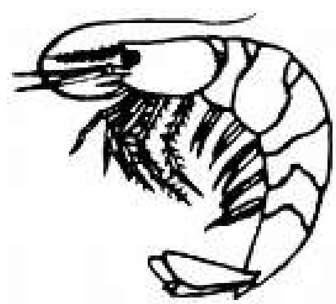
The University of British Columbia Sustainable Seafood Project – Phase II:

An Assessment of the Sustainability of

Shrimp

Purchasing at UBC



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Abstract

Although humans have fished for millennia, recent technological changes and heightened social desire for seafood has lead to the over-exploitation and degradation of marine environments. In an effort to help curb the collapse of marine resources, the University of British Columbia (UBC) has embarked on the Sustainable Seafood Project. A collaborative initiative of food service providers, seafood suppliers, researchers, and students, the project aims to source all seafood consumed on campus from ecologically sustainable supplies. The complexities of commercial shrimp products are here examined, in Phase II of the project.

Globally, shrimp fisheries are extremely destructive to marine environments. Consumption of any type of shrimp product carries ecological, social, and economical consequences. This report presents the major concerns relating to shrimp consumption as well as a preliminary analysis of UBC's present trends in shrimp purchasing. There are few precise answers with regard to sustainable shrimp purchasing and consumption, but we here propose choices that UBC could make in order to improve the sustainability of its shrimp sourcing. We also suggest that UBC food service providers consider the possibility of removing shrimp from UBC menus. This report should serve as a guide for discussions and decisions surrounding UBC's shrimp purchasing. It also furthers UBC's progress towards sustainable seafood consumption on campus.

Introduction

Despite their usual diminutive size, shrimp species collectively represent the largest and most valuable seafood commodity traded worldwide (Kourous, 2006, Naylor et al., 2000). Globally, annual exports of shrimp average more than 1.6 million tonnes, have a value of over 11 US$ billion, and are a major source of employment, income, and tax revenue globally (Kourous, 2006). The high economic value of shrimp fisheries comes with high ecological costs as both farmed and wild-caught shrimp industries threaten marine environments. Aside from immediate environmental concerns, there are many social and economic complications associated with shrimp industries. Concerns are often centred in developing nations, which extract 90% of all wild-caught shrimp and produce 99% of all farmed shrimp, and where many communities and individuals are dependant on the substantial revenue generated by shrimp production (Kourous, 2006). Nearer to home, British Columbia's local shrimp fishery is shrinking as processing plants close because of recent restrictions that have eliminated shrimp fishing within the Queen Charlotte Islands, some of British Columbia's most productive shrimping grounds (L. Clayton, *pers. comm.,* 2006).

This report addresses many issues associated with the sustainability of both wild-caught and farmed shrimp. Exploitation of wild shrimp leads to high volumes of by-catch. In contrast, shrimp aquaculture commonly damages mangrove ecosystems, pollutes coastal waters, depends on high-protein feed, introduces exotic species (when farm stock escapes from shrimp farms) and propagates disease (Kourous, 2006, FAO, 2006, SF, 2006, Cascorbi, 2004, Larsson et al., 1994). Although the majority of shrimp farmers worldwide are small-scale local farmers, the number of large-scale, export-oriented industrial shrimp aquaculture operations is increasing and often produces higher volumes than the small-scale producers (Kourous, 2006). As capture fisheries and aquaculture ventures strive to meet developed countries' increasing demand for shrimp, ecological concerns associated with commercial shrimp production will likely escalate (Kourous, 2006, Naylor et al., 1998).

Biology

Detailed knowledge of shrimp biology and ecology is available (e.g. University of Victoria, 2006). These animals are members of the crustacean order of Decapoda, which also includes lobsters, true crabs, and hermit crabs. Decapods have a chitinous exoskeleton that is shed periodically as the animal matures. All decapods have a full carapace and five pairs of walking legs.

Organisms that are commercially labeled as shrimp come from two separate taxonomic groups: *caridean shrimps* from the taxonomic infraorder Caridea *penaeoid shrimps* from the superfamily Penaeoidae. Both groups are found worldwide, primarily in marine environments but also in estuaries, rivers, lakes, and brackish waters. While caridean and penaeoid shrimps look similar, the taxa differ significantly in both reproductive biology and physical morphology. Caridean shrimp species have a second abdominal segment plate that overlaps both neighbouring segment plates (first and third) on each side whereas penaeoid shrimp have abdominal segment plates that overlap in a tile-like manner with the following segment plate overlapped by the exceeding plate (Figure 1). During reproduction, female caridean shrimps incubate eggs on their abdomens while penaeoid shrimps disperse fertilized eggs into the water.

