

The Market for Geoduck

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Preface

The Canada Department of Fisheries & Oceans retained GSGilson & Associates Ltd. to conduct a market analysis for geoduck.

The consultants have benefited from discussions with industry and government. Notwithstanding this assistance, the consultant has final responsibility for the analyses and conclusions of the study.

Summary

Introduction

- analysis of the geoduck market is needed to inform fisheries policy and management for both wild and cultured geoduck
- this report profiles: 1) world supply & demand flows of geoduck, 2) the important geoduck product attributes affecting quality, grades & pricing, 3) market potential for geoduck, and 4) the sensitivity of geoduck prices to increased supply

Current Market & Distribution

- current total production is about 6,000 tonnes annually - 600 to 800 tonnes from culture, the remainder from the wild fishery
- 90% or more of BC production is exported with 95% of the exports going to Hong Kong and China - Vancouver is the distribution hub for both BC and US product as the city has better air connections to Hong Kong and Mainland China than West Coast US locations
- the vast majority, more than 95%, is live sales - prices for live geoduck, like all live or fresh seafood, is supply-sensitive since one can not inventory the product for very long
- current exports from North America are dominated by Vancouver-area businesses with close connections, often family connections, to Asian importers - the result is an opaqueness to the marketing function and a lack of formal marketing & promotion
- Hong Kong is a tariff free zone whereas Mainland China has a 28.82% tariff on geoduck imports - Hong Kong is a transshipment point for much of the geoduck destined to China

Average Annual Production 2007-2010 tonnes

Wild	- British Columbia*	1,572
	- Alaska	348
	- Washington State	2,143
	- Mexico	1,094
Culture	- British Columbia	75
	- Washington State	<u>591</u>
Total		5,823

* includes pre-seed harvest

Market Assessment

- major end user applications are hot pot and quick fry meals (sushi/sashimi is only 10% but growing) - over 90% is consumed in foodservice/restaurants
- geoduck competes with other high end seafood such as Australian lobster & abalone
- colour (whiter the better) and size (~1 kg preferred) are the most important product attributes - BC product is sold ungraded by the primary producer to the processor who grades the product into about four categories
- wild product generally is crunchier, hardier & has less shrinkage than culture product - culture product is whiter/higher share of the #1 Grades, more uniform in size and has thinner shell/higher recovery - culture product gets 10% higher price on average than wild due to the better grade mix
- peak demand months are winter, December through early February before and during Chinese New Year
- large price increases, in real inflation adjusted terms, occurred over 1990 to 1994 due to: 1) transformation of product mix from low valued frozen meat to high value live sales, 2) growth in Chinese economy & per capita incomes in China, and 3) better matching of seasonal supply to seasonal demand (made possible by the IQ management system in British Columbia), and 4) a decline in world supply
- however, over the past 15 years from 1995 to 2010 the world supply of geoduck increased by 113% (due mainly to the launch of the Mexican wild and Washington State farmed industries), per capita real incomes increased 270% in China, and the real price of geoduck in Chinese currency declined 16%
- over past 15 years, each 10% increase in supply has been associated with a 1 to 2% decline in the real price of geoduck in Chinese currency even though the Chinese economy and incomes have continued to grow
- wild supply is likely to decline by 3-5% over next 10 years, culture supply from Washington State likely will remain flat (due to lack of good growing areas & regulatory constraints related to opposition to geoduck culture on intertidal lands), geoduck culture potential from China is an unknown - but could take root as scallop culture did 30 years ago

Conclusions

- the market is short of product, and has been for 10 years, supply growth from traditional sources is constrained, and therefore there is market opportunity for new sources of supply
- there is potential to expand the market for geoduck to the relatively untapped North China and Interior China regions
- new supply would have some negative effect on the overall price, but the actual price impact would depend critically on: 1) the size of the supply increase, 2) any new marketing efforts (the product essentially is not marketed now), 3) the strategic behaviour of industry, and 4) how orderly the new supply was introduced (e.g., a steady increase in annual production would disrupt the market and market pricing much less than a sudden large increase in production)

Acronyms

ADF&G	-	Alaska Dept. of Fish & Game
AMR	-	Archipelago Marine Research Ltd.
BC	-	British Columbia
CIF	-	Cost Insurance Freight
CSSP	-	Canadian Shellfish Sanitation Program
DFO	-	Canada Dept. of Fisheries & Oceans
DNR	-	Washington State Dept. of Natural Resources
FAO	-	Food and Agriculture Organization (Rome)
FOB	-	Freight on Board
GDP	-	Gross Domestic Product
HK	-	Hong Kong
IFMP	-	Integrated Fisheries Management Plan
IQ	-	Individual Quota
ITQ	-	Individual Transferable Quota
JIT	-	Just in Time
kg	-	Kilogram
NMFS	-	US National Marine Fisheries Service
NSSP	-	National Shellfish Sanitation Program
POS	-	Point of Sale
PSP	-	Paralytic Shellfish Poisoning
RMB	-	Renminbi or Yuan, China's Unit of Currency
SARDFA	-	Southeast Alaska Regional Dive Fisheries Association
SARS	-	Severe Acute Respiratory Syndrome
TAC	-	Total Allowable Catch
UHA	-	Underwater Harvesters Association
WCVI	-	West Coast of Vancouver Island
WTO	-	World Trade Organization

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I.0 Introduction

Interest in the culture or farming of the geoduck *Panopea generosa* in British Columbia has grown in response to strong product prices. However, to date government has issued only a limited number of aquaculture licences, and no new tenure applications have been accepted since 2006.

An issue surrounding the expansion of geoduck culture is the impact of such expansion on the wild geoduck industry. There is a well-established, well-managed wild industry that generates significant financial returns - the fishery produces the highest seafood value per unit weight in the Province and is much larger than the existing culture industry. There is a concern that expansion of geoduck culture will negatively affect the market, particularly market prices.

Canada Department of Fisheries and Oceans (DFO) is developing an Integrated Fisheries Management Plan (IFMP) for geoduck that addresses both wild and cultured geoduck. DFO needs additional information and research as input to fisheries policy and the IFMP process.

I.1 Study Objectives

This study and investigations of the geoduck market have several important objectives:

- to profile world supply & demand flows i.e., producing regions, consuming regions, wild vs culture production levels
- to identify important product attributes affecting quality, grades & pricing e.g., colour, size
- to assess the potential to expand the market e.g., new markets, expansion of existing markets, needed marketing initiatives to support growth
- to investigate the sensitivity of prices to increased supply

The market research will lead to a subsequent investigation of the production potential and tradeoffs associated with geoduck aquaculture in British Columbia.

I.2 Information Sources

The research program included both primary (interviews) and secondary (literature review) research:

- interviews with 28 individuals from industry, governments, and seafood brokers/marketers/distributors (see Appendix A)
- reviews of several reports and publications (see Bibliography)

Interviews and report reviews include several from other countries such as the US and China. The consultants visited the China Seafood Show and Washington State to interview industry and government officials. The consultants also made a presentation to an industry meeting in Nanaimo BC.

Selected comments from the interview program are presented in Appendix E. The information in the report is presented in aggregate form to preserve confidentiality. All values and prices are expressed in Canadian dollars unless otherwise indicated.

2.0 Geoduck Production & Trade

The wild harvesting of geoduck in North America started in the early 1970s. The first geoduck beds were seeded in the early 1990s with the first culture production occurring in the year 2000.

2.1 Species & Harvesting Description

The following description of the Pacific geoduck is taken from the 2008 “Seafood Watch Wild Geoduck Report” (Seafood Watch 2008).

The Pacific geoduck is the largest burrowing clam in the world. The clam is native to the Pacific region including Baja California and the Pacific Northwest from Washington State to British Columbia and SE Alaska.

Geoduck is commonly called “giant clam” or “elephant trunk clam” and generally weighs between 0.5 and 1.5 kg although specimens up to 3 kg have been recorded.

It is exceptionally long-lived with a life span of over 100 years. This longevity reflects the fact that the geoduck buries itself in the substrate of the intertidal or subtidal ocean floor - the only exposed part of an adult geoduck is the syphon, a muscular tube through which the geoduck feeds and expels waste.

Harvesters of both wild and cultured geoduck in subtidal areas operate on the ocean floor using a breathing apparatus and using a small hydraulic pump attached to a pipe, known as a “stinger”, to liquefy the sand around the geoduck. The diver then reaches down and extracts the geoduck by its syphon from the sand mixture.

2.2 Production Trends

Current total production of geoduck from North America - wild plus farmed - is in the order of 6,000 tonnes annually with 600 to 800 tonnes of this coming from culture (see Exhibit 1).

The wild fisheries from Washington State and BC are the largest production areas followed by Mexico. Washington State produces over 90% of culture production with British Columbia producing the remainder.

2.2.1 Wild Harvest

British Columbia. The BC wild fishery has operated under an Individual Quota (IQ) System since 1989. Although the current Total Allowable Catch (TAC) and the harvest of 1,560 tonnes are less than half those in the late 1980s, the ex-vessel or landed value has increased dramatically - see Exhibit 2.

The increase in value has resulted from a product shift from processed meat products to the much more valuable live product, especially to Hong Kong and Mainland China.

Harvesting occurs in subtidal areas by divers throughout the year by the 55 licence holders.

For a history of the BC commercial geoduck fishery see Heizer (1999), James (2000), James (2008), and GSGislason (2008).

Exhibit 1: North American Production of Geoduck

Year	Wild Production (tonnes)					Farmed Production (tonnes)			Total Production
	BC	Alaska	Washington	Mexico	Subtotal	BC**	Washington	Subtotal	
1980	2,806	0	1,774	0	4,580	0	0	0	4,660
81	2,704	0	1,946	0	4,650	0	0	0	4,650
82	3,135	0	2,405	0	5,540	0	0	0	5,540
83	2,635	0	1,598	0	4,233	0	0	0	4,233
84	3,484	0	2,005	0	5,489	0	0	0	5,489
85	5,370	65	1,864	0	7,299	0	0	0	7,299
86	5,005	13	1,295	0	6,313	0	0	0	6,313
87	5,735	84	2,023	0	7,842	0	0	0	7,842
88	4,567	65	2,091	0	6,723	0	0	0	6,723
89	3,904	94	1,483	0	5,481	0	0	0	5,481
1990	3,958	86	1,566	0	5,610	0	0	0	5,610
91	3,234	88	1,523	0	4,845	0	0	0	4,845
92	2,852	86	787	0	3,725	0	0	0	3,725
93	2,422	95	946	0	3,463	0	0	0	3,463
94	2,227	89	895	0	3,211	0	0	0	3,211
95	2,085	104	563	0	2,752	0	0	0	2,752
96	1,842	92	1,251	0	3,185	0	0	0	3,185
97	1,796	82	1,487	0	3,365	0	0	0	3,365
98	1,797	50	1,614	0	3,461	0	0	0	3,461
99	1,797	92	1,921	0	3,810	0	0	0	3,810
2000	1,797	199	1,564	0	3,560	0	9	9	3,569
01	1,821	129	1,847	0	3,797	0	123	123	3,920
02	1,822	178	2,006	50	4,056	7	235	242	4,298
03	1,724	171	1,931	40	3,866	19	220	239	4,105
04	1,797	243	2,045	260	4,345	27	354	381	4,726
05	1,560	198	2,110	690	4,558	55	436	491	5,049
06	1,560	330	2,002	1,270	5,162	77	393	470	5,632
07	1,560	277	1,959	1,200	4,996	110	451	561	5,557
08	1,559	422	2,321	1,220	5,522	76	598	674	6,196
09	1,560	312	2,329	713	4,914	69	701	770	5,684
2010	1,610*	382	1,963	1,241	5,196	45	613	658	5,854

* Includes 50 tonnes of preseed harvest

** Fan Seafoods Ltd. production only (about 90% of BC total)

Source: GSGislason (2008), Archipelago Marine Research Ltd., Washington Dept. Natural Resources, Fan Seafoods Ltd., Calderon pers. comm., and ADF&G

Exhibit 2: Profile of BC Commercial Geoduck Fishery

Year	Regulations*			Activity		Vessel Landings			Live Product**	
	TAC tonnes (1)	Licences (2)	Active Vessels (3)	Divers (4)	Diver Hours (5)	Tonnes (6)	\$ millions Value (7)	\$ per kg* (8)=(7)/(6)	% Sales (9)	\$ per kg (10)
1983	2,948	54	53			2,635	1.8	.68	9%	1.65
84	2,994	54	44			3,484	2.9	.84	11%	1.70
85	2,971	55	52			5,370	4.7	.88	11%	1.70
86	3,980	55	55			5,005	4.3	.86	18%	2.05
87	4,239	55	55			5,735	6.2	1.08	15%	3.60
88	3,890	55	55			4,567	9.8	2.14	18%	4.10
89	3,992	55	47	176	18,070	3,904	12.3	3.15	26%	4.30
1990	3,992	55	44	145	19,500	3,958	10.6	2.67	29%	4.10
91	3,368	55	44	133	17,210	3,234	9.2	2.84	47%	5.15
92	2,863	55	41	135	14,750	2,852	16.1	5.65	53%	7.85
93	2,432	55	44	112	13,050	2,422	26.7	11.00	76%	15.20
94	2,245	55	44	110	12,400	2,227	33.7	15.11	80%	26.50
95	2,096	55	42	108	11,330	2,085	43.0	20.64	83%	27.15
96	1,841	55	44	94	10,640	1,842	36.0	19.56	88%	24.45
97	1,796	55	42	91	11,820	1,796	33.2	18.51	92%	21.75
98	1,796	55	42	88	10,700	1,797	29.3	16.29	93%	18.80
99	1,796	55	41	93	10,790	1,797	32.9	18.30	96%	23.90
2000	1,796	55	42	92	10,860	1,797	40.7	22.67	95%	27.45
01	1,821	55	40	91	10,610	1,821	43.5	23.87	96%	25.90
02	1,821	55	40	96	10,780	1,822	38.5	21.13	96%	25.65
03	1,721	55	41	93	10,050	1,724	32.8	19.03	97%	24.50
04	1,796	55	40	95	10,070	1,797	34.4	19.13	98%	22.35
05	1,559	55	40	83	8,260	1,560	31.7	20.30	98%	23.65
06	1,559	55	39	85	8,960	1,560	32.2	20.61	99%	24.30
07	1,559	55	40	85	8,578	1,560	30.6	19.62	96%	24.75
08	1,559	55	39	76	8,273	1,559	25.2	16.16	99%	21.45
09	1,559	55	39	77	8,639	1,560	31.2	20.02	99%	27.50
2010	1,559	55	40	76	8,540	1,560	39.3	25.22	99%	34.05

* Fisheries Management Regimes - limited entry pre 1989, ITQs 1989 onwards

** There is 2- 5% shrinkage between the harvested live product and the processed live product due to loss of liquid

Source: GSGislason (2008), BC Agriculture, DFO Catch Stats & Archipelago Marine Research Ltd.

Washington State. The Washington State wild fishery since the Rafeedie Decision of 1994 has had two components each with 50% of the TAC:

- a Tribal Harvest TAC split among 15 different tribes who are allowed to harvest their allocation throughout the year
- a non-Tribal harvest TAC that is auctioned in increments, by time and location, throughout the year

Each of the Tribal and non-Tribal interests receiving an allocation then arrange for harvesting.

The Washington State wild harvest has been about 2,000 tonnes annually for close to 10 years. Harvesting occurs throughout the year by divers in subtidal areas.

Alaska. The Alaska fishery for geoduck is a competitive or derby fishery that usually starts in October and goes to March or April.

Alaskan harvests jumped after 2003 when the State changed their PSP testing protocol and procedures, a change that allowed more Alaskan product to go to the live market.

The current Alaskan harvest level has been 200-400 tonnes annually. Harvesting occurs by divers in subtidal areas in Southeast Alaska.

Mexico. Mexican wild harvests only started in 2002 and come from three regions:

- off the east coast of Gulf of California in the Sea of Cortez
- off the Pacific Ocean of Baja Peninsula
- off the southeast coast of Baja Peninsula

The first region actually produces a different species of geoduck than *Panopea generosa*, the species *Panopea globosa* which is often called “water geoduck” since it has a high water content.

After a rapid industry growth phase, recent production has plateaued at about 1,200 tonnes annually (note that the official statistics may underestimate actual production).

2.2.2 Culture Harvest

British Columbia. There is only one significant producer of cultured geoduck in BC, namely Fan Seafoods Ltd. Culture occurs on subtidal lands. Harvesting occurs by divers.

Fan Seafood Ltd. first reported production in 2002, rapidly grew to a production level exceeding 100 tonnes by 2007 and has declined to less than half that level since. Apparently, the decline resulted predominately from a hatchery problem (Fred Lochmatter pers. comm.).

Washington State. There are two main growers of geoduck in Washington State - Taylor Shellfish of Shelton and Seattle Shellfish of Olympia (together they comprise 75% or more of the total state harvest). Culture occurs almost exclusively on intertidal lands. Harvesting is conducted by a combination of dive and beach crew.

The State currently does not have any deepwater leases for geoduck culture.

The culture industry grew rapidly but has plateaued at 600-700 tonnes annually in recent years.

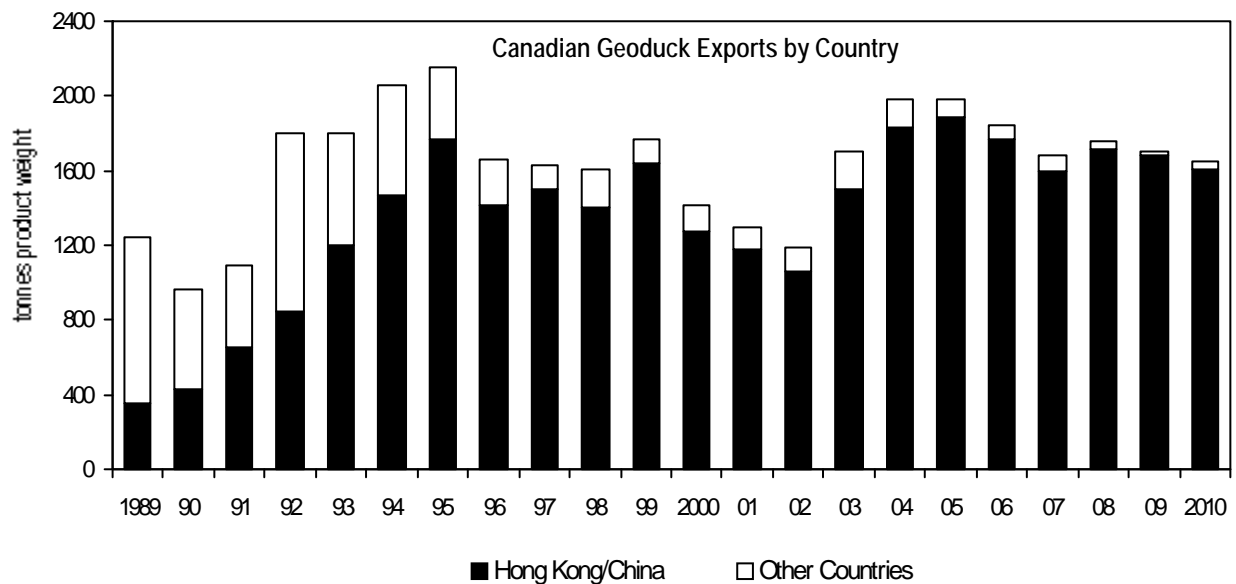
2.2.3 Enhanced Harvest

The Underwater Harvesters Association (UHA), the association representing the 55 commercial geoduck licence holders in British Columbia, has been undertaking geoduck enhancement i.e., seeding geoduck in subtidal beds.

To date harvests of enhanced geoduck has been minimal at under 10 tonnes per year (harvests are included in the wild harvest figures of Exhibit I).

2.3 World Trade

The vast majority of production from all producing regions, 90% or more, goes to export markets. Appendices B and C provide geoduck trade statistics for Canada and the US respectively.



Source: Appendix B

Note the following:

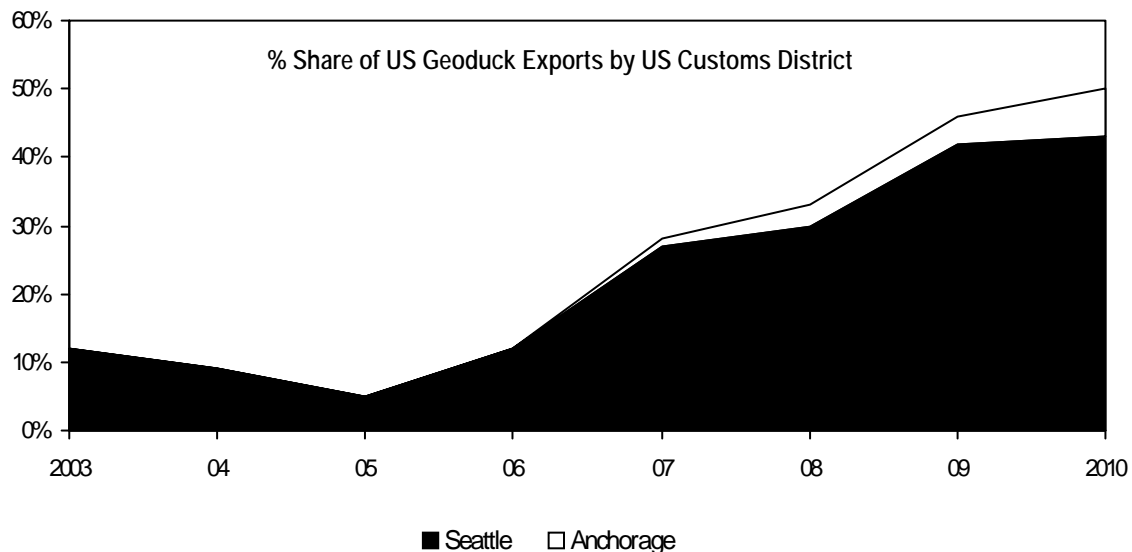
- China/Hong Kong is the major export market with over 95% export share from both countries (the exports from the US to Canada in Appendix C represent product that is largely re-exported to Asia).
- the export share going to China/Hong Kong has increased dramatically over the past 20 years.
- the vast majority of geoduck export trade is in live product for all countries - the growth in exports to China/Hong Kong is correlated with an increase in export share of live products.
- Japan has declined significantly as an export market - today less than 10 tonnes a year - due mainly to the substantial price increases over the past 20 years.

We note that the export value statistics in the Appendices may not be accurate as there is an incentive to under report geoduck shipment values due to significant tariffs in Asia.

2.4 Distribution & Markets

Vancouver is the distribution hub for North American product apart from Mexican product - Vancouver has better air connections to Hong Kong and China than does West Coast US ports. Traditionally the majority of US product, 90% or more, was shipped by air or truck to Vancouver before being flown to Asia.

However, the share of US exports going through the airports of Seattle WA and Anchorage AK has increased over the past decade. Today half of US exports go through Vancouver.



Source: GSGislason estimates based on material in Exhibit 1, Appendix B, Appendix C.

All Canadian product is flown to Asia through Vancouver.

The Canadian and US governments do not recognize the water quality testing protocols of Mexico. Therefore, Mexican geoducks can only enter Canada or the US in bond for immediate re-export. Most of the Mexican geoduck is flown from Los Angeles airport to Asia.

The airplanes for transport typically are passenger planes. The Canadian industry developed special aluminium containers that fit in the curved belly of a plane.

Hong Kong and Mainland China - Shanghai, Beijing, Guangzhou etc. - receive most of the geoduck shipments. Over half of the product landed in Hong Kong is transshipped to mainland China. The distribution system between port of landing by air in Asia and the ultimate consumer is "murky" but can contain several steps or agents.

Historically the bulk of consumption in China occurred in South China e.g., cities such as Guangzhou and Shanghai.

However, access to markets in Northern and Interior China cities has improved over the past decade with improvements in direct air flights to more cities and improvements in the cold chain for seafood e.g., refrigerated trucks (but the use of refrigerated trucks in China is nowhere near as prevalent or sophisticated as in Hong Kong or Japan). Awareness of the geoduck product has expanded beyond south China cities as well.

3.0 Market Assessment

The market assessment for geoduck reflects the results of our research program including the industry interviews of Appendix E. Appendix D summarizes key points from two previous geoduck market research efforts.

3.1 Users and Uses

The two main user groups are foodservice/restaurants and retail sales for home consumption.

Foodservice comprises the vast majority, 90% or more of end users. And the majority of restaurants customers ordering geoduck are business people entertaining clients or colleagues.

There are three main food applications of geoduck - our interviews suggest the following meal mix.

	<u>% Meal Share</u>
Hot pot	~50%
Quick fry	~40%
Sushi/sushimi	~10%

Hot pot is more prevalent in winter months. The sushi/sashimi share in Japan and North America would be higher than 10%. All three geoduck products can be served with an array of sauces or seasonings.

Geoduck is well-known in Hong Kong and South China high end seafood restaurants.

...there are 800 or more seafood or hot pot restaurants in Hong Kong two thirds of which offer geoduck (UHA pers. comm. - Exhibit D.2, Appendix D).

3.2 Competitive Suppliers, Competitive Seafood Products

The main competitive suppliers to Canadian geoduck are Washington State (both wild and cultured), Mexico and Alaska. The Canadian share of total North American supply is 25-30%, a share much lower than the 50% plus share of 10 or 20 years ago (see Exhibit 1, Section 2).

The main competitive seafood products for hot pot and stir fry applications appear to be other high end live seafood such as:

- Australian lobster
- abalone
- crab

Exhibit 3 gives seafood price points for a high end seafood restaurant in Beijing China (note that there are several seafood items that are priced higher than geoduck).

For sushi applications, other seafood with the same price point are bluefin tuna, abalone, and sea urchin roe - see Exhibit 4 for sushi pricing in Japan.

Exhibit 3: High End Seafood Restaurant Pricing - Beijing China

Category*	Seafood Item/Price	Yuan/kg
#1	Napoleon Fish	1,960
	Humpback Grouper	1,396
	Miniatus Grouper	1,176
#2	Australia King Crab	796
	Japanese Aomoriken Abalone	796
	Vermilion Coral Cod	676
	Australia Lobster	656
	Mexican Red Lobster	596
	Australia Spotted Lobster	596
	Yellow Grouper	576
	Canadian Geoduck	576
	Australia Snow Crab	576
	Alaska King Crab	576
Small Australia Lobster	516	
#3	Small Green Lobster	476
	Mantis Shrimp	476
	Boston Lobster	396
	Orange-Spotted Grouper	396
	Marbled Sleeper	396
	Grouper	396
	Salmon	376
	Banded Grouper	336
	Japanese Shrimp	336
	Cancel Crab	336
#4	Black Sea Bass	316
	Duck-mouth Sturgeon	276
	Tuna	216
	Halibut	176
	Live Octopus	136
	Sturgeon	116
	Greasyback Shrimp	96
Bighead	96	

* The categories in Canadian dollars correspond to: Category #1 - more than \$125 CDN per kg, Category #2 - \$75 to \$124 CDN per kg, Category #3 - \$50 to \$74 CDN per kg, Category #4 - under \$50 CDN per kg (based on 2008 exchange rate of 1 RMB = 0.154 \$ CDN)

Source: UHA Research 2008 pers. comm.

Exhibit 4: Typical Sushi Restaurant Pricing - Japan

Category	Price per Plate 2 pieces*		Typical Seafood Items	
	High End Restaurant	Conveyor Restaurant	Clam	Other
#1	200-300 yen	100-200 yen	Aoyagai (round clam) Tsubugai (whelk)	rolled egg lean tuna octopus cooked prawn horse mackerel
#2	300-500 yen	150-300 yen	Hokkigai (from Canada)**	eel snapper Atlantic salmon
#3	400-700 yen	200-400 yen	Hokkigai (from Japan) Torigai (cockle) Akagai (Ark shell) Hotategai (scallop)	fatty tuna salmon roe yellow tail fresh prawn flounder
#4	600-1,200 yen	400-800 yen	Mirugai (geoduck)	abalone very fatty tuna sea urchin roe

* The exchange rate in 2009 was 1 Yen = \$0.0122 CDN

** Called Arctic surf clam in Canada

Source: GSGislason interviews with importers in Japan (early 2009)

3.3 Product Attributes, Quality & Grading

3.3.1 Important Attributes

The most important attribute is the colour of the syphon or trunk of the geoduck, the whiter the better. Some geoducks can have off-white or even dark coloration - the syphon colour appears to be a function of the location/substrate in which the animal grows or its age.

The second most important attribute is size with a 1 kg \pm .25 kg animal typically preferred. A 1kg geoduck can serve a table of four people at a restaurant.

Another important attribute is texture or “crunch” - an animal with crunchy syphon is preferred especially for sushi applications. However, unlike colour and size, it is very difficult to ascertain meat texture by visual inspection of live animals.

Other attributes contributing to higher quality or product attractiveness include:

- long syphon
- thin shell i.e., high meat to total weight
- freshness, vigour i.e., shelf life

Broken shell product is poor quality, but broken shell typically is less than 1% of the product mix.

3.3.2 Grades & Grading

Most of the existing production of geoduck from British Columbia, both wild and farmed, is sold as ungraded “ocean run” product from the primary producer to the processor (but US primary production may be graded). The processor then grades the product. One US processor/seller told us that he had 16 different grades although only 4 or 5 predominated.

Typically there is say four main grades of both wild and farmed live geoduck with Grade #1 typically being the one with the white syphon.

The hot pot market segment can take a lower grade with the sushi trade demanding a higher grade. Uniform size is also more important to the sushi trade (for portion control).

3.3.3 Quality by Supply Region

Typically BC geoduck shipped to Asian markets is not identified as wild vs culture and this lack of distinction is carried through the distribution channel to the end user. However, Washington State producers do differentiate product as wild or culture.

Importers in Asia do differentiate between supply region/country but again the distribution channel thereafter does not retain the distinction.

Canadian product has an excellent reputation in the marketplace - it is especially valued for its texture/crunchiness. However, the lack of uniformity in size is a concern to some buyers.

It appears that BC has better ocean bottom/substrate than the Puget Sound area of Washington State for producing geoducks with long necks and white colour.

At the other end of the spectrum is Mexican product most of which is a different geoduck species, *Panopea globosa*. Mexican product is larger on average than other wild or cultured product, has softer or more flaccid flesh, and has significantly higher water content/lower meat recovery than geoduck from farther north. On the plus side, Mexican geoduck can have a tank life of up to 1 month, double or more the tank life of other North American geoduck.

Tank life depends on handling practices in China. BC product needs a tank water temperature substantially below the tank temperature for Mexican product. Some BC product is not tanked appropriately in China.

In some lower end distribution centres/markets in China, Mexican geoduck can be labelled erroneously as “Canadian” - this is a concern to Canadian suppliers.

3.3.4 Wild vs Culture

The wild and culture geoduck industries both can produce high quality products. However, the products do differ. The advantages of each are:

Advantages	
Wild	Culture
<ul style="list-style-type: none"> • crunchier • hardier, travels better • less water/shrinkage 	<ul style="list-style-type: none"> • whiter in general, more #1 Grade • more uniform in size • thinner shell

Moreover, the average cultured geoduck may weigh 25% less than the average wild geoduck.

Our interviews and research suggest that there is not a distinction in the marketplace between wild and cultured per se. However, since the grade mix in cultured sales has a higher share of #1 Grade, the inference is that the culture producer on average produces a higher quality product than the wild producer.

Based on our interviews, we project the following:

	Typical Grade Mix	
	Wild*	Culture
Grade #1	30%	80%
#2	35%	10%
#3	30%	5%
#4	5%	5%

**from BC*

Note that the grade mix can vary by site.

Buyers in Asia prefer a geoduck of approximately 1 kg in weight, a market specification which the culture industry is better positioned to meet than the wild industry since culturists know the product year class in each bed.

3.4 Logistical Issues

The Chinese market can only absorb a certain amount of live seafood, including geoduck, per week. The live market is very sensitive to supply as the product can not be inventoried - a pulse of excess supply can crash the market.

Accessing markets in China requires transportation infrastructure, air and refrigerated truck, so that the product can reach the consumer within 2 to 3 days from date of harvest.

Typically BC geoduck are submersed or tanked in relatively cold water, water typically colder than for most other seafood, including Mexican geoduck, displayed in restaurants in Hong Kong and China - this requires special attention by restaurateurs.

3.5 Trade Restrictions

China joined the World Trade Organization (WTO) in December 2001. Nevertheless, China has a significant 28.82% tariff on imports of crustaceans including geoduck.

Hong Kong is a tariff free zone for geoduck. This appears to explain the emergence of Hong Kong as a transshipment point for geoduck from North America.

3.6 Seasonality

Supply Seasonality. Canadian supply capability is constrained at certain times of the year because specific regions can be closed e.g., the West Coast of Vancouver Island is closed mid February for a portion of time to prevent potential conflict with herring fisheries. In addition, supply can be constrained due to high water temperature and Paralytic Shellfish Poisoning (PSP) issues.

Unlike the Canadian and Washington State wild industries, the Alaskan wild fishery for geoduck is only open from October through March or April. The culture industries for geoduck operate year round.

Demand Seasonality. The peak demand months are the winter months, more specifically December through early February before and during Chinese New Year.

Geoduck producers try to shift supply to these peak demand months to the extent possible (but harvesting of both wild and farmed product can be more problematic in winter).

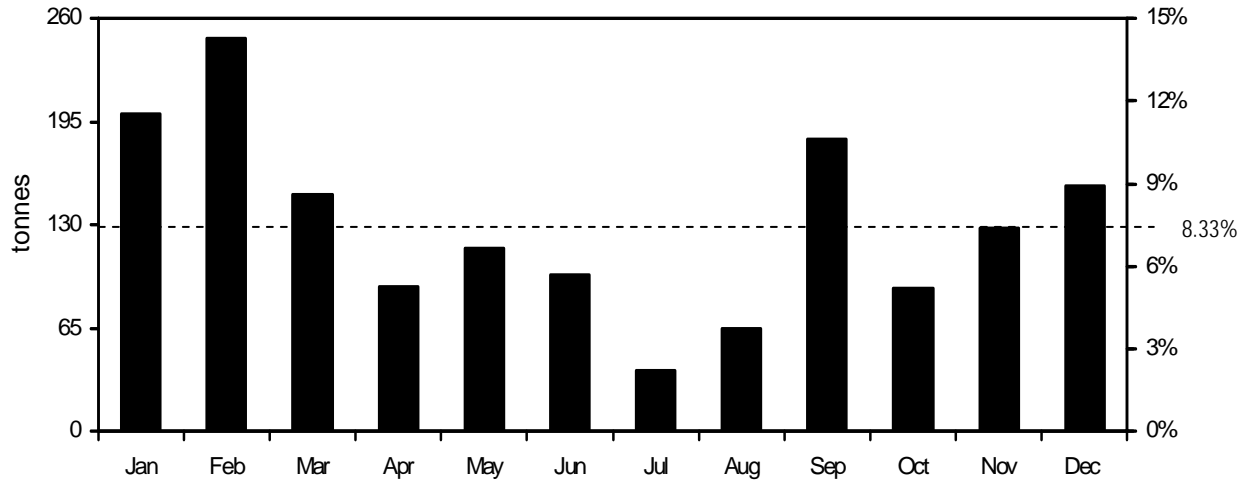
Exhibit 5 gives the 2010 monthly landing of wild geoduck from BC - there is a peak in winter months. There is also a peak in September just before the Alaskan wild fishery opens.

3.7 Promotional Methods

The geoduck market is short of product and has been for some time. Industry appears reluctant to promote and market extensively geoduck as there will be extreme difficulty in filling any new orders.

We discovered few direct marketing efforts for geoduck - the UHA consistently has a presence at the China Seafood Show each November but major BC distributors such as Evergreen International, Sea World, and Best Honour do not have booths at the Show. The UHA also has participated in the recently-launched Asia Seafood Show and in Vancouver-area events targeted at delegations from China.

Exhibit 5: Monthly Landings of Wild Geoduck - British Columbia 2010*



* Total 2010 landings were 1,560 tonnes, an average of 130 tonnes per month

Source: Archipelago Marine Research Ltd.

The UHA has had a program of generic marketing for “Geoduck from Canada” since 1989. This program includes attendance at trade shows (this year both the China Seafood Show and the Asia Seafood Expo), organizing visiting delegations and media tours, developing and distributing promotional materials, participating in trade missions (in 2011 the UHA participated in the Premier’s fall trade mission to China), participating in promotional activities such as chef’s competitions in China, developing a technical manual for the trade in China, holding technical seminars with the trade in China, and developing and distributing product handling guidelines for fishermen. The UHA’s international generic marketing activities are supported by the Federal Government through the Agri-Marketing Program of Agriculture and Agri-Food Canada (Michelle James UHA pers. comm.).

One Tribe from Washington State had a booth displaying geoduck product at the November 2011 China Seafood Show - but Taylor Shellfish, Seattle Shellfish or other Washington State producers did not (and Alaska producers did not have a presence).

One issue that commonly arose in our interviews and research was the traditional close connections, even family connections, between BC exporters and Hong Kong/China importers. Transactions do not appear to be “arms length” in all cases - the result is an opaqueness to the marketing function and a perceived lesser need for explicit marketing and promotion by existing BC exporters.

However, in recent years some new buyers have emerged, and these new buyers have put upward pressure on price (see discussion in Section 3.8 below).

It is the responsibility of industry exporters to lead marketing and promotion initiatives. The introduction of new exporters/buyers may lead to more active marketing efforts.

3.8 Pricing

The analysis of geoduck prices is problematic as many of the official sources, in both Canada and the US, are misleading. For example:

- the Washington State Dept. of Natural Resources (DNR) in reporting value and prices for wild harvests from fish tickets includes transactions with zero/unknown price (Bob Sizemore, DNR pers. comm.) i.e., the calculated prices are an underestimate to an unknown extent
- the geoduck trade statistics produced by Government of Canada and the Government of United States appear to underestimate values and prices due to the incentive to underreport values to minimize tariffs paid, due to the apparent use of a low transfer price for geoduck trade between Canada and the US (such product is often re-exported to Asia), or due to other unknown reasons

The result is that one has to be careful in the use of geoduck price data.

Exhibit 6 and 7 following present geoduck price data for Canada and the US respectively that we believe is relatively reliable.

3.8.1 Price Trends

The BC wild geoduck price data of Exhibit 2 indicates a substantial increase in Canadian prices since 1990 - however, almost all the price escalation has occurred in the 1990 to 1995 period. Apart from inflation, this price escalation reflects several factors:

- the transformation of the product mix from low valued frozen meat to live sales,
- the substantial growth in the Chinese economy and per capita incomes in China, the main market,
- the better matching of supply from both wild and culture sources to the peak demand period in winter around Chinese New Year (made possible for wild supply for British Columbia through the introduction of the Individual Quota or IQ management system in 1989),
- a significant decline from 1990 to 1995 in world supply (see Exhibit 1).

New buyers from Mainland China have entered the market in the last two years and put upward pressure on price.

There have been some price declines over the period such as: 1) in 2003 and 2004 due to SARS health concerns in China, and 2) in late 2007 due to oversupply from Alaska resulting in severe price discounting to move a perishable product (or resulting in processing of product into frozen meat products).

3.8.2 Product Prices by Quality/Grade

We estimate that the relative product prices by the four main grades of Canadian and US geoduck, relative to a price score of 100 for Grade #1, to be:

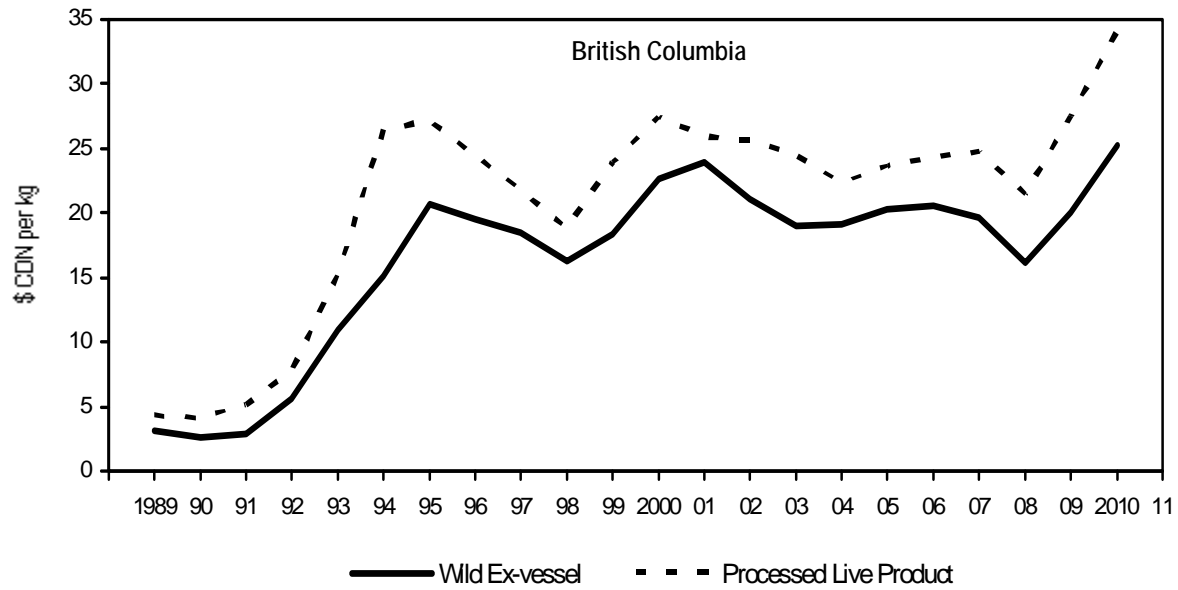
<u>Grade</u>	<u>Price Score</u>
Grade #1	100
#2	85
#3	75
#4	50

Since culture geoduck has a better grade mix than wild geoduck (see Section 3.3.4), the average price of cultured geoduck overall is about 10% higher than for wild geoduck at the wholesale level.

Mexican geoduck is priced at 50-60% of the price for Canadian geoduck in wholesale markets in China (Michelle James, UHA pers. comm.).

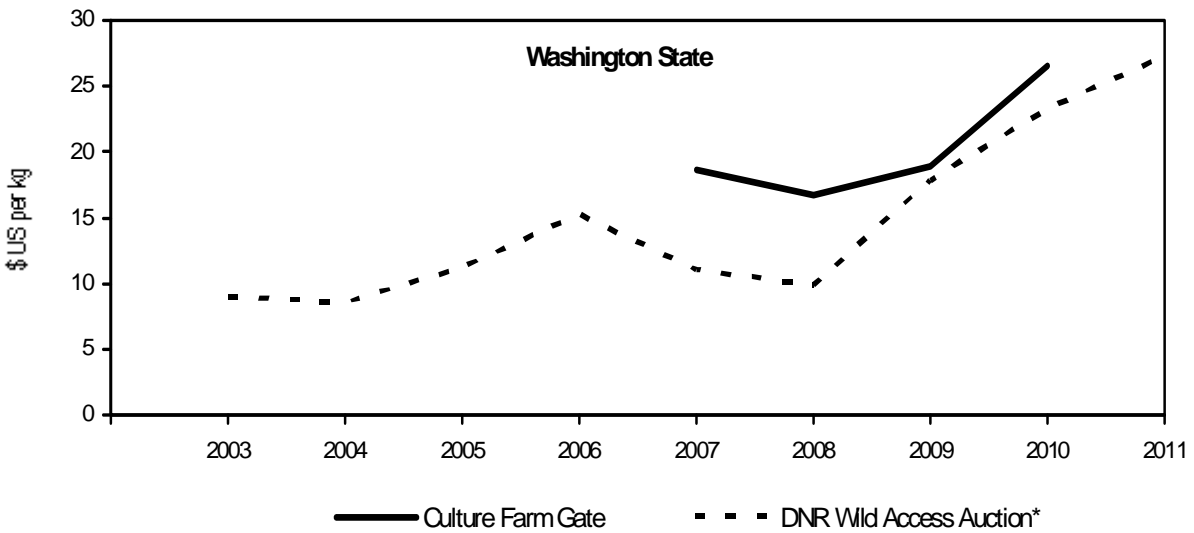
We note that when supply is tight relative to demand, as it is now, the price rankings can narrow. Conversely, when there is excess supply the price rankings can expand. This same phenomenon occurs for other live or fresh seafood with a short inventory period.

Exhibit 6: British Columbia Wild Geoduck Prices



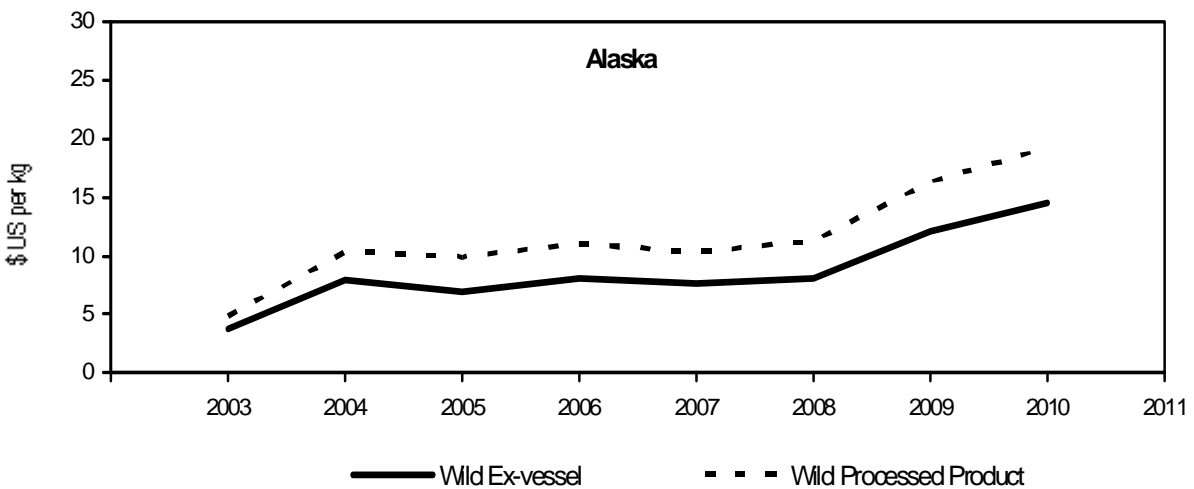
Source: Exhibit 2

Exhibit 7: US Geoduck Prices



* the winning bidder has to arrange and pay for harvest of the geoduck

Source: Washington State DNR



Source: ADF&G

3.8.3 Delivered Prices to Asia

The following gives illustrative pricing/costing for a shipment of live Canadian geoducks to Asia.

	Geoduck Price/Cost	
	\$ per lb	\$ per kg
Harvester Payment	\$13.00	\$28.60
Packing/Trucking	2.00	4.40
Plant inc. Cont ⁿ to Overhead	2.00	4.40
Loss Factor*	1.70	3.74
Air Freight	<u>1.30</u>	<u>2.86</u>
	\$20.00	\$44.00

* 10% for shrinkage/water loss, overpack, broken shells

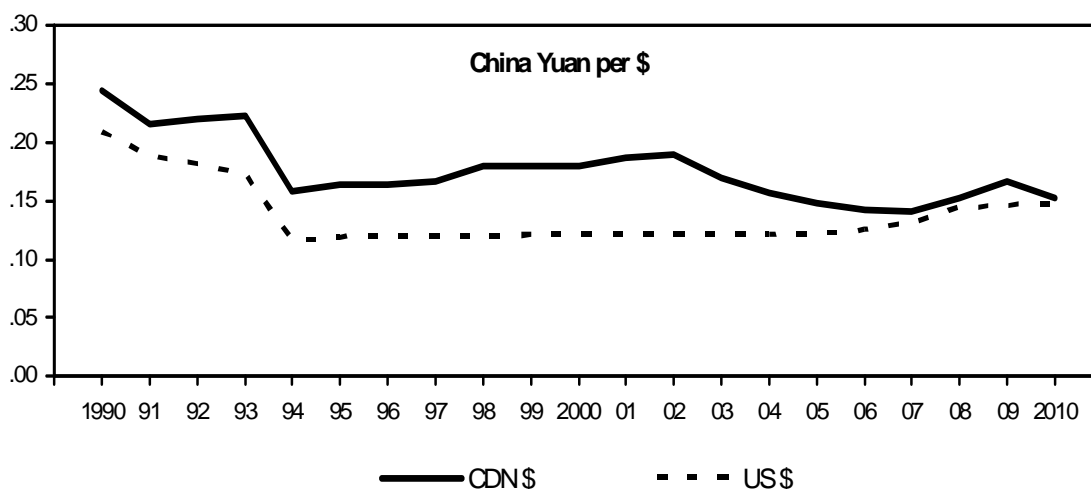
The delivered cost to the Asian airport, before customs and import duties if applicable, then is \$20 per lb or \$44 per kg.

Individuals interviewed suggest that live geoduck can sell for the equivalent of \$60 per lb or more, \$132 per kg, in Asian restaurants i.e., at least three times the delivered cost to Asia.

3.8.4 The Influence of Exchange Rates

The majority of geoduck sold in export markets is priced in US dollars. Accordingly, currency exchange rate fluctuations are important in assessing market demand and returns for geoduck.

From 1990 to 2005 the China Yuan currency weakened significantly against both the US and Canadian dollars thereby increasing the costs of geoduck imports into China. Since 2005 there has been some modest strengthening of the Yuan currency.



3.9 New Production Potential

New supply of geoduck could come from the expansion of harvest from existing sources/regions or from the introduction of new sources/regions of geoduck supply.

Existing Sources. We see expansion of geoduck harvests from traditional sources of production as unlikely. In fact, it is likely that there will be an overall decline of about 3-5% over the next decade.

The outlooks for particular sources/regions, apart from geoduck culture in BC, over the next decade are:

- BC wild harvest - it is likely that BC wild production will decline by say 10% due to sea otter predation. In fact, the 2012 TAC is 4% lower than the 2011 TAC, and without product from enhancement would have dropped another 2% (Michelle James, UHA pers. comm.).
- Alaskan wild harvest - it is likely that Alaskan wild production will decline by 10-20% over the decade due to sea otter predation (Philip Doherty, SARDFA pers. comm.).
- Washington State wild harvest - no growth over the wild harvest production of around 2,000 tonnes over the last decade is envisaged (Bob Sizemore, DNR pers. comm.).
- Washington State culture harvest - growth constrained by: 1) lack of new good growing areas, and 2) regulatory constraints related to opposition to geoduck culture on intertidal lands (Bob Sizemore, DNR pers. comm.).
- Mexico wild harvest - the maximum annual harvest level appears to be about 1,200 tonnes, a level already reached (Luis Eduardo Calderon, CICESE pers. comm.).

With respect to Washington State culture potential, most of the best locations for culture have already been identified and purchased or leased - marginal grounds could come into production as prices rise (Bob Sizemore, DNR pers. comm.).

New Sources. Culture operations may start in Mexican waters but this is speculative.

There is a small amount of current production from New Zealand and other countries surrounding the Pacific Ocean. Our understanding is that this is a very different species than *Panopea generosa*, a species that is much smaller and darker. We do not see this product competing with the Pacific geoduck.

China has investigated the feasibility of geoduck culture with the *Panopea generosa* species. Challenges appear to be the long growout period for return of capital, the availability of suitable beach land, and the issue of unauthorized harvesting or poaching.

The current status of geoduck culture efforts in China is unclear. However, imports of live geoduck from North America could serve as broodstock to launch a significant industry. As a comparison, note that in the 1980s China imported live American bay scallops and Japanese culture technology the result of which was that 20 years later China had become the world's largest producer of scallops at close to 1 million tonnes annually (Northern Economics 2004).

3.10 Price Sensitivity to an Increase in Supply

Our interviews suggested that (Appendix E):

- with the strong market that is short of product, a small increase in supply would depress the price only a little
- a large increase in supply, for example doubling world supply, would have a significant impact on price
- the long time horizon for bringing a new aquaculture supply source to market means that it should be possible to plan, in an orderly way, its introduction to market

These observations are generally consistent with past work (Northern Economics 2004).

In addition to the interview program and the review of secondary research/reports, we attempted to investigate the price sensitivity to supply changes through statistical analysis of price, supply/quantity and other variables - e.g., Gross Domestic Product or GDP per capita in China (in real, inflation adjusted Chinese RMB currency) - over the 1990 to 2010 period.

The modelling of price as a function of supply is appropriate when supply is independent of price, for example when fish catch is subject to a quota and the price of fish exceeds the costs of fishing. The sensitivity of price to supply in such an inverse demand model is called price flexibility and is defined as the percentage change in price divided by the percentage change in supply (Anderson 2003 p.142).

One would expect increases in per capita income to have a positive impact on price and increases in quantity supplied to have a negative impact on price.

	Geoduck		
	Real Price*	World Supply	Real Per Capita GDP in China
	2009 Yuan per tonne	tonnes	2009 Yuan per Capita**
1990	46,500	5,616	4,510
95	250,300	2,752	7,590
2000	214,200	3,569	10,960
05	191,500	5,049	16,930
2010	211,500	5,854	28,040

* CDN wholesale price converted to constant Yuan currency

** Note that real per capita GDP increased between 1990 and 2010 by about 30% in both Canada and the US (compared to 520% in China)

Our investigation suggests:

- the real, inflation - adjusted price of geoduck in China has fallen since 1995,
- the 113% increase in world supply of geoduck over the past 15 years has been associated with a 16% decrease in the real price of geoduck in China, and
- if per capita incomes in China continue to rise at the same rate as experienced over the past 15 years, then each 10% increase in geoduck supply is expected to be associated with a 1-2% decrease in price in China.

Tempering the usefulness of the above results are several issues namely: 1) the reliability of the data, 2) any changes in seafood infrastructure, consumer awareness, