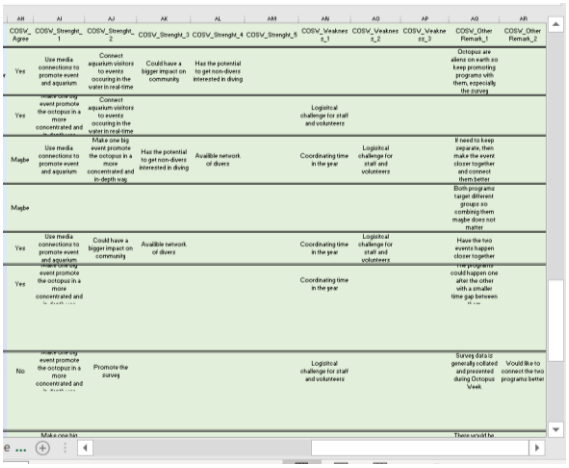
4.3 Combine Octopus Survey Week and Octopus Week (COSW) Data

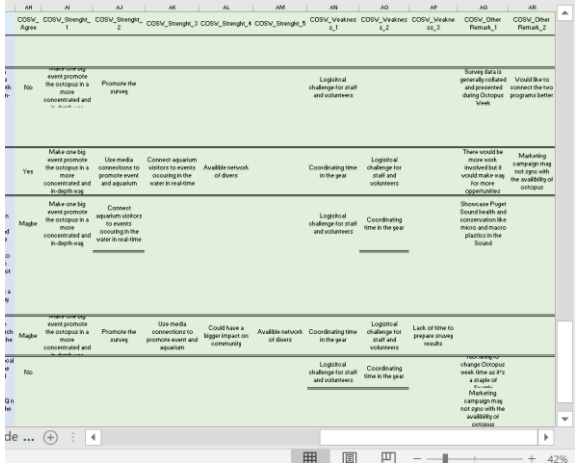






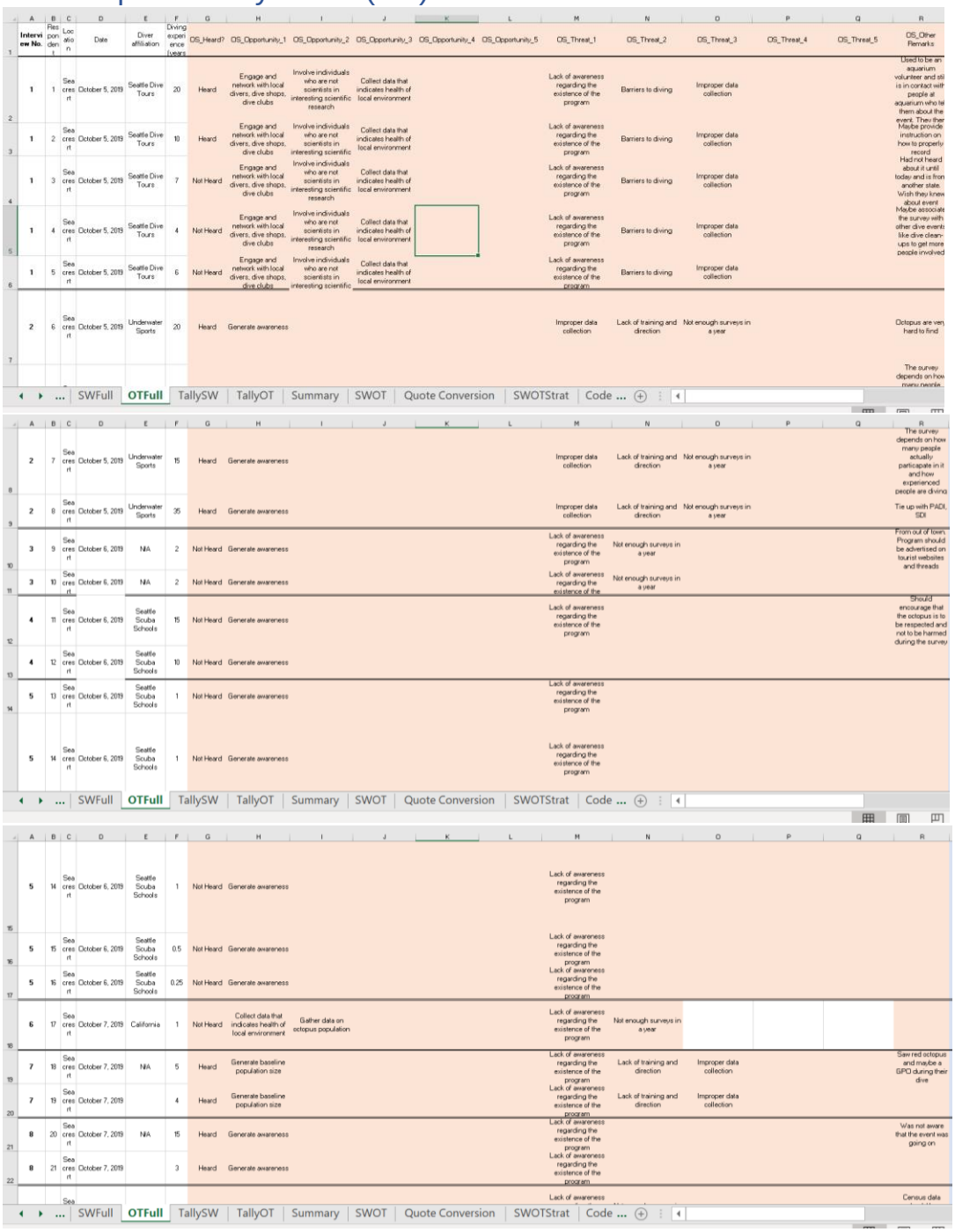




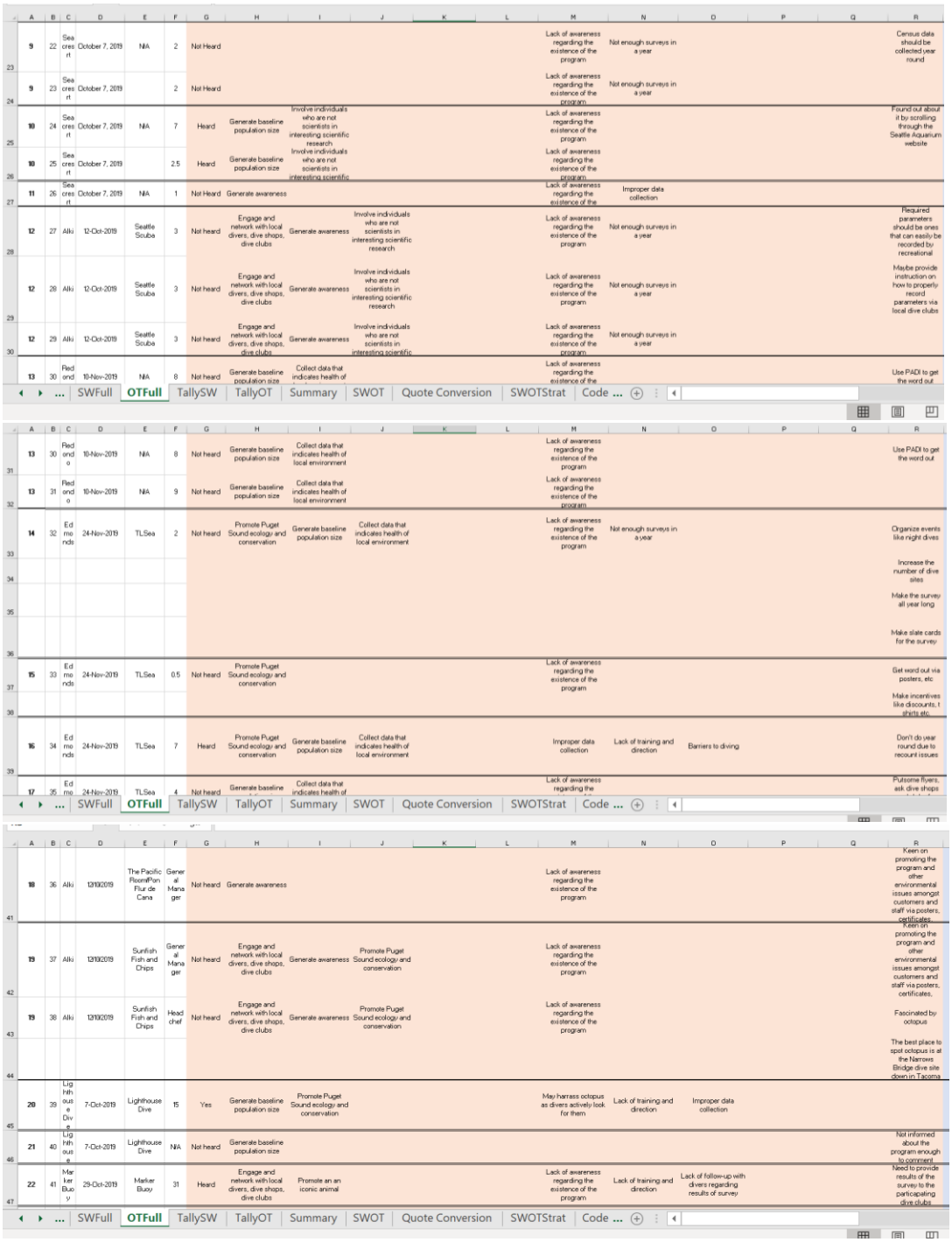


Appendix 5: Full Opportunities and Threats Table

5.1 Octopus Survey Week (OS) Data

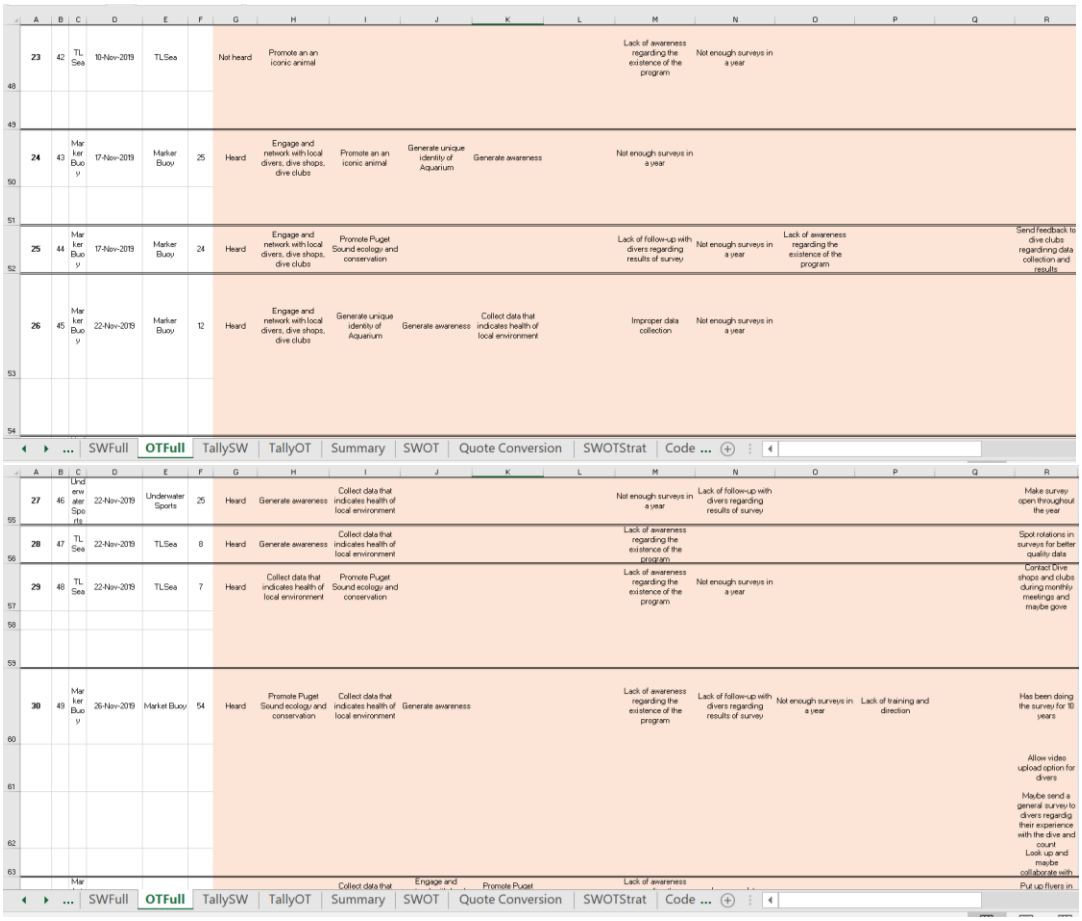


Interview No.	Respondent	Location	Date	Diver affiliation	Diving experience (years)	OS_Heard?	OS_Opportunity_1	OS_Opportunity_2	OS_Opportunity_3	OS_Opportunity_4	OS_Opportunity_5	OS_Threat_1	OS_Threat_2	OS_Threat_3	OS_Threat_4	OS_Threat_5	OS_Other Remarks
1	1	Seacrest	October 5, 2019	Seattle Dive Tours	20	Heard	Engage and network with local divers, dive shops, dive clubs	Involve individuals who are not scientists in interesting scientific research	Collect data that indicates health of local environment			Lack of awareness regarding the existence of the program	Barriers to diving	Improper data collection			Used to be an aquarium volunteer and still is in contact with people at aquarium who tell them about the event. They ther
1	2	Seacrest	October 5, 2019	Seattle Dive Tours	10	Heard	Engage and network with local divers, dive shops, dive clubs	Involve individuals who are not scientists in interesting scientific	Collect data that indicates health of local environment			Lack of awareness regarding the existence of the program	Barriers to diving	Improper data collection			Maybe provide instruction on how to properly record
1	3	Seacrest	October 5, 2019	Seattle Dive Tours	7	Not Heard	Engage and network with local divers, dive shops, dive clubs	Involve individuals who are not scientists in interesting scientific research	Collect data that indicates health of local environment			Lack of awareness regarding the existence of the program	Barriers to diving	Improper data collection			Had not heard about it until today and is from another state. Wish they knew about event
1	4	Seacrest	October 5, 2019	Seattle Dive Tours	4	Not Heard	Engage and network with local divers, dive shops, dive clubs	Involve individuals who are not scientists in interesting scientific research	Collect data that indicates health of local environment			Lack of awareness regarding the existence of the program	Barriers to diving	Improper data collection			Maybe associate the survey with other dive events like dive clean-ups to get more people involved
1	5	Seacrest	October 5, 2019	Seattle Dive Tours	6	Not Heard	Engage and network with local divers, dive shops, dive clubs	Involve individuals who are not scientists in interesting scientific	Collect data that indicates health of local environment			Lack of awareness regarding the existence of the program	Barriers to diving	Improper data collection			
2	6	Seacrest	October 5, 2019	Underwater Sports	20	Heard	Generate awareness					Improper data collection	Lack of training and direction	Not enough surveys in a year			Octopus are very hard to find
																	The survey depends on how many people
2	7	Seacrest	October 5, 2019	Underwater Sports	15	Heard	Generate awareness					Improper data collection	Lack of training and direction	Not enough surveys in a year			The survey depends on how many people actually participate in it and how experienced people are diving
2	8	Seacrest	October 5, 2019	Underwater Sports	35	Heard	Generate awareness					Improper data collection	Lack of training and direction	Not enough surveys in a year			Tie up with PADI, SDI
3	9	Seacrest	October 6, 2019	NIA	2	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program	Not enough surveys in a year				From out of town. Program should be advertised on tourist websites and threads
3	10	Seacrest	October 6, 2019	NIA	2	Not Heard	Generate awareness					Lack of awareness regarding the existence of the	Not enough surveys in a year				
4	11	Seacrest	October 6, 2019	Seattle Scuba Schools	15	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program					Should encourage that the octopus is to be respected and not to be harmed during the survey
4	12	Seacrest	October 6, 2019	Seattle Scuba Schools	10	Not Heard	Generate awareness										
5	13	Seacrest	October 6, 2019	Seattle Scuba Schools	1	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program					
5	14	Seacrest	October 6, 2019	Seattle Scuba Schools	1	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program					
5	14	Seacrest	October 6, 2019	Seattle Scuba Schools	1	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program					
5	15	Seacrest	October 6, 2019	Seattle Scuba Schools	0.5	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program					
5	16	Seacrest	October 6, 2019	Seattle Scuba Schools	0.25	Not Heard	Generate awareness					Lack of awareness regarding the existence of the program					
6	17	Seacrest	October 7, 2019	California	1	Not Heard	Collect data that indicates health of local environment	Gather data on octopus population				Lack of awareness regarding the existence of the program	Not enough surveys in a year				
7	18	Seacrest	October 7, 2019	NIA	5	Heard	Generate baseline population size					Lack of awareness regarding the existence of the program	Lack of training and direction	Improper data collection			Saw red octopus and maybe a GPO during their dive
7	19	Seacrest	October 7, 2019		4	Heard	Generate baseline population size					Lack of awareness regarding the existence of the program	Lack of training and direction	Improper data collection			
8	20	Seacrest	October 7, 2019	NIA	15	Heard	Generate awareness					Lack of awareness regarding the existence of the program					Was not aware that the event was going on
8	21	Seacrest	October 7, 2019		3	Heard	Generate awareness					Lack of awareness regarding the existence of the program					
		Seacrest										Lack of awareness					Census data



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
23	9	22	Seacrest	October 7, 2019	N/A	2	Not Heard						Lack of awareness regarding the existence of the program	Not enough surveys in a year				Census data should be collected year round
24	9	23	Seacrest	October 7, 2019		2	Not Heard						Lack of awareness regarding the existence of the program	Not enough surveys in a year				
25	10	24	Seacrest	October 7, 2019	N/A	7	Heard	Generate baseline population size	Involve individuals who are not scientists in interesting scientific research				Lack of awareness regarding the existence of the program					Found out about it by scrolling through the Seattle Aquarium website
26	10	25	Seacrest	October 7, 2019		2.5	Heard	Generate baseline population size	Involve individuals who are not scientists in interesting scientific				Lack of awareness regarding the existence of the program					
27	11	26	Seacrest	October 7, 2019	N/A	1	Not Heard	Generate awareness					Lack of awareness regarding the existence of the	Improper data collection				
28	12	27	Alki	12-Oct-2019	Seattle Scuba	3	Not heard	Engage and network with local divers, dive shops, dive clubs	Generate awareness	Involve individuals who are not scientists in interesting scientific research			Lack of awareness regarding the existence of the program	Not enough surveys in a year				Required parameters should be ones that can easily be recorded by recreational
29	12	28	Alki	12-Oct-2019	Seattle Scuba	3	Not heard	Engage and network with local divers, dive shops, dive clubs	Generate awareness	Involve individuals who are not scientists in interesting scientific research			Lack of awareness regarding the existence of the program	Not enough surveys in a year				Maybe provide instruction on how to properly record parameters via local dive clubs
30	12	29	Alki	12-Oct-2019	Seattle Scuba	3	Not heard	Engage and network with local divers, dive shops, dive clubs	Generate awareness	Involve individuals who are not scientists in interesting scientific			Lack of awareness regarding the existence of the program	Not enough surveys in a year				
31	13	30	Redondo	10-Nov-2019	N/A	8	Not heard	Generate baseline population size	Collect data that indicates health of				Lack of awareness regarding the existence of the					Use PADI to get the word out
32	13	31	Redondo	10-Nov-2019	N/A	9	Not heard	Generate baseline population size	Collect data that indicates health of local environment				Lack of awareness regarding the existence of the program					
33	14	32	Edmonds	24-Nov-2019	TLSea	2	Not heard	Promote Puget Sound ecology and conservation	Generate baseline population size	Collect data that indicates health of local environment			Lack of awareness regarding the existence of the program	Not enough surveys in a year				Organize events like night dives
34																		Increase the number of dive sites
35																		Make the survey all year long
36																		Make slate cards for the survey
37	15	33	Edmonds	24-Nov-2019	TLSea	0.5	Not heard	Promote Puget Sound ecology and conservation					Lack of awareness regarding the existence of the program					Get word out via posters, etc
38																		Make incentives like discounts, t shirts etc.
39	16	34	Edmonds	24-Nov-2019	TLSea	7	Heard	Promote Puget Sound ecology and conservation	Generate baseline population size	Collect data that indicates health of local environment			Improper data collection	Lack of training and direction	Barriers to diving			Don't do year round due to recount issues
40	17	35	Edmo	24-Nov-2019	TLSea	4	Not heard	Generate baseline	Collect data that indicates health of				Lack of awareness regarding the					Putsome flyers, ask dive shops
41	18	36	Alki	12/19/2019	The Pacific Room/Pon Flur de Cana	General Manager	Not heard	Generate awareness					Lack of awareness regarding the existence of the program					Keen on promoting the program and other environmental issues amongst customers and staff via posters, certificates
42	19	37	Alki	12/19/2019	Sunfish Fish and Chips	General Manager	Not heard	Engage and network with local divers, dive shops, dive clubs	Generate awareness	Promote Puget Sound ecology and conservation			Lack of awareness regarding the existence of the program					Keen on promoting the program and other environmental issues amongst customers and staff via posters, certificates,
43	19	38	Alki	12/19/2019	Sunfish Fish and Chips	Head chef	Not heard	Engage and network with local divers, dive shops, dive clubs	Generate awareness	Promote Puget Sound ecology and conservation			Lack of awareness regarding the existence of the program					Fascinated by octopus
44																		The best place to spot octopus is at the Narrows Bridge dive site down in Tacoma
45	20	39	Lighthouse Dive	7-Oct-2019	Lighthouse Dive	15	Yes	Generate baseline population size	Promote Puget Sound ecology and conservation				May harrass octopus as divers actively look for them	Lack of training and direction	Improper data collection			
46	21	40	Lighthouse	7-Oct-2019	Lighthouse Dive	N/A	Not heard	Generate baseline population size										Not informed about the program enough to comment
47	22	41	Marker Buoy	29-Oct-2019	Marker Buoy	31	Heard	Engage and network with local divers, dive shops, dive clubs	Promote an an iconic animal				Lack of awareness regarding the existence of the program	Lack of training and direction	Lack of follow-up with divers regarding results of survey			Need to provide results of the survey to the participating dive clubs

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



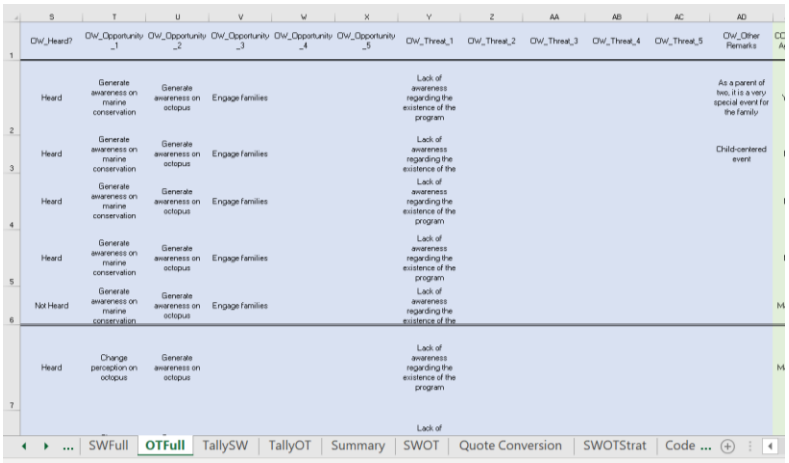
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
48	23	42	TL Sea	10-Nov-2019	TLSea		Not heard	Promote an an iconic animal					Lack of awareness regarding the existence of the program	Not enough surveys in a year				
49																		
50	24	43	Marker Buoy	17-Nov-2019	Marker Buoy	25	Heard	Engage and network with local divers, dive shops, dive clubs	Promote an an iconic animal	Generate unique identity of Aquarium	Generate awareness		Not enough surveys in a year					
51																		
52	25	44	Marker Buoy	17-Nov-2019	Marker Buoy	24	Heard	Engage and network with local divers, dive shops, dive clubs	Promote Puget Sound ecology and conservation				Lack of follow-up with divers regarding results of survey	Not enough surveys in a year	Lack of awareness regarding the existence of the program			Send feedback to dive clubs regarding data collection and results
53	26	45	Marker Buoy	22-Nov-2019	Marker Buoy	12	Heard	Engage and network with local divers, dive shops, dive clubs	Generate unique identity of Aquarium	Generate awareness	Collect data that indicates health of local environment		Improper data collection	Not enough surveys in a year				
54																		

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
55	27	46	Underwater Sports	22-Nov-2019	Underwater Sports	25	Heard	Generate awareness	Collect data that indicates health of local environment				Not enough surveys in a year	Lack of follow-up with divers regarding results of survey				Make survey open throughout the year
56	28	47	TL Sea	22-Nov-2019	TLSea	8	Heard	Generate awareness	Collect data that indicates health of local environment				Lack of awareness regarding the existence of the program					Spot rotations in surveys for better quality data
57	29	48	TL Sea	22-Nov-2019	TLSea	7	Heard	Collect data that indicates health of local environment	Promote Puget Sound ecology and conservation				Lack of awareness regarding the existence of the program	Not enough surveys in a year				Contact Dive shops and clubs during monthly meetings and maybe gove
58																		
59																		
60	30	49	Marker Buoy	26-Nov-2019	Market Buoy	54	Heard	Promote Puget Sound ecology and conservation	Collect data that indicates health of local environment	Generate awareness			Lack of awareness regarding the existence of the program	Lack of follow-up with divers regarding results of survey	Not enough surveys in a year	Lack of training and direction		Has been doing the survey for 10 years
61																		Allow video upload option for divers
62																		Maybe send a general survey to divers regardig their experience with the dive and count
63																		Look up and maybe collaborate with
			Mar						Collect data that	Engage and	Promote Puget		Lack of awareness					Put up flyers in

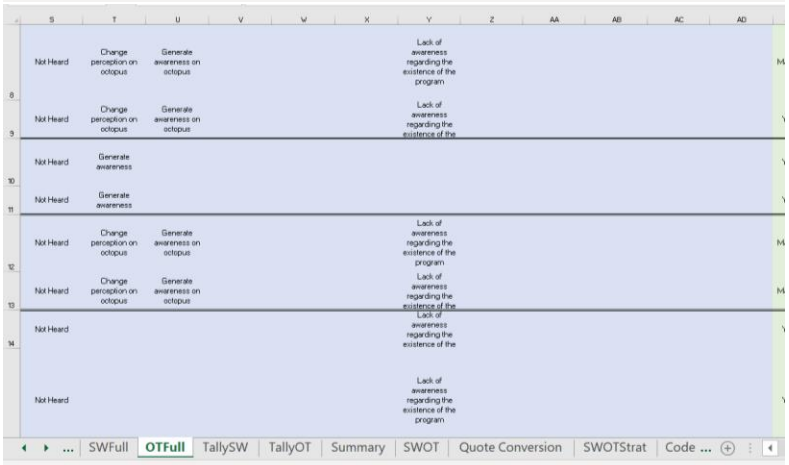
SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...

5.2 Octopus Week (OW) Data



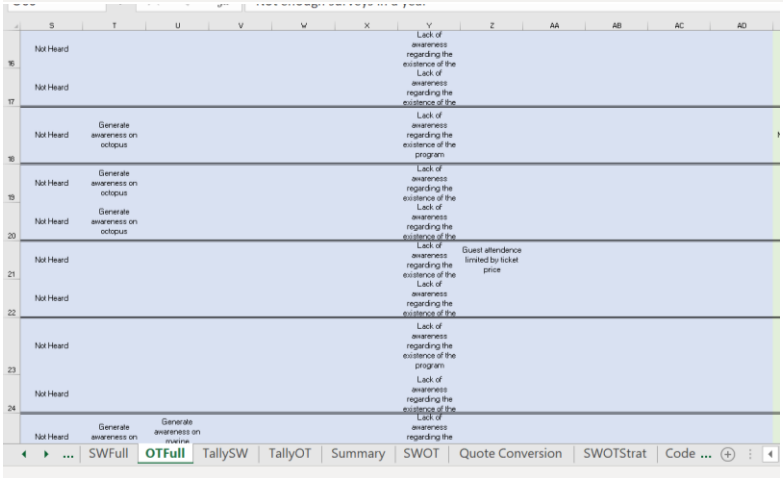
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	OW_Heard?	OW_Opportunity_1	OW_Opportunity_2	OW_Opportunity_3	OW_Opportunity_4	OW_Opportunity_5	OW_Threat_1	OW_Threat_2	OW_Threat_3	OW_Threat_4	OW_Threat_5	OW_Other Remarks
2	Heard	Generate awareness on marine conservation	Generate awareness on octopus	Engage families			Lack of awareness regarding the existence of the program					As a parent of two, it is a very special event for the family
3	Heard	Generate awareness on marine conservation	Generate awareness on octopus	Engage families			Lack of awareness regarding the existence of the					Child-centered event
4	Heard	Generate awareness on marine conservation	Generate awareness on octopus	Engage families			Lack of awareness regarding the existence of the program					
5	Heard	Generate awareness on marine conservation	Generate awareness on octopus	Engage families			Lack of awareness regarding the existence of the program					
6	Not Heard	Generate awareness on marine conservation	Generate awareness on octopus	Engage families			Lack of awareness regarding the existence of the					
7	Heard	Change perception on octopus	Generate awareness on octopus				Lack of awareness regarding the existence of the program					
							Lack of					

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



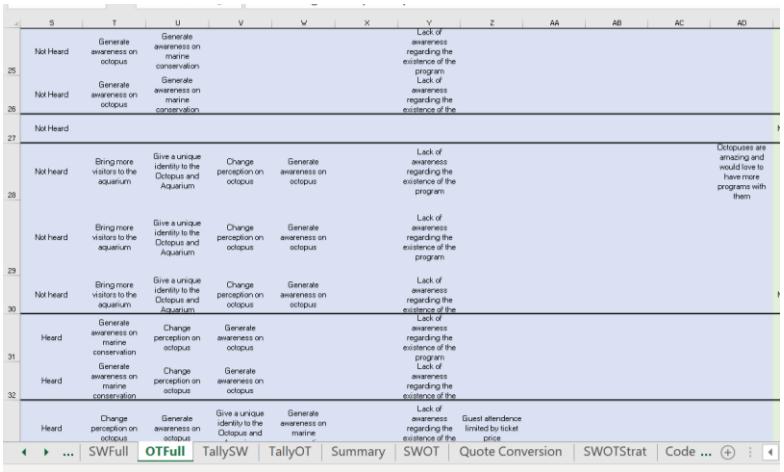
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
8	Not Heard	Change perception on octopus	Generate awareness on octopus				Lack of awareness regarding the existence of the program					
9	Not Heard	Change perception on octopus	Generate awareness on octopus				Lack of awareness regarding the existence of the					
10	Not Heard	Generate awareness										
11	Not Heard	Generate awareness										
12	Not Heard	Change perception on octopus	Generate awareness on octopus				Lack of awareness regarding the existence of the program					
13	Not Heard	Change perception on octopus	Generate awareness on octopus				Lack of awareness regarding the existence of the					
14	Not Heard						Lack of awareness regarding the existence of the					
	Not Heard						Lack of awareness regarding the existence of the program					

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



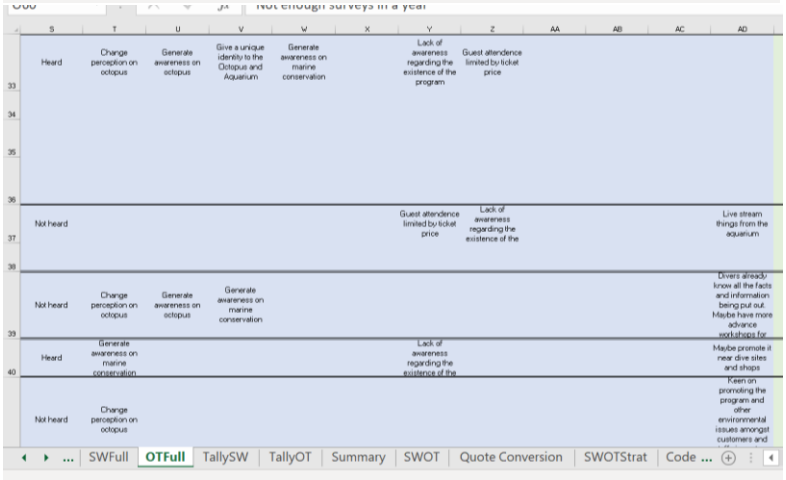
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
16	Not Heard						Lack of awareness regarding the existence of the					
17	Not Heard						Lack of awareness regarding the existence of the					
18	Not Heard	Generate awareness on octopus					Lack of awareness regarding the existence of the program					
19	Not Heard	Generate awareness on octopus					Lack of awareness regarding the existence of the					
20	Not Heard	Generate awareness on octopus					Lack of awareness regarding the existence of the					
21	Not Heard						Lack of awareness regarding the existence of the	Guest attendence limited by ticket price				
22	Not Heard						Lack of awareness regarding the existence of the					
23	Not Heard						Lack of awareness regarding the existence of the program					
24	Not Heard						Lack of awareness regarding the existence of the					
	Not Heard	Generate awareness on	Generate awareness on marine				Lack of awareness regarding the					

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



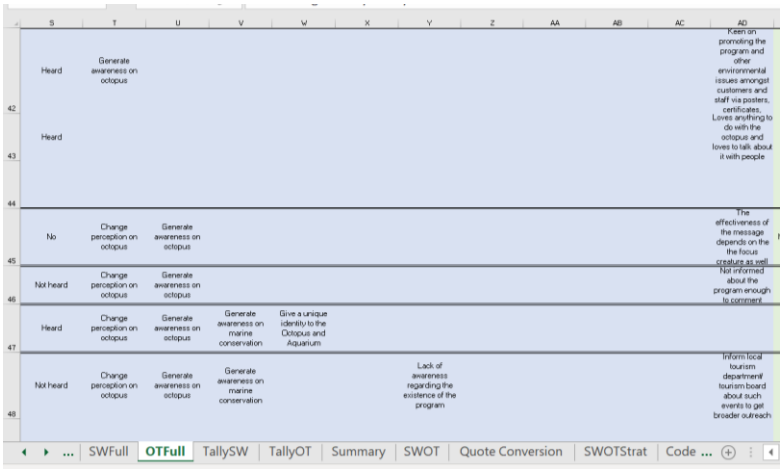
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
25	Not Heard	Generate awareness on octopus	Generate awareness on marine conservation				Lack of awareness regarding the existence of the program					
26	Not Heard	Generate awareness on octopus	Generate awareness on marine conservation				Lack of awareness regarding the existence of the					
27	Not Heard											
28	Not heard	Bring more visitors to the aquarium	Give a unique identity to the Octopus and Aquarium	Change perception on octopus	Generate awareness on octopus		Lack of awareness regarding the existence of the program					Octopuses are amazing and would love to have more programs with them
29	Not heard	Bring more visitors to the aquarium	Give a unique identity to the Octopus and Aquarium	Change perception on octopus	Generate awareness on octopus		Lack of awareness regarding the existence of the program					
30	Not heard	Bring more visitors to the aquarium	Give a unique identity to the Octopus and Aquarium	Change perception on octopus	Generate awareness on octopus		Lack of awareness regarding the existence of the					
31	Heard	Generate awareness on marine conservation	Change perception on octopus	Generate awareness on octopus			Lack of awareness regarding the existence of the program					
32	Heard	Generate awareness on marine conservation	Change perception on octopus	Generate awareness on octopus			Lack of awareness regarding the existence of the					
	Heard	Change perception on octopus	Generate awareness on octopus	Give a unique identity to the Octopus and	Generate awareness on marine		Lack of awareness regarding the existence of the	Guest attendence limited by ticket price				

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



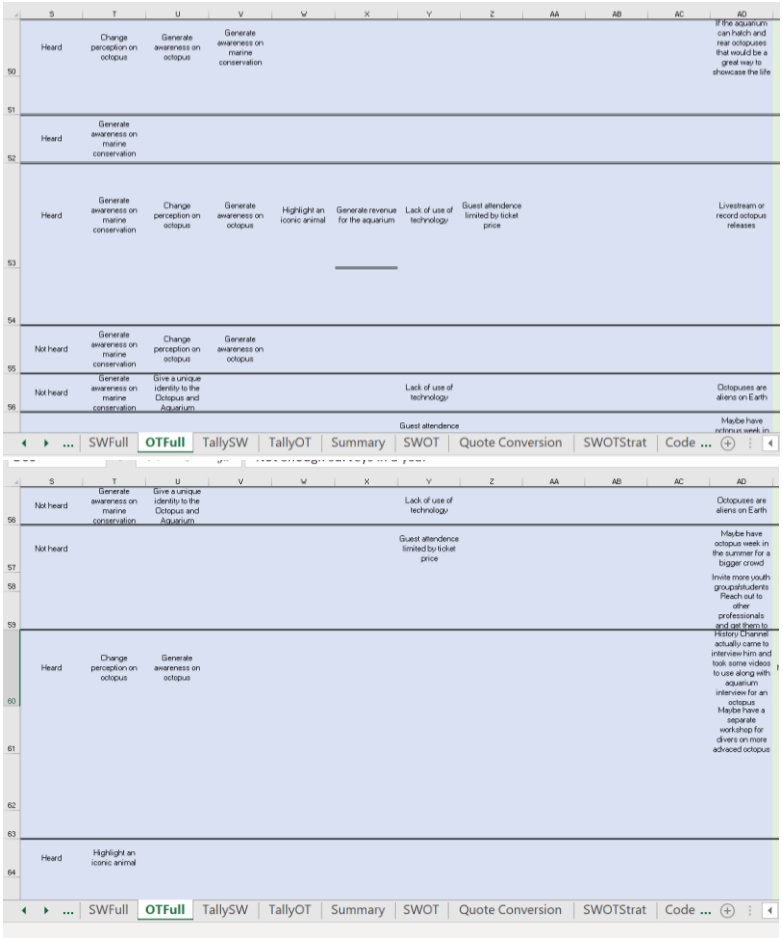
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
33	Heard	Change perception on octopus	Generate awareness on octopus	Give a unique identity to the Octopus and Aquarium	Generate awareness on marine conservation		Lack of awareness regarding the existence of the program	Guest attendence limited by ticket price				
34												
35												
36												
37	Not heard						Guest attendence limited by ticket price	Lack of awareness regarding the existence of the				Live stream things from the aquarium
38												
39	Not heard	Change perception on octopus	Generate awareness on octopus	Generate awareness on marine conservation								Divers already know all the facts and information being put out. Maybe have more advance
40	Heard	Generate awareness on marine conservation					Lack of awareness regarding the existence of the					Maybe promote it near dive sites and shops
	Not heard	Change perception on octopus										Keen on promoting the program and other environmental issues amongst customers and

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
42	Heard	Generate awareness on octopus										Keen on promoting the program and other environmental issues amongst customers and staff via posters, certificates.
43	Heard											Loves anything to do with the octopus and loves to talk about it with people
44												
45	No	Change perception on octopus	Generate awareness on octopus									The effectiveness of the message depends on the the focus creature as well
46	Not heard	Change perception on octopus	Generate awareness on octopus									Not informed about the program enough to comment
47	Heard	Change perception on octopus	Generate awareness on octopus	Generate awareness on marine conservation	Give a unique identity to the Octopus and Aquarium							
48	Not heard	Change perception on octopus	Generate awareness on octopus	Generate awareness on marine conservation			Lack of awareness regarding the existence of the program					Inform local tourism department/ tourism board about such events to get broader outreach

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...



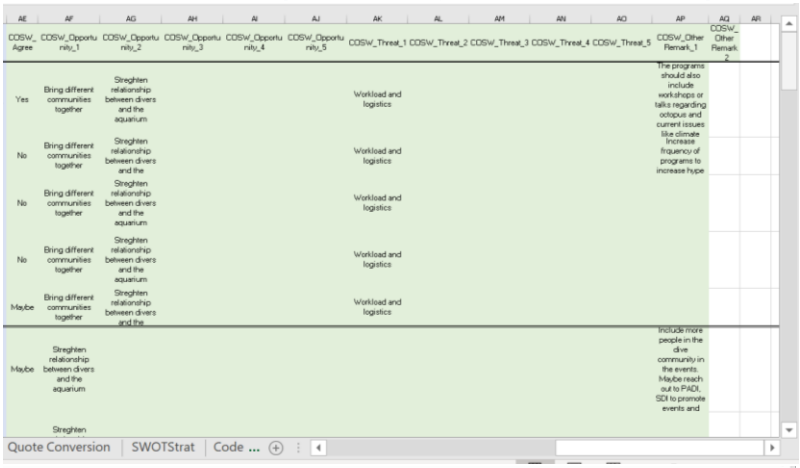
	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
50	Heard	Change perception on octopus	Generate awareness on octopus	Generate awareness on marine conservation								If the aquarium can hatch and rear octopuses that would be a great way to showcase the life
51												
52	Heard	Generate awareness on marine conservation										
53	Heard	Generate awareness on marine conservation	Change perception on octopus	Generate awareness on octopus	Highlight an iconic animal	Generate revenue for the aquarium	Lack of use of technology	Guest attendence limited by ticket price				Livestream or record octopus releases
54												
55	Not heard	Generate awareness on marine conservation	Change perception on octopus	Generate awareness on octopus								
56	Not heard	Generate awareness on marine conservation	Give a unique identity to the Octopus and Aquarium				Lack of use of technology					Octopuses are aliens on Earth
							Guest attendence					Maybe have octopus week in

SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...

	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
56	Not heard	Generate awareness on marine conservation	Give a unique identity to the Octopus and Aquarium				Lack of use of technology					Octopuses are aliens on Earth
57	Not heard						Guest attendence limited by ticket price					Maybe have octopus week in the summer for a bigger crowd
58												Invite more youth groups/students
59												Reach out to other professionals and get them to
60	Heard	Change perception on octopus	Generate awareness on octopus									History Channel actually came to interview him and took some videos to use along with aquarium interview for an octopus
61												Maybe have a separate workshop for divers on more advaced octopus
62												
63												
64	Heard	Highlight an iconic animal										

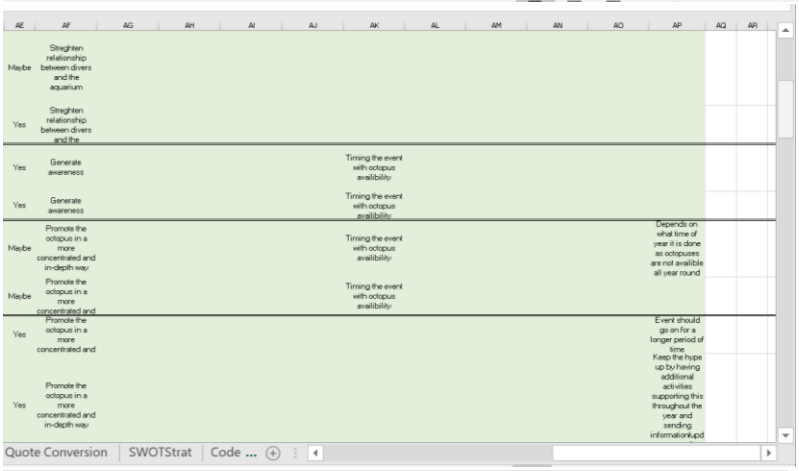
SWFull | OTFull | TallySW | TallyOT | Summary | SWOT | Quote Conversion | SWOTStrat | Code ...

5.3 Combine Octopus Survey Week and Octopus Week (COSW) Data



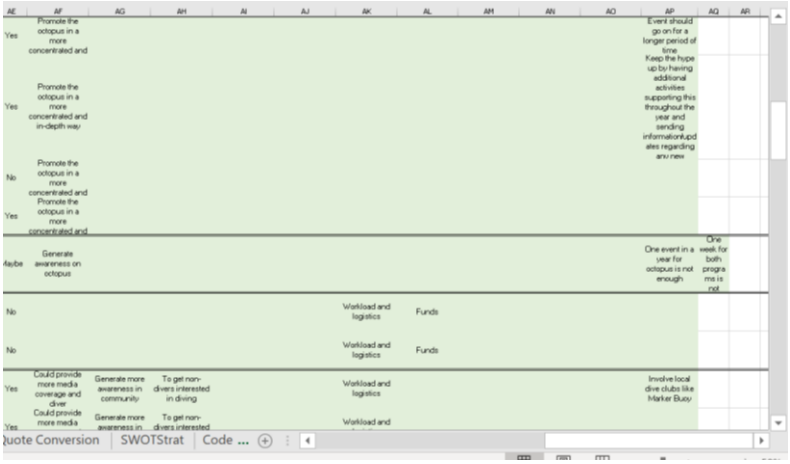
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
COSW_Agree	COSW_Opportunity_1	COSW_Opportunity_2	COSW_Opportunity_3	COSW_Opportunity_4	COSW_Opportunity_5	COSW_Threat_1	COSW_Threat_2	COSW_Threat_3	COSW_Threat_4	COSW_Threat_5	COSW_Other Remark_1	COSW_Other Remark_2	
Yes	Bring different communities together	Stregthen relationship between divers and the aquarium				Workload and logistics					The programs should also include workshops or talks regarding octopus and current issues like climate		
No	Bring different communities together	Stregthen relationship between divers and the				Workload and logistics					Increase frquency of programs to increase hype		
No	Bring different communities together	Stregthen relationship between divers and the aquarium				Workload and logistics							
No	Bring different communities together	Stregthen relationship between divers and the aquarium				Workload and logistics							
Maybe	Bring different communities together	Stregthen relationship between divers and the				Workload and logistics							
Maybe	Stregthen relationship between divers and the aquarium										Include more people in the dive community in the events. Maybe reach out to PADI, SDI to promote events and		
	Stregthen												

Quote Conversion | SWOTStrat | Code ...



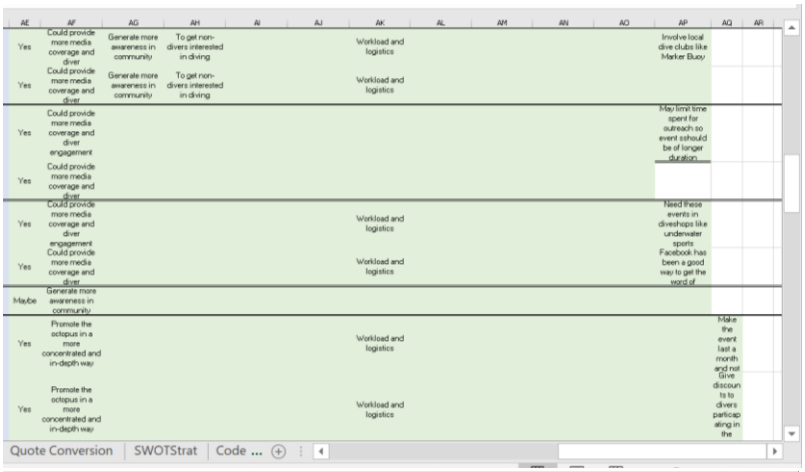
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Maybe	Stregthen relationship between divers and the aquarium												
Yes	Stregthen relationship between divers and the												
Yes	Generate awareness					Timing the event with octopus availibility							
Yes	Generate awareness					Timing the event with octopus availibility							
Maybe	Promote the octopus in a more concentrated and in-depth way					Timing the event with octopus availibility					Depends on what time of year it is done as octopuses are not availible all year round		
Maybe	Promote the octopus in a more concentrated and					Timing the event with octopus availibility							
Yes	Promote the octopus in a more concentrated and										Event should go on for a longer period of time		
Yes	Promote the octopus in a more concentrated and in-depth way										Keep the hype up by having additional activities supporting this throughout the year and sending informationUpd		

Quote Conversion | SWOTStrat | Code ...



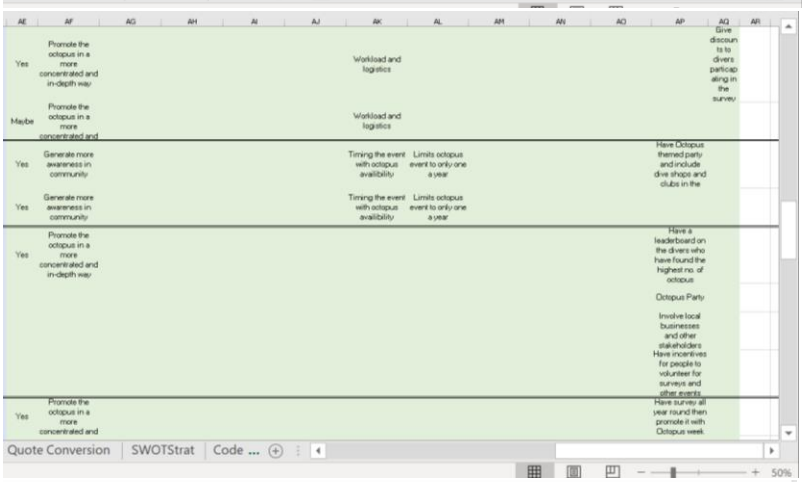
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Yes	Promote the octopus in a more concentrated and										Event should go on for a longer period of time		
Yes	Promote the octopus in a more concentrated and in-depth way										Keep the hype up by having additional activities supporting this throughout the year and sending informationUpd		
No	Promote the octopus in a more concentrated and										ates regarding any new		
Yes	Promote the octopus in a more concentrated and												
Maybe	Generate awareness on octopus										One event in a year for octopus is not enough	One week for both programs is not	
No						Workload and logistics	Funds						
No						Workload and logistics	Funds						
Yes	Could provide more media coverage and diver	Generate more awareness in community	To get non-divers interested in diving			Workload and logistics					Involve local dive clubs like Marker Buoy		
Yes	Could provide more media	Generate more awareness in	To get non-divers interested			Workload and							

Quote Conversion | SWOTStrat | Code ...



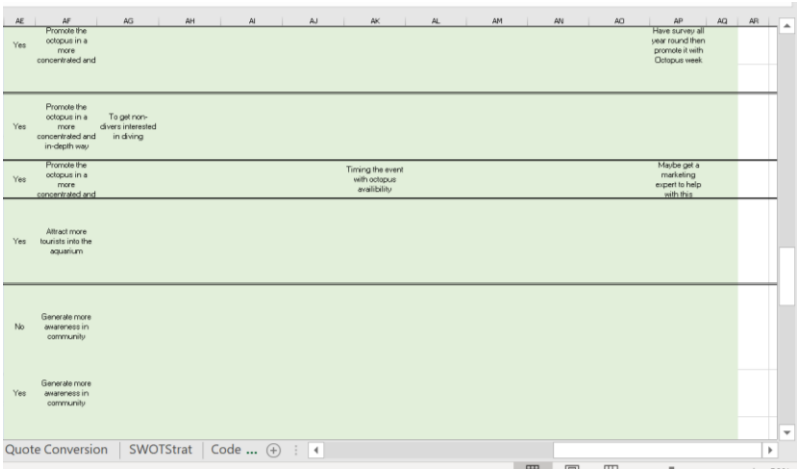
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Yes	Could provide more media coverage and diver	Generate more awareness in community	To get non-divers interested in diving			Workload and logistics					Involve local dive clubs like Marker Buoy		
Yes	Could provide more media coverage and diver	Generate more awareness in community	To get non-divers interested in diving			Workload and logistics							
Yes	Could provide more media coverage and diver engagement										May limit time spent for outreach so event should be of longer duration		
Yes	Could provide more media coverage and diver												
Yes	Could provide more media coverage and diver engagement					Workload and logistics					Need these events in diveshops like underwater sports		
Yes	Could provide more media coverage and diver					Workload and logistics					Facebook has been a good way to get the word of		
Maybe	Generate more awareness in community												
Yes	Promote the octopus in a more concentrated and in-depth way					Workload and logistics						Make the event last a month and not	
Yes	Promote the octopus in a more concentrated and in-depth way					Workload and logistics						Give discounts to divers particap ating in the	

Quote Conversion | SWOTStrat | Code ...



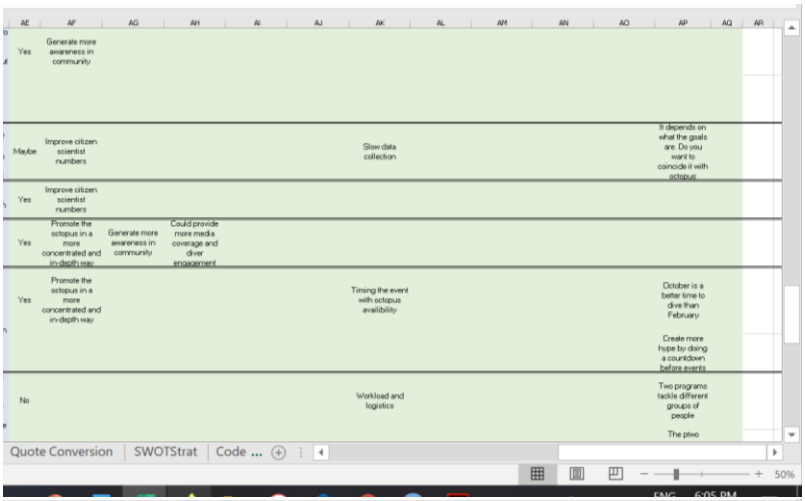
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Yes	Promote the octopus in a more concentrated and in-depth way					Workload and logistics						Give discounts to divers particap ating in the survey	
Maybe	Promote the octopus in a more concentrated and					Workload and logistics							
Yes	Generate more awareness in community					Timing the event with octopus availibility	Limits octopus event to only one a year				Have Octopus themed party and include dive shops and clubs in the		
Yes	Generate more awareness in community					Timing the event with octopus availibility	Limits octopus event to only one a year						
Yes	Promote the octopus in a more concentrated and in-depth way										Have a leaderboard on the divers who have found the highest no. of octopus		
											Octopus Party		
											Involve local businesses and other stakeholders		
											Have incentives for people to volunteer for surveys and other events		
Yes	Promote the octopus in a more concentrated and										Have survey all year round then promote it with Octopus week		

Quote Conversion | SWOTStrat | Code ... 50%



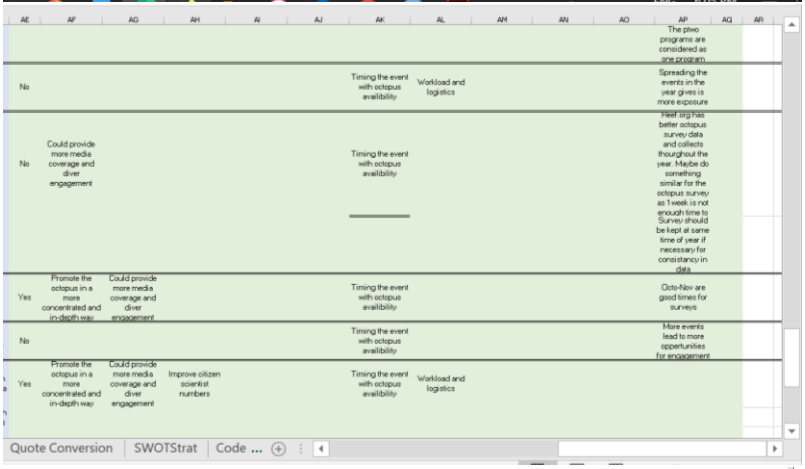
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Yes	Promote the octopus in a more concentrated and										Have survey all year round then promote it with Octopus week		
Yes	Promote the octopus in a more concentrated and in-depth way	To get non-divers interested in diving											
Yes	Promote the octopus in a more concentrated and					Timing the event with octopus availibility					Maybe get a marketing expert to help with this		
Yes	Attract more tourists into the aquarium												
No	Generate more awareness in community												
Yes	Generate more awareness in community												

Quote Conversion | SWOTStrat | Code ...



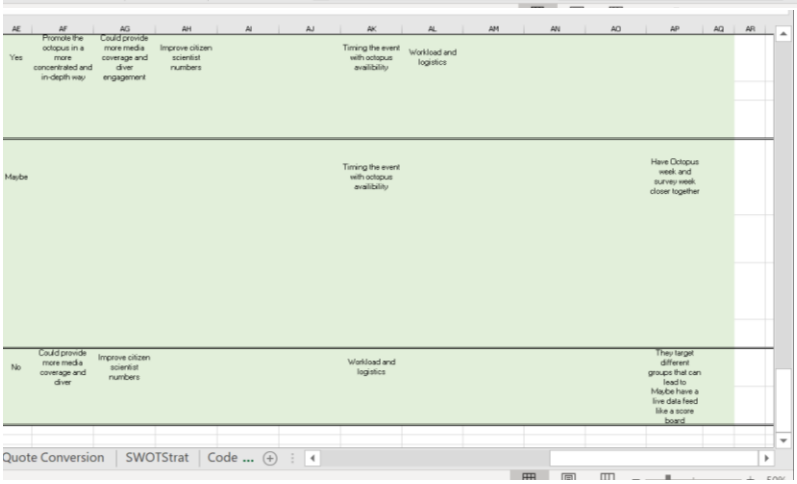
AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Yes	Generate more awareness in community												
Maybe	Improve citizen scientist numbers					Slow data collection					It depends on what the goals are. Do you want to coincide it with octopus		
Yes	Improve citizen scientist numbers												
Yes	Promote the octopus in a more concentrated and in-depth way	Generate more awareness in community	Could provide more media coverage and diver engagement										
Yes	Promote the octopus in a more concentrated and in-depth way					Timing the event with octopus availibility					October is a better time to dive than February Create more hype by doing a countdown before events		
No						Workload and logistics					Two programs tackle different groups of people The piwo		

Quote Conversion | SWOTStrat | Code ...



AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
											The piwo programs are considered as one program.		
No						Timing the event with octopus availibility	Workload and logistics				Spreading the events in the year gives is more exposure		
No	Could provide more media coverage and diver engagement					Timing the event with octopus availibility					Heat ring has better octopus survey data and collects throughout the year. Maybe do something similar for the octopus survey as 1 week is not enough time to Survey should be kept at same time of year if necessary for consistancy in data		
Yes	Promote the octopus in a more concentrated and in-depth way	Could provide more media coverage and diver engagement				Timing the event with octopus availibility					Octo-Nov are good times for surveys		
No						Timing the event with octopus availibility					More events lead to more opportunities for engagement		
Yes	Promote the octopus in a more concentrated and in-depth way	Could provide more media coverage and diver engagement	Improve citizen scientist numbers			Timing the event with octopus availibility	Workload and logistics						

Quote Conversion | SWOTStrat | Code ...



AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
Yes	Promote the octopus in a more concentrated and in-depth way	Could provide more media coverage and diver engagement	Improve citizen scientist numbers			Timing the event with octopus availibility	Workload and logistics						
Maybe						Timing the event with octopus availibility					Have Octopus week and survey week closer together		
No	Could provide more media coverage and diver	Improve citizen scientist numbers				Workload and logistics					They target different groups that can lead to Maybe have a live data feed like a score board		

Quote Conversion | SWOTStrat | Code ...

Appendix 6: Maps

6.1 Maps Generated in RStudio

For my final project in SMEA 550 B: *Spatial Data Workshop*, I worked to determine how best I can represent the data collected for my thesis, *Experiencing tentacle difficulties? SWOT it out! A SWOT Analysis on the Giant Pacific Octopus Marine Conservation Tourism programs at the Seattle Aquarium.* As part of this thesis, I conducted semi-structured interviews and focus groups all across the Seattle area, asking interviewees whether the Seattle Aquarium should combine two of their Giant Pacific Octopus programs (Octopus Survey Week and Octopus Week) into one major, all-encompassing program. The following references to specific maps can be found in the code I used for RStudio (Section 6.1.1).

Using the geographical coordinates, the number of interviews and number of individuals that said yes to the union per location, three maps were generated using ggplot2, a data visualization package for RStudio (Rstudio.com. n.d.). To add boundaries, two shapefiles were taken from a geodatabase that I created for an assignment in SEFS 520: *Introduction To Geographic Information Systems In Forest Resources*. The collected data was then used to generate three maps using ggplot. One of these maps had the locations depicted using proportional symbols of the number of interviews conducted at each location (gginterview_map). Another map also used proportional symbols, except it represented the number of individuals who said yes to the union at each site (ggyes_map).

The last map was that of the state of Washington with the boundary of my study area highlighted (WA_map). This was then inset in the final map which had the gginterview_map and ggyes_map side by side. I then generated another map using the package leaflet. Here I was able to be a bit more creative, going as far as to generating my own icon to mark the interview locations over two different base maps. I even added the proportional symbols of the number of interviews to this map as well.

Another question that popped up in my mind is regarding the neighborhood in which the interview sites were located. For my thesis, I mostly interviewed SCUBA

divers at dive sites, dive shops and dive clubs. Scuba diving is an extremely expensive sport with gear rentals going for a minimum of $185 excluding tax (Seattle Dive Tours. n.d.). Thus, one can hypothesize that these interview locations would be in high socio-economic neighborhoods.

To tackle this question, I downloaded the Racial and Social Equity Composite Index Data from Seattle City Geodatabase (Data-seattlecitygis.opendata.arcgis.com. 2019). Using the socio-economic index data under SOCIOECONO in the dataset, I generated another ggplot (soec_map) where the index was represented in gradient to help interpret the map. This map disproved my hypothesis. The dive sites, shops and clubs were shown to be in neighborhoods in the lower end of the socio-economic index. A reason why these locations are set up in those neighborhoods is that, due to the cost of the gear and equipment, the stores and clubs need to set-up in more affordable areas.

Both sets of maps had limitations. In the case of the number of interviews against locations, I was limited by the nature of my data, i.e. it is not spatial and my thesis itself does not have a spatial research element to it. The socio-economic map only showed the neighborhoods in Seattle, excluding Des Moines and Edmonds. As such, one must assume that, if the data for these areas were available, they would show similar results.

In conclusion, this final project has helped me generate informative and aesthetically pleasing maps for my thesis. It has also showcased the current situation of dive community in Seattle that can be further looked into through a separate study.

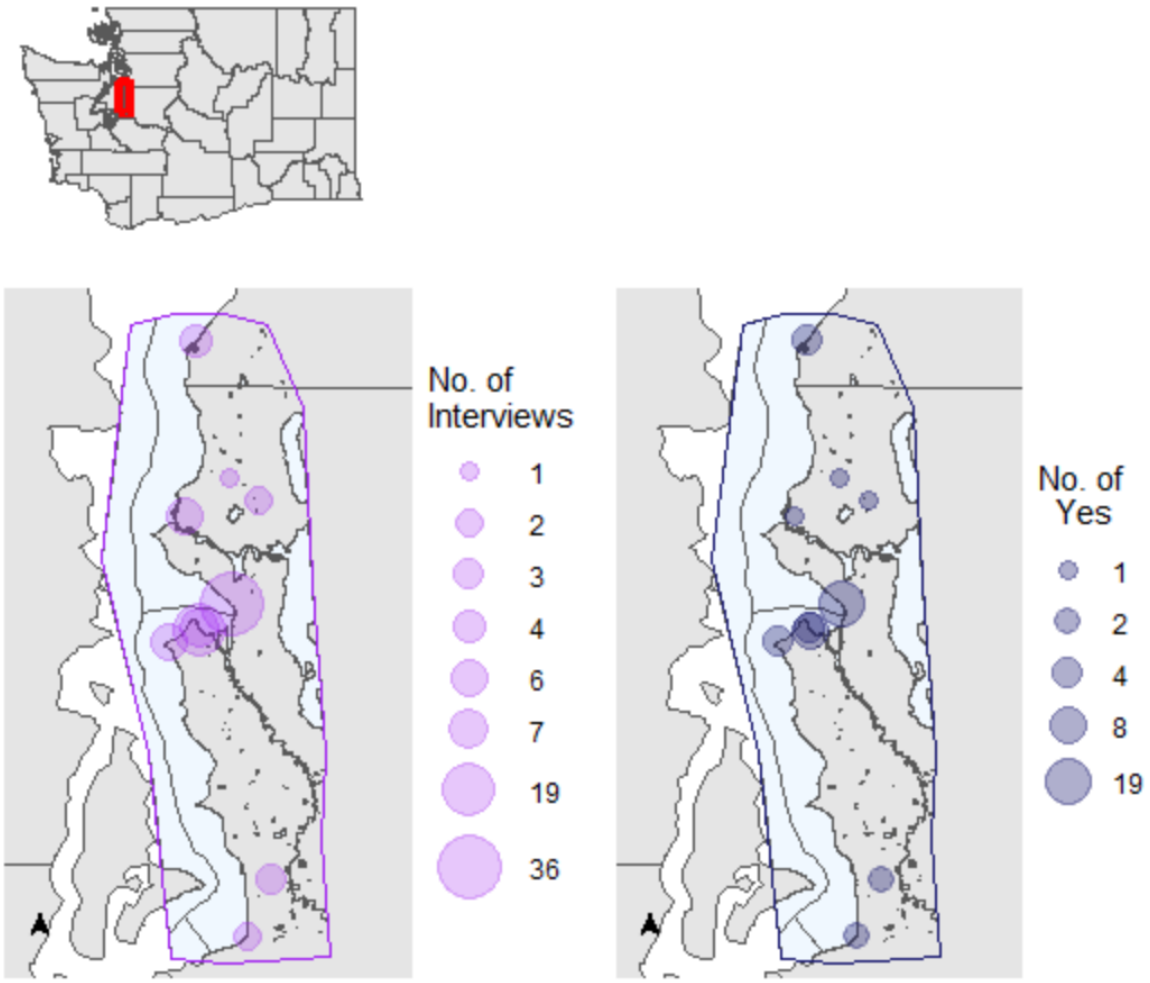


Figure1: Proportional Map of Number of Interviews at each sit and Number of 'Yes' to combing Octopus Survey Week and Octopus Weeks at each site. Map generated by author in RStudio.

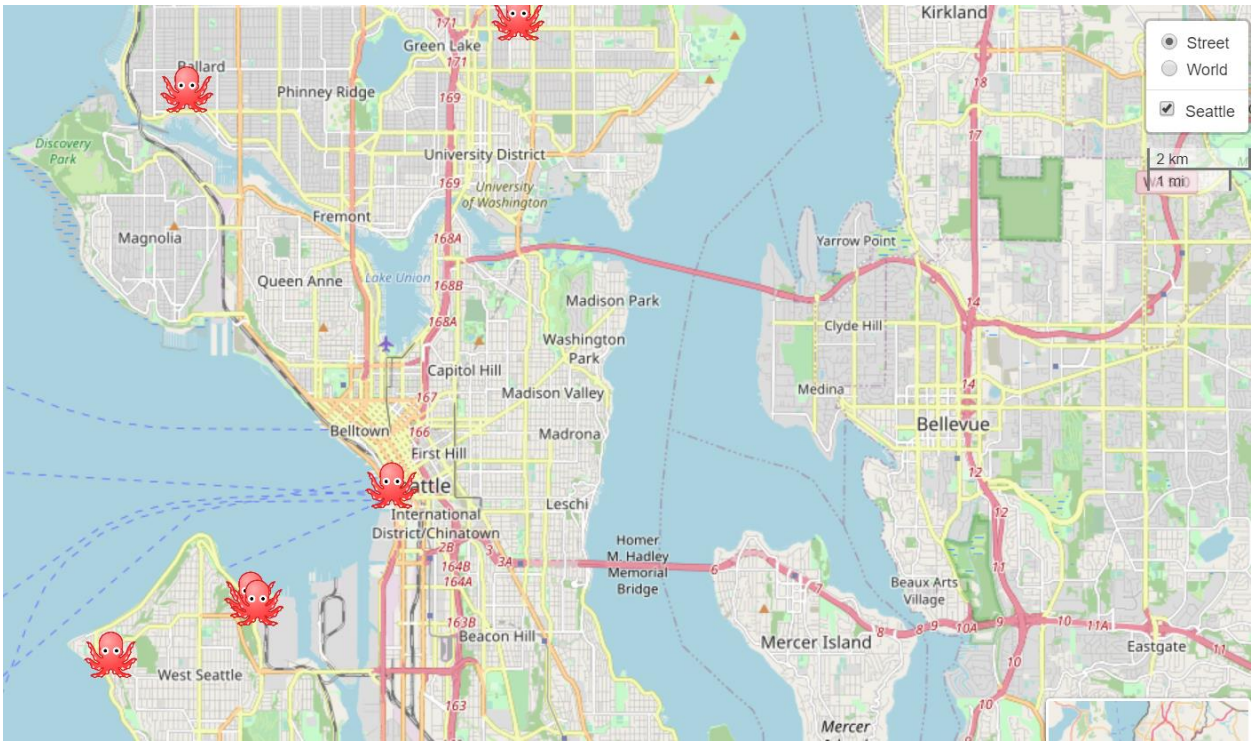


Figure 2: Image of Interactive Map with octopus icons for interview sites. Generated by the author in RStudio.

Link to Interactive Map

Link to Interactive Map with proportional symbols

6.1.1 R Code for Figure 1 and Figure 2

```
rm(list=ls())

setwd("~/UW Spring Spatial Data")


library(sf)

library(spData)

library(dplyr)

library(ggplot2)

library(lwgeom)

library(tidyverse)

library(units)

library(raster)

library(ggsn)
```

```
x <- c("sf", "spData", "dplyr", "ggplot2", "leaflet", "htmlwidgets",
       "DT", "shiny", "raster", "scatterpie", "cartogram", "gridExtra")
lapply(x, library, character.only = TRUE)



interview <- read_csv("UW Thesis/Octo_XY_Points.csv") ##ask about the errors
boundary <- read_sf("UW Thesis/UW Thesis.gdb", layer = "Boundary")
water_boundary <- read_sf("UW Thesis/UW Thesis.gdb", layer = "Hydro_Clip")
world <- read_sf(system.file("shapes/world.gpkg", package="spData"))
us_counties <- read_sf("UW
Thesis/cb_2018_us_county_500k/cb_2018_us_county_500k.shp")
socio_eco <- read_sf("UW
Thesis/Racial_and_Social_Equity_Composite_Index/9362e3b7-801d-4b8e-9a79-
cf70afe2d10d202037-1-12y9ny2.x61ol.shp")



st_crs(world)
st_crs(boundary)
st_crs(water_boundary)

Boundary <- st_transform(boundary, crs = 4326)
WBoundary <- st_transform(water_boundary, crs = 4326)
Counties <- st_transform(us_counties, crs = 4326)

washington <- Counties %>% filter(STATEFP == "53")

Box_oct <- st_as_sfc(st_bbox(Boundary), expand = TRUE)

WA_map <- ggplot() +
```

```
  geom_sf(data = washington) +
  geom_sf(data = Box_oct, color = "red",
          fill = "transparent", lwd =1.5) +
  theme_void()

# Convert data frame to sf object
plot.interview <- st_as_sf(x = interview,
                           coords = c("x", "y"),
                           crs = 4326)

soec_map <- ggplot() +
  geom_sf(data = washington) +
  geom_sf(data = WBoundary, fill = "lightcyan") +
  geom_sf(data = Boundary, color = "black", fill = "transparent") +
  geom_sf(data = socio_eco, aes(color = SOCIOECONO, fill = SOCIOECONO, legend =
"none")) +
  scale_fill_gradient(low = "firebrick", high = "dodgerblue3",
                      name = "SocioEconomic
       Index") +
  geom_sf(data = plot.interview, color = "black") +
  coord_sf(xlim = c(-122.582439 , -122.155),
           ylim = c(47.50, 47.8285), expand = T) +
  north(location = "bottomleft", scale = 0.08,
       symbol = 12, x.min = -122.582439, x.max = -122.155,
       y.min = 47.34, y.max = 47.8285) +
  theme_void() +
  theme(legend.title = element_text(color = "black", size = 11),
       legend.text = element_text(color = "black", size = 9))
```

```
#scalebar not working
ggplot() +
  geom_sf(data = washington) +
  geom_sf(data = WBoundary, fill = "lightcyan") +
  geom_sf(data = Boundary, color = "black", fill = "transparent") +
  geom_sf(data = plot.interview, color = "red") +
  coord_sf(xlim = c(-122.582439 , -122.155),
           ylim = c(47.34, 47.8285), expand = T) +
  scalebar(location = "bottomleft", dist = 50,
           dist_unit = "km", transform = TRUE,
           model = "WGS84", height = 0.02,
           st.dist = 0.04, st.bottom = TRUE,
           st.size = 2, border.size = 1,
           x.min = -122.582439, x.max = -122.155,
           y.min = 47.34, y.max = 47.8285) +
  north(location = "bottomleft", scale = 0.08,
        symbol = 12, x.min = -122.582439, x.max = -122.155,
        y.min = 47.34, y.max = 47.8285) +
  theme_void()
??scalebar



#No. of interviews
gginterview_map <- ggplot() +
  geom_sf(data = washington) +
  geom_sf(data = WBoundary, fill = "aliceblue") +
  geom_sf(data = Boundary, color = "purple", fill = "transparent") +
```

```
  geom_point(data = interview, aes(x = x, y = y,
                                   size = Number_of_interviews),
             alpha = 0.25, color = "purple") +
    scale_size_continuous(range = c(3,10),
                          breaks  = c(1, 2, 3, 4, 6, 7, 19, 36)) +
    coord_sf(xlim = c(-122.582439 , -122.155),
             ylim = c(47.34, 47.8285), expand = T) +
  north(location = "bottomleft", scale = 0.08,
        symbol = 12, x.min = -122.582439, x.max = -122.155,
        y.min = 47.34, y.max = 47.8285) +
  labs(size = "No. of
Interviews") +
  theme(legend.title = "Interviews", element_text(color = "black", size = 11),
        legend.text = element_text(color = "black", size = 9)) +
  theme_void()


#No. of Yes

ggyes_map <- ggplot() +
  geom_sf(data = washington) +
  geom_sf(data = WBoundary, fill = "aliceblue") +
  geom_sf(data = Boundary, color = "midnightblue", fill = "transparent") +
  geom_point(data = interview, aes(x = x, y = y,
                                   size = No_of_Yes_for_Union),
             alpha = 0.35, color = "midnightblue") +
  scale_size_continuous(range = c(3,7),
                        breaks  = c(1, 2, 4, 8, 19)) +
```

```
  coord_sf(xlim = c(-122.582439 , -122.155),
           ylim = c(47.34, 47.8285), expand = T) +
  north(location = "bottomleft", scale = 0.08,
        symbol = 12, x.min = -122.582439, x.max = -122.155,
        y.min = 47.34, y.max = 47.8285) +
  labs(size = "No. of
  Yes") +
  theme(legend.title = element_text(color = "black", size = 11),
        legend.text = element_text(color = "black", size = 9)) +
  theme_void()

#####Side by SIde and inset

side_octo_map <- ggplot() +
  coord_equal(xlim = c(0, 3),
              ylim = c(0, 3), expand = FALSE) +
  annotation_custom(ggplotGrob(gginterview_map),
                    xmin = 0, xmax = 1.5,
                    ymin = 0.2, ymax = 2) +
  annotation_custom(ggplotGrob(ggyes_map),
                    xmin = 1.6, xmax = 3,
                    ymin = 0.2, ymax = 2) +
  annotation_custom(ggplotGrob(WA_map),
                    xmin = 0, xmax = 0.98,
                    ymin = 1.9, ymax = 3) +
  theme_void()

side_octo_map
```

```
#######Inset Map#######

ggplot() +
  coord_equal(xlim = c(0, 3),
              ylim = c(0, 3), expand = FALSE) +
  annotation_custom(ggplotGrob(soec_map),
                    xmin = 0, xmax = 2,
                    ymin = 0, ymax = 3) +
  annotation_custom(ggplotGrob(WA_map),
                    xmin = 2.1, xmax = 3,
                    ymin = 1.9, ymax = 3) +
  theme_void()

#######Interactive Map#######

nhd_wms_url <-
"https://basemap.nationalmap.gov/arcgis/services/USGSTopo/MapServer/WmsServer"

OctoIcon <- makeIcon(
  iconUrl = "https://www.hiclipart.com/free-transparent-background-png-clipart-ibwba",
  iconWidth = 38, iconHeight = 95,
  iconAnchorX = 22, iconAnchorY = 94,
  )

OctoIcon2 <- makeIcon("UW Thesis/octo.png",
  iconWidth = 40, iconHeight = 40,
  iconAnchorX = 3, iconAnchorY = 3,
)
```

```
leaflet(interview) %>%
  addTiles(group = "Street") %>%
  addProviderTiles(providers$Esri.WorldImagery,
                   group = "World") %>%
  addMarkers(lng = ~x, lat = ~y,
             label = as.character(interview$Location_Name)) %>%
  setView(lng = -122.3321, lat = 47.6062, zoom = 12) %>%
  addLayersControl(baseGroups = c("Street", "World"),
                   overlayGroups = c("Seattle"),
                   options = layersControlOptions(
                     collapsed = FALSE)) %>%
  addMiniMap(zoomLevelOffset = -4) %>%
  addScaleBar()

octo_imap <- leaflet(interview) %>%
  addTiles(group = "Street") %>%
  addProviderTiles(providers$Esri.WorldImagery,
                   group = "World") %>%
  addMarkers(lng = ~x, lat = ~y,
             popup = as.character(interview$Number_of_interviews),
             label = as.character(interview$Location_Name),
             icon = OctoIcon2) %>%
  setView(lng = -122.3321, lat = 47.6062, zoom = 12) %>%
  addLayersControl(baseGroups = c("Street", "World"),
                   overlayGroups = c("Seattle"),
                   options = layersControlOptions(
                     collapsed = FALSE)) %>%
```

```
  addMiniMap(zoomLevelOffset = -4) %>%
  addScaleBar()

saveWidget(octo_imap, file = "octo_imap.html")


####prop on leaflet######

octo2_imap <- leaflet(interview) %>%
  addTiles(group = "Street") %>%
  addProviderTiles(providers$Esri.WorldImagery,
                   group = "World") %>%
  addMarkers(lng = ~x, lat = ~y,
             popup = as.character(interview$Number_of_interviews),
             label = as.character(interview$Location_Name),
             icon = OctoIcon2) %>%
  addCircles(lng = ~x, lat = ~y,
             color = "orange",
             opacity = 2,
             fillOpacity = 0.7,
             weight = 1,
             radius = interview$Number_of_interviews*30
  ) %>%
  setView(lng = -122.3321, lat = 47.6062, zoom = 12) %>%
  addLayersControl(baseGroups = c("Street", "World"),
                   overlayGroups = c("Seattle"),
                   options = layersControlOptions(
                     collapsed = FALSE)) %>%
```

```
  addMiniMap(zoomLevelOffset = -4) %>%
  addScaleBar()


saveWidget(octo2_imap, file = "octo2_imap.html")
```

6.2 Maps Generated in ArcGIS Pro

I generated the following maps for my course, SEFS 520: Introduction To Geographic Information Systems In Forest Resources. These maps were generated in the advanced data visualization software, ArcGIS Pro (Esri.com. n.d.).

For these maps, I had to generate a boundary layer encompassing all my interview sites (See Chapter 5, Table 5.1). I downloaded the National Hydrography Dataset from the USDA Geospatial Data website (Datagateway.nrcs.usda.gov. n.d.) and used it to enhance my basemap and then loaded the site data listed in Chapter 5, Table 5.1 as well as the Giant Pacific Octopus (GPO) sighting data from REEF (Reef.org. n.d.). These datasets were represented as proportional symbol points on the map (Final Project Map 1).

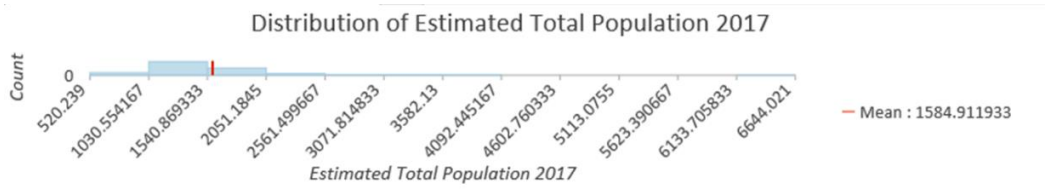


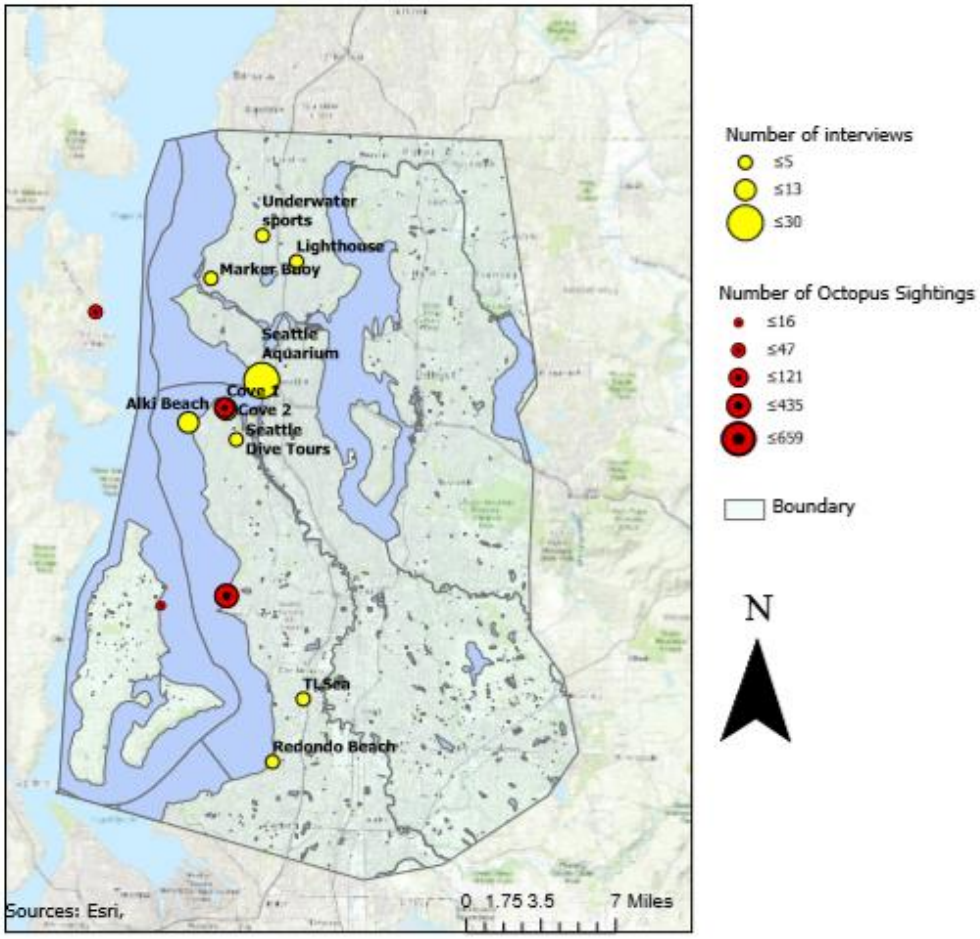
Figure 3: Bar graph of estimated total population of humans in each neighborhood near the interview site in. Data is the population data for Seattle in 2017 Graph generated by the author in ArcGIS Pro.

For Final Project Map 2, I wanted to see the population density of humans in and around the interview sites i.e. the dive sites, shops and clubs. The population density data also came from the USDA Geospatial Data website (Datagateway.nrcs.usda.gov. n.d.). Upon loading it to the main map, I used the 'Select Layer by Location' tool to only see the population density of the neighbourhoods closest to the interview sites. Based

on the bar graph (Figure 3) generated using the loaded population density dataset, scuba diving sites, clubs and shops are in areas of relatively low population density.

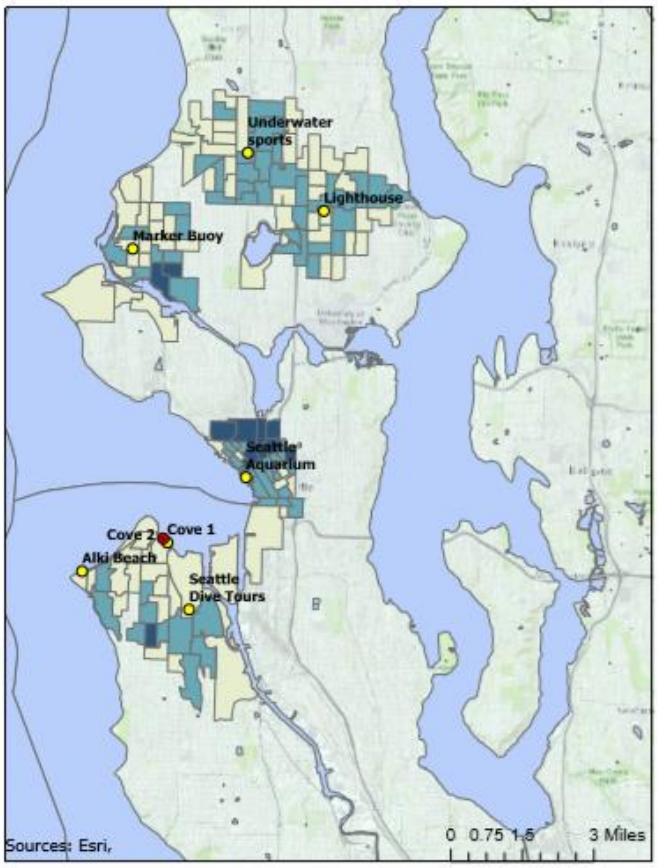
As is Section 6.1, I wanted to determine the socio-economic status of the neighbourhoods the interview sites were in. Using the same Racial and Social Equity Composite Index Data from Seattle City Geodatabase (Data-seattlecitygis.opendata.arcgis.com. 2019), I used the Buffer tool to see the socio-economic status of the neighbourhoods within a 1 mile radius of the interview sites. The results were the same as in Section 6.1.

Manjari Misra, SEFS 520 Final Project Map1: Scuba diver and Private Business Interviews regarding Giant Pacific Octopus Conservation Programs at Seattle Aquarium



Created by Manjari Misra
Data provided by:
Manjari Misra
Reef.org
Seattle Aquarium

Manjari Misra, SEFS 520 Final Project Map 2: Population Density in and around Dive Sites, Clubs and Shops



Octopus Sightings
Interview locations

Estimated Population Density 2017

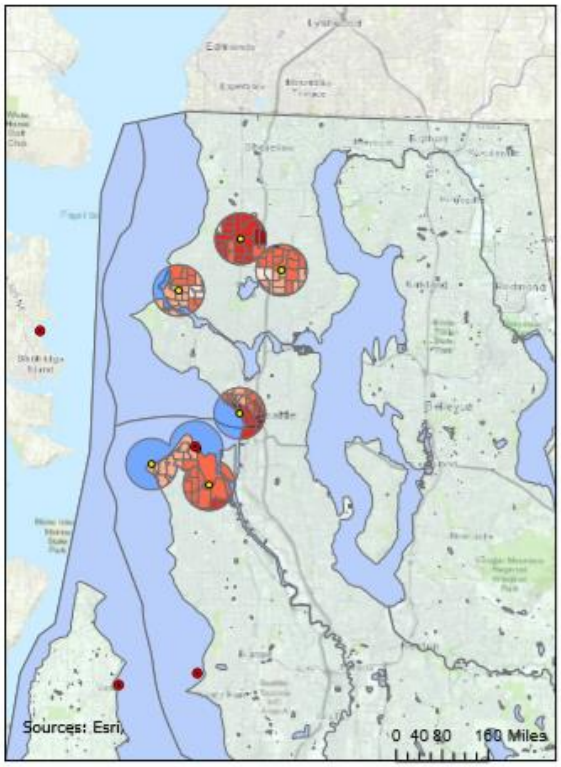
Low density
Medium density
High density

N

Created by Manjari Misra
Data provided by:
Manjari Misra
Reef.org
Seattle Aquarium
University of Washington
Seattle.gov

SMEA 2019

Manjari Misra SEFS 520 Final Project Map 3: Socioeconomic Status of Neighborhoods in and around Dive Sites, Clubs and Shops



Octopus Sightings

Interview locations

Neighborhoods that are Socioeconomically Disadvantaged

Least

Second Least

Middle

Second Most

Most

Boundary

N

Created by Manjari Misra
Data provided by:
Manjari Misra
Reef.org
Seattle Aquarium
University of Washington
Seattle.gov

SMEA 2019

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