Caridean shrimps are found within a broad range of habitats worldwide and comprise at least 28 families and 2500 identified (Bauer, 2006, Roberts, 2006) but account for only 18% of the total global shrimp fisheries. Penaeoid shrimp species primarily live in tropical and subtropical areas, comprise 5 families and 400 species, and account for over 70% of the world’s shrimp production (Bauer, 2006). Trawlers often target species belonging to the genus *Penaeus*, a group known for their rapid growth and seemingly large population sizes (Bauer, 2006).

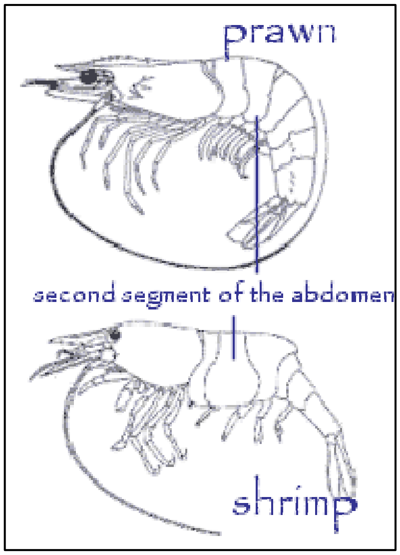

Figure 1. Physical difference between penaeoid (labeled prawn above) and caridean (labeled shrimp above) shrimp, taken from the University of Victoria Biology of Shrimp website (2006)

In this report, the term shrimp will embrace all shrimp and prawn species, as is the case in commercial contexts, but regional differences in terminology abound. In North America, it is most common to refer to caridean species as shrimps and penaeiod species as prawns. Under the American definition, a “prawn” is defined as a freshwater shrimp or prawn (SF, 2006), while in Southeast Asia, a large “shrimp” is called a prawn even if its taxonomy places it within the infraorder of Caridea. In Australia and the U.K., it is more common to refer to all shrimp and prawns as prawns (SF, 2006). A local example of this naming inaccuracy is demonstrated with B.C.’s white spot prawn, which is in fact a shrimp in the infraorder Caridea (DFO, 2006a).

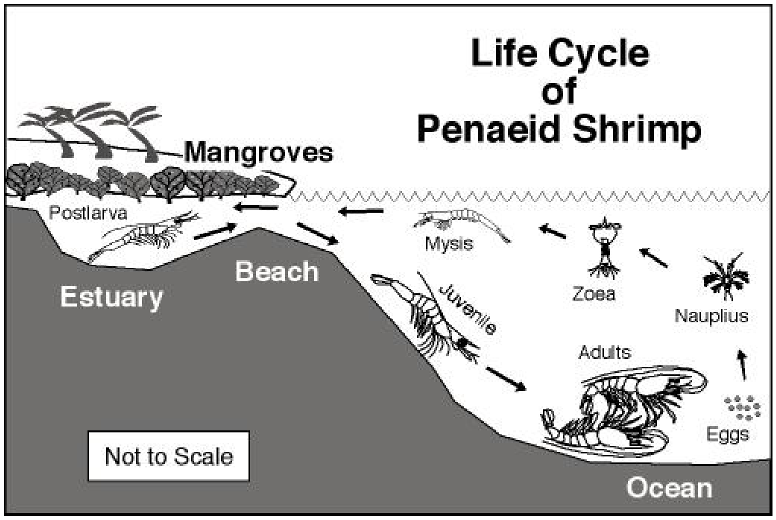

Figure 2. Penaeid Shrimp Life Cycle, taken from Bauer (2006)

Life Cycle & Reproduction

In the general life cycle of shrimp, the juvenile and young adult shrimp of nearly all species migrate offshore to the more stable ocean environment where they mature, mate, and spawn eggs (Figure 2). Mating occurs after females have molted. Males then turn females on their backs and place spermatophores (or sperm sacs) close to the female genital duct from holes at the base of the male's last and third legs. Within 24 hours, the female will spawn and release eggs (although the timing varies with availability of abiotic factors such as heat and light). Eggs become fertilized as they pass through spermatophores on release. The female (if a caridean shrimp) then holds the fertilized eggs within a brood chamber that is glued to hairs beneath the abdomen. The eggs will remain in the brood chamber during both incubation and the first larval stage, or nauplius. Clutch sizes of temperate shrimp species ranges from a few hundred to about 4,000 eggs, which is few compared to the tens of thousands of eggs released by tropical species (Roberts, 2005). Once the nauplii become zoeae (a free swimming stage of development), they are released from the female's abdomen. The zoeae exist as plankton and resemble adult shrimp in morphology while growing and molting through various stages of larval development. Approximately 12 molts are required to reach the final form of a juvenile shrimp, which settles on the ocean bottom. Postlarval shrimp are carried by oceanic currents to estuaries where they obtain protection and nutrition. They remain within the estuaries until they reach late juvenile/early adult stage, which is usually a period of 4-5 months for tropical species. After reaching the early adult stage of development, shrimp then migrate out into the open ocean for the remainder of their life (Whetstone, et al., 2002).

While tropical shrimp species mature to different sexes and spawn freely in the ocean, temperate species exhibit protandric hermaphroditism: all juvenile shrimp are male, they mature to breed males for one or two years and then they transform into breeding females for the remaining year or two of life (DFO, 2006b, Roberts, 2006). Species that change sex at some critical age or size present a challenge to sustainable exploitation (Vincent and Sadovy, 1998). For fish or invertebrates that become females after a certain age (or a certain size), repeated removal of large adults (all of one sex) may lead to a highly biased sex ratio and consequent population declines.

The majority of shrimp are omnivorous, consuming whatever animal or plant material is readily available (Roberts, 2006). Most shrimp species stay on the bottom of the ocean during the day and feed on worms, small crustaceans, and marine plants. At night they migrate up from the bottom feeding on small pelagic crustaceans but also serving as prey for many fish species. Many temperate shrimp species are very effective swimmers capable of swimming horizontally and vertically (DFO, 2006b, Bauer, 2006).

Conservation and Management Status

Wild-capture Shrimp

Shrimp are fished and farmed around the world. Nearly every coastal nation in the world fishes for wild shrimp, while up to 50 nations produce shrimp through aquaculture (Whetsone, 2002). Although there are more than 3,000 shrimp species worldwide, only 40 species are in fact commercially exploited (Roberts, 2006, Whetsone, 2002); other species are too small or exhibit preferences for habitat that are unsuitable for commercial exploitation. Shrimp species can be exploited commercially if they reach a relatively large size (between 2-10 cm) and they school, shoal, migrate, or aggregate together, enabling easy capture (Roberts, 2006).

By-catch

Wild-caught shrimp are primarily captured through trawl methods that are well-known for both their negative impacts on non-target fish species and their damage to physical ocean environments. Bottom-trawling and dredging for shrimp, in which nets with weights are dragged across the ocean floor, have often been identified as damaging marine environments (Harrington et. al., 2005, Eayrs, 2005, Kirby, 2003, BBC, 2006). The majority of shrimp trawlers are, however, mid-water trawlers that cause less habitat damage than dredging and bottom-trawling, because they do not scrape the bottom of an ocean area (Eayrs, 2005). However, the small mesh sizes of mid-water shrimp trawlers still leads to high bycatch (accidental capture) of non-target marine organisms. Shrimp trawling, in fact, has the highest rates of by-catch in the world (Harrington et al., 2005, FAO, 2006, Kirby, 2003, Eayrs, 2005).

Bycatch includes fish, turtles, pieces of coral, sponges, and other living and non-living material. The majority of by-catch is considered useless and discarded overboard but fishers in developing countries are often able to sell portions of their by-catch (Harrington et al., 2005). Perhaps 7 million tonnes of fish are caught as by-catch annually by commercial fishers, equating to about 8% of total global marine capture (Kourous, 2006, Eayrs, 2005). Shrimp trawlers in tropical marine waters generate the highest amounts of by-catch, approximately 27% of global by-catch (Eayrs, 2005). Nets with mesh sizes small enough to catch mean that shrimp trawling is the least selective of all fisheries. Conservative estimates of the ratio of by-catch to shrimp caught for temperate areas fall around 5:1, meaning that only 1/6 of the contents in a shrimp trawl net is actually shrimp. The global average ratio of by-catch to shrimp yield is 20:1 and this ratio often creeps even higher (Kirby, 2003, Eayrs, 2005). By-catch often includes endangered species such as turtles, sharks, dugongs, sea snakes, sea horses, and corals. Such capture is often illegal and often wastes a portion of fishers' effort and resources in developing nations (Harrington et al., 2005).

Aside from the obvious concern of over-exploiting non-target fish from the ocean, shrimp exploitation often catches fish as by-catch that have not yet reached sexual maturity. The exploitation of juvenile fish threatens the long-term survival of fish stocks further. Removal of young fish from a population before they are capable of reproducing limits the ability of a population to grow or rebound from exploitation. Sharp declines in the stocks of non-targeted fish species in areas with shrimp trawl operations (Harrington et al., 2005, Eayrs, 2005, Cascorbi, 2004) highlight the possible repercussions of unintentional exploitation of juvenile fish.

Substantial efforts to curb the large volumes of shrimp fishery by-catch has focused on technological advancements such as Turtle Excluder Devices (TEDs) and By-catch Reduction Devices (BRDs), rather than catch policy reforms and enforcement. While there is evidence that these devices do decrease by-catch, they are often erroneously used and in the case of many developing countries, are not employed at all. Unless there is well-enforced implementation of these devices at a global scale, it is very difficult to believe that shrimp by-catch will decrease significantly. However, evidence from many North American and Australian shrimp fisheries indicates that proper employment of these devices has decreased by-catch considerably among these fisheries, thus improving the ecological credibility of the industry (Eayrs, 2005, DFO, 2003, Harrington, 2005). It is necessary however, that a similar trend of proper implementation of BRDs occurs within the shrimp fisheries of all countries, particularly developing ones.

British Columbia Wild-Capture Industry

British Columbia's shrimp fishery is relatively small, with only seven of 85 local species exploited commercially (DFO, 2006a, DFO, 2006b). The targeted species for B.C.'s shrimp fishery are the northern shrimp (*Pandalus borealis*), humpy shrimp (*P. goniurus*), sidestripe shrimp (*P. montagui*), spot prawn (*P. platyceros*), coonstripe shrimp (*P. hypsinotos*), smooth pink shrimp (*P. jordani)*, and dock shrimp (*P. danae*) (DFO, 2006a). British Columbia shrimp fisheries use both trawl and trap gears, with over 75% trawl vessels utilizing beam trawls (DFO, 2001). Over 90% of the landed shrimp in the trawl fishery are northern or pink shrimp, with the remainder being sidestripe shrimp (DFO, 2001). Coonstripe shrimp are landed by both trawl and trap gear, although commercial landings by trap gear are not considered significant (DFO, 2005a,). The other species aside from spot prawns are caught generally incidentally by northern or smooth pink shrimp trawl vessels (DFO, 2005a).

Historically, Vancouver Island's West Coast has been the central area for shrimp trawling in British Columbia, responsible for 80-90% of BC's catch (DFO, 1999). Despite a robust economy and traditionally resilient stocks, shrimp from B.C. only accounts for 3% of all Canadian shrimp landings, the remainder coming from the Atlantic northern shrimp fishery (DFO, 2003, Roberts, 2005). Because of large amounts of appropriate habitat, B.C. has the largest spot prawn fishery on North America's Pacific coast (Roberts, 2006, Clayton, 2006). Spot prawns are caught almost entirely (98%) by trap gear (DFO, 1999, DFO, 2006a). Roughly 90% are exported to Japan for sushi with the remainder either sold fresh to B.C. markets or sold to the U.S. (DFO, 1999, Roberts, 2005). Traps are baited wire or wooden cages that attract target species with low by-catch rates and have very little impact on marine environments (DFO, 2005a). For these reasons as well as persistently stable stock levels, the B.C. spot prawn industry is recognized as one of the most ecologically sustainable shrimp fisheries in the world (Roberts, 2005).

Although wild-stocks of shrimp in B.C. appear to be relatively stable, the industry is presently in a precarious state. Because high smooth pink shrimp fishery by-catch was blamed for rapid declines in eulachon stocks, the B.C. government closed the entire Queen Charlotte Island shrimp fishery in 2001 and introduced the mandatory installment of BRDs on every shrimp vessel in BC (DFO, 2006b, Clayton, 2006). While shrimp by-catch has declined substantially to 0-22% of the entire catch and eulachon by-catch has decreased dramatically by 96%, the closure of the Queen Charlotte Island shrimp fishery resulted in the closure of shrimp processing plants (Clayton, 2006). Consequently, the province's three machine shrimp processing plants closed, resulting in not only a loss of jobs for B.C. but also a decreased ability to meet local demands for local shrimp products (Clayton, 2006). Currently, the remaining shrimp processing plants hand-peel their products. Although a niche market for hand-peeled shrimp products exists, such BC enterprises are unable to compete with the significantly lower prices of East Coast and Oregon machine-peeled pink shrimp.

Aquaculture

From 1986 –1997, global aquaculture production increased from 10Mt to 29 Mt, more than doubling in magnitude (FAO, 1999). Recent estimates are that aquaculture production accounts for 25%-43% of all fish consumed by humans, whereas only 9% of fish consumed in 1980 came from aquaculture (FAO, 1999;

Kourous, 2006). The demand for fish, particularly by developed affluent countries, is increasing while the wild-capture fisheries have faltered. The decline of wild capture fisheries could perhaps create increasing pressure on aquaculture initiatives, permitting rapid development that may be unstable (Kourous 2006, FAO, 2006a).

Shrimp aquaculture accounts for 25% of global shrimp production and has been growing at the rapid rate of nearly 10% annually since the late 1980s (Naylor et al. 1998, FAO, 2006a). Today there are approximately 50,000 farms distributed in 50 nations. Almost 1.2 million hectares of land is devoted to shrimp production, generating annual revenues estimated to be between $5 - $6 billion US (SF, 2003, Naylor et al. 1998, Whetsone, 2002).

Asia has been at the forefront of the phenomenal growth in shrimp aquaculture. In the late 1990s, it was responsible for over 90% of the world's shrimp aquaculture production (Kourous, 2006, SF, 2006). China has led other nations with increases in shrimp aquaculture production of up to 15% annually since the late 1990s, whereas other Asian countries have annual aquaculture production increases in the range of 3%, a figure that is similar to that of North America and Europe (Garcia, 2002). Africa and Latin America both experienced high annual aquaculture growth between 2000-2004 of 9% and 11% respectively (FAO, 2006b). Asia as a whole is the largest producer, but Thailand is the largest exporter and the United States and Japan are the largest consumers of shrimp (SF, 2006). Despite environmental setbacks, shrimp aquaculture has sometimes been credited with alleviating immediate poverty concerns within impoverished nations of the world (Kourous, 2006).

Shrimp farming can be divided into extensive, semi-intensive, intensive, and super-intensive farming practices (SNI, 2006). Intensive and super-intensive farms have the highest stocking densities with the largest amounts of artificial inputs such as protein feed and chemicals to control disease and bacteria.

Although the majority of recent shrimp farm developments have occurred at the level of semi-intensive and intensive farms, most shrimp farming production still occurs in extensive farms of India, Vietnam, Bangladesh, the Philippines and Indonesia (Kourous, 2006, SNI, 2006). Shrimp farms that use extensive farming techniques use lower amounts of feed and chemicals and generally keep shrimp at lower densities (SNI, 2006).

About 10 species of shrimp in total are farmed commonly. Two species, however, account for 80% of all farmed shrimp: the Pacific white shrimp (*Penaeus vannamei*) and the giant tiger prawn (*Penaeus monodon*) (Coscorbi, 2004, SF, 2006). Other commonly farmed species include the Western blue shrimp (*P. stylirostris*), the Chinese white shrimp (*P. chinensis*), Kuruma shrimp (*P. japonicus*), the Indian white shrimp *(P. indicus*), and the Banana shrimp (*P. merguiensis*) (SF, 2006). No temperate shrimp species are presently being farmed (Roberts, 2006).

Shrimp production is one of the most environmentally destructive aquaculture industries. During the 1980s and 1990s, 35% of all mangroves in developing countries were removed for extensive shrimp farming (Valiela et al., 2001, Coscorbi, 2003). Once covering nearly all of tropical and sub-tropical coastlines, the rate of mangrove deforestation now exceeds the rate of old-growth deforestation, with shrimp farming believed to be responsible for one-third of all removal (Naylor et al.,1998, Valiela et al., 2001). Mangroves provide spawning grounds and protective habitats for juvenile fish as well as reduce sediment transport onto downstream coral reefs. Thus, mangrove deforestation indirectly threatens the survival of wild fish stocks (Valiela et al., 2001, Naylor et al., 2000). Although in many countries legislation is slowing further mangrove deforestation, continued mangrove conversion into shrimp farms remains a concern in the developing countries of Bangladesh, Myanmar, and Vietnam (Naylor et al., 1998, Naylor et al., 2000, Valiela et al., 2001).

Mangrove deforestation is not the only impact of shrimp farming resulting in a net loss of wild fish stocks. Intensive shrimp farms use inefficient amounts of fish protein in their shrimp feed (Naylor et al., 2000). As omnivores in the wild, shrimp farms often over-feed their shrimp with high amounts of feed that quickly turns into waste. Shrimp feed contains approximately 30% fishmeal and 3% fish oil and the production of fishmeal and fish oil is dependant on wild-caught fisheries, meaning that active fishing is needed in order to feed the farmed shrimp (Naylor et al., 2000). In terms of feed efficiency, 1.7-2.8 kg of wild fish are needed to produce 1 kg of farmed shrimp (Cascorbi, 2004, Naylor et al., 2000). Farmed marine finfish (such as flounder, halibut, sole, cod, hake, haddock, redfish, seabass, congers, tuna, bonito, and billfish), farmed eel, and farmed salmon operations are the only other aquaculture operations that require higher amounts of wild fish input per unit of production than marine shrimp (Naylor et al., 2000). Current research is attempting to increase the balance of protein input and output, however, the ratio remains unsustainably high at present.

Shrimp farming operations generate genuine concern for both marine environments and human health. Poor management of shrimp farms can lead to high use of chemical fertilizers, pesticides, and antibiotics, resulting in chemical and biological pollution in coastal waters. Inland farms can cause soil salination and loss of agricultural lands. Thailand has banned inland shrimp farms since 1999 as a result of high salination events that were destroying agricultural lands (SF, 2006). The toxicity of the farm’s waste products reduces the lifespan of the farm and ecological integrity of surrounding marine environments and ultimately leaves the land unusable (Latt, 2002). The average lifespan of an Asian intensive shrimp farm is between 2-5 years, at which point the levels of pollution and disease often force farm closures (Quarto, 2006). Some Indian studies found that it took over 30 years to rehabilitate closed shrimp farms into healthy marine environments (SF, 2006).

The frequency of disease outbreaks within intensely populated, monoculture shrimp farms is the root cause of high antibiotic and chemical use. Viral infections such has the Yellowhead disease (with an outbreak in Thailand 1990), the Whitespot syndrome (which afflicted Asia and the Americas in 1993), the Taura syndrome (that occurred in Ecuador in1992) and Infectious Hypodermal and Hematpoietic Necrosis (with a recent outbreak in Pacific shrimp) have crippled shrimp farming ventures on numerous occasions and unfortunately can spread to wild populations (SF, 2006, Whetstone et al., 2002). Treatments used to prevent disease outbreaks not only add to the farm's environmental toxicity but are also of grave concern to human health. Prevention is done through treatment with antibiotics. Some of the antibiotics known to be used within some Asian shrimp farms, such as chloramphenicol and nitrofurans, are banned substances in the European Union, the United States, and Canada (SF, 2006, Quarto, 2006, Coscorbi, 2003). These substances are carcinogens and therefore ongoing enforcement and testing of imported shrimp products are necessary to ensure that Canadian consumers are not unknowingly putting their health at risk through the consumption of these shrimp products.

Recent human rights concerns surrounding shrimp aquaculture raise more concerns than my two examples here can cover, and need thorough examination. In Latin America, many commercial shrimp farms were implemented without considering local economies and have harmed many communities' fishing grounds, as well as their health, from farm run-off and effluents (Larsson et al., 1994, Quarto, 2006). In Bangladesh, there have been reports of civil strife and death over shrimp farming conflicts, employee treatment, and ownership (BBC 2003, Kirby, 2006).

Shrimp Product Traceability and Labeling Considerations:

Traceability and accurate labeling of shrimp products does not commonly exist and both became evident issues during an interview with one of UBC's suppliers (who requested to remain anonymous). When I asked about the particular species of shrimp found in their products, the response given by the supplier was that the company only differentiates between shrimp species as coarsely as calling them either “black” or “white” tiger shrimp. As the Pacific white shrimp (*Penaeus vannamei*) and the giant tiger prawn (*P. monodon*) account for 80% of global farmed-shrimp, I make the assumption in this report that the farmed products consumed were either one of these two species, or perhaps Chinese white shrimp (*P. chinensis*) that is also frequently farmed in Chinese farms.

Labeling of pink shrimp is also problematic as “pink shrimp” is the market name for at least five different shrimp species in North America coastal waters . Pink shrimp products from North American fisheries can originate from the Atlantic Ocean, the Gulf of Mexico, or the Pacific Ocean (Monterey Bay Aquarium, 2006; Sustainable Seafood Canada 2006). One species, the northern pink shrimp (*Pandalus borealis*), is found in both the northern Atlantic and Pacific Oceans (FAO, 2007). A second species, called the smooth pink shrimp (*Pandalus jordani*), is found only in the Pacific Ocean. Two further shrimp species are found in western Atlantic Ocean, the Gulf of Mexico, and southward (Holthus, 1980, Sustainable Seafood Canada 2006). They are marketed as northern pink shrimp (*Penaeus duorarum)* and southern pink shrimp (*Penaeus notialis*). It is clear that pink shrimp products are hard to assess for sustainability given the irregularities with market names and that detailed information on the sources of shrimp is essential for sustainability assessments.

UBC’s Shrimp Consumption:

Shrimp is the fourth most-purchased seafood product by volume on campus after salmon, tuna, and pollock (often prepared as surimi or artificial crab), respectively (Magera, 2006). From 2003-2005, the average annual consumption of shrimp products for AMS Food and Beverage was 205.5 kg/yr, while UBC Food and Beverage Services consumed 1 501.3 kg/yr (Magera, 2006). In contrast to the overall decline in seafood consumption at UBC, shrimp consumption may be increasing: 1000 kg of shrimp was consumed in 2003, and close to 1800 kg of shrimp was consumed for both 2004 and 2005. Neither AMS Food and Beverage nor UBC Food Services has purchased local B.C. shrimp products. Although both Green College and St. John's College use shrimp products on occasion, their purchasing records could not be accessed for this report.

From 2004–2006, AMS Food and Beverage purchased their shrimp products from Sysco, Nishimoto, and Blundell food suppliers (Magera, 2006). Aside from a small percentage of northern Shrimp originating from Eastern Canada, all products purchased from these suppliers were from Asian-farmed sources, AMS Food and Beverage reports sourcing 174.5 kg of nobashi shrimp from Nishimoto (Table 1), but that company did not respond to numerous requests to identify the origin of the product. Upon inquiry, Vancouver Aquarium's Ocean Wise Program Co-ordinator Mike McDermott clarified that nobashi shrimp is a style of shrimp preparation that restaurants purchase for specific menu items (M. McDermott, pers. comm., 2006). As the product contains Asian-farmed shrimp, I assume that the species used in the product are either Pacific white shrimp (*Panaeus vannamei*) or giant tiger prawn (*P. monodon*).

Shrimp consumed by UBC Food Services were purchased from Albion Foods and Neptune (Table 2). Their shrimp products originate from both wild and farmed shrimp from Asia and Latin America as well as the wild-caught shrimp industry of Quebec for the northern pink shrimp (*Pandalus borealis*). The species of the Asian and Latin American shrimp could not be determined from the records obtained for this report

Table I. AMS Food and Beverage shrimp consumption and sourcing information from September 2004 – May 2006, with ratings from Monterey Bay Aquarium's (MBA) Seafood Watch programme.

PRODUCT	SUPPLIER	AMOUNT (KG)	FARMED/ WILD	SOURCE REGION	MBA RATING
Nobashi shrimp	Nishimoto	174.5	Farmed	Imported (but undetermined region, probably Asian)	Avoid
31/40 Blue bt prawns	Blundell	5.5	Undetermined	Vietnam	Avoid
Black Tiger Shrimp	Sysco	65.4	Farmed	Vietnam	Avoid
White Tiger Shrimp	Sysco	10.9	Farmed	China	Avoid
Northern Pink Shrimp	Sysco	259.0	Wild-caught	Gulf of St. Lawrence (Canada)	Best-inter-mediate

Table 2. UBC Food Services shrimp consumption and sourcing information from September 2004 – May 2006.

PRODUCT	SUPPLIER	AMOUNT (KG)	FARMED/ WILD	SOURCE REGION	CATCH METHOD	MBA RATING
Prawns/ shrimp (imported)	Albion, Neptune	2810	Wild-caught and farmed	Vietnam, India, Myanmar, Indonesia, Mexico, Ecuador	Trap, trawl	Avoid
Prawns/ shrimp (local)	Albion	1694	Wild-caught	Quebec	Beam trawl	Best-inter-mediate

Assessing the Sustainability of UBC's Use:

The current purchasing of shrimp products by UBC food service providers is evidently unsustainable. All AMS Food and Beverage purchases of farmed shrimp products (49.7% of all AMS consumption) come from Asian sources that are highly damaging to marine environments and pose considerable threats to human health (Figure 3). The Monterey Bay Aquarium (MBA) *Seafood Watch* labels internationally farmed shrimp under the “avoid” category (Cascorbi, 2006). Sustainable Seafood Canada’s *SeaChoice* program has not released a rating for warm-water farmed shrimp at this time but their sustainability assessments use the same assessment methodology as the MBA employs (Sustainable Seafood Canada 2007). The remainder of shrimp products purchased by AMS Food and Beverage (50.3%) were wild-caught shrimp from Canada’s East Coast shrimp fishery, a “best-intermediate” choice for ecological shrimp consumption (Cascorbi, 2006). The Canadian industry has ecological concerns to rectify as it does trawl (although it employs BRDs). There are also some social issues

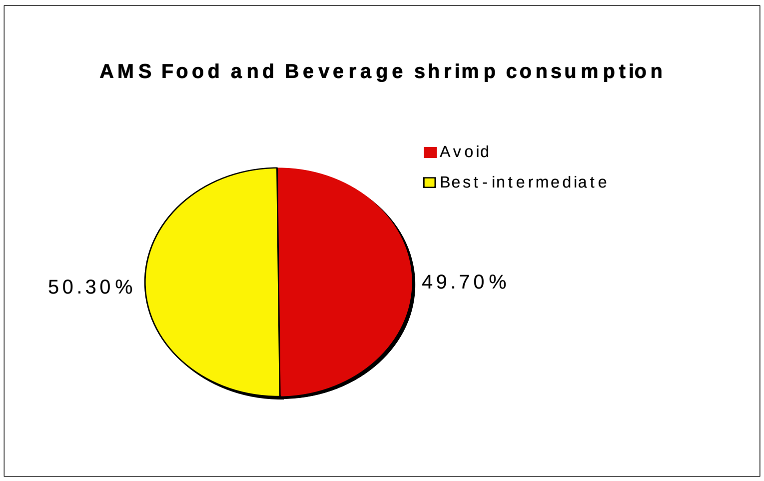

Figure 3. Percentage of AMS Food and Beverage shrimp consumption rated according to the MBA criteria.

surrounding licensing, as many fishers who experienced the collapse of the cod fishery entered the shrimp fishery. When compared to other wild-caught shrimp industries with regard to the use of BRDs and the enforcement of quotas, however, the Canadian East Coast industry is, according to MBA assessments, a more compliant shrimp trawl fishery; only the Oregon State shrimp trawling industry is considered more ecological benign (Coscorbi, 2006).

UBC Food Services shrimp purchasing is slightly inferior to AMS Food and Beverage in terms of sustainability, with 62.4% of shrimp products under Avoid and the rest as Best-Intermediate (Figure 4). Similar to AMS Food and

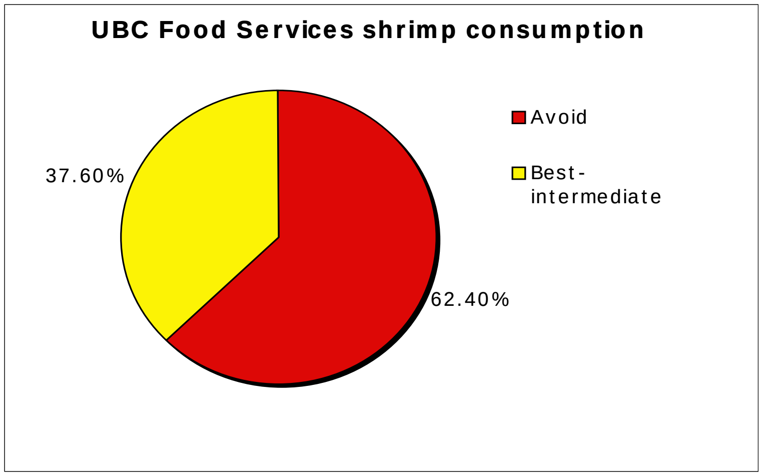

Figure 4. Percentage of UBC Food Services shrimp consumption rated according to the MBA criteria.

Beverage, UBC Food Services purchases a substantial amount of wild and farmed shrimp from Asian and Latin American regions with shrimp-producing industries that have ubiquitous ecological and social concerns. All other shrimp products that were purchased by UBC Food Services originated from the East Coast of Canada.

Discussion:

Given the precarious and ecologically damaging state of global shrimp fisheries, there are no simple answers to UBC's shrimp consumption. There are, however, areas where purchasing could be improved. To start with, UBC food services providers currently purchase none of the MBA's *Seafood Watch* or Canada's *SeaChoice* recommended best-choice shrimp products. The Atlantic or East Coast fishery for northern pink shrimp is ecologically better than developing countries' wild-caught and farmed shrimp. However, the Oregon, Washington, and British Columbian northern and smooth pink shrimp fisheries appear to be better-managed and more effective with lower amounts of trawl by-catch (Coscorbi, 2006). Obtaining baby shrimp from Oregon or Washington fisheries would not only decrease by-catch amounts but also reduce fossil fuel emissions of UBC's seafood purchasing, as transportation distances from ocean to plate are reduced. At this time, however, UBC does not purchase any of its shrimp products from Oregon, Washington, or B.C. shrimp fisheries.

Given British Columbia's reputation for fresh quality seafood products, UBC may be able to move to source local shrimp products (including B.C. Spot prawns, especially for the catering section of UBC Food Services. It is unfortunate that, processing capacity for pink/baby shrimp products is declining; processing plants are being shut-down and this is threatening the local shrimp industry (Clayton, 2006). If UBC decides to continue to serve shrimp, it should attempt to assist local shrimp fishers by purchasing B.C. shrimp products and support what most ecological rating seafood guides esteem as the most ecologically responsible shrimp fishery in the world.

British Columbia's spot prawns are a suitable alternative to tiger prawns and other imported larger shrimp products. These species are caught in traps that virtually eliminate by-catch of other species and inflict minimal harm to physical marine environments. Although these prawns can only be served fresh seasonally, they are available frozen year-round from many of the current UBC seafood suppliers, including Albion and Sysco. Prices of these products are, however, significantly higher than Asia-farmed large shrimp products. Again, the decision to consume both of these B.C. shrimp products will help to decrease environmental transportation impacts, as well as support communities and livelihoods of British Columbia.

Final Recommendations:

The initial recommendation for shrimp purchasing at UBC is to phase out the purchasing of shrimp products from developing countries, which includes shrimp products containing Asian, and Latin American farmed and/or wild-caught shrimp. UBC food services need to discuss the possibility of removing certain items containing shrimp from the menu and/or adjusting products to make the use of shrimp optional.

UBC should attempt to purchase pink shrimp products from Oregon and/or British Columbian sources, in support of the minimal by-catch rates of the fishery and decreased fossil fuel emissions. B.C. spot prawns would serve as a replacement for tiger prawns (which often come from farmed sources), in order to promote a local product and the most ecologically sustainable shrimp fishery in the world.

Throughout this report, it has been emphasized that local seafood suppliers must provide more accurate records of the sources of their shrimp products, particularly for imported products. Accurate source information from seafood suppliers would help move towards ecological sustainability and health and social responsibility.

UBC food service providers should insist that seafood suppliers improve the sourcing accuracy of shrimp product information. Ongoing assessment of current shrimp extraction and production techniques will be necessary to ensure that the UBC's shrimp products come from most ecologically responsible fisheries, especially as newer technology and farming methods develop.

Further Research:

This report was only able to scratch the surface of the many issues surrounding sustainable shrimp exploitation. To obtain the most ecologically sustainable shrimp products, more in-depth field research would be needed, so as to provide the most accurate information of current shrimp exploitation/ aquaculture procedures. Other areas of interest for further research may also include a deeper investigation into the potential health hazards of consuming shrimp extracted by certain processes or extracted from certain regions of the globe.

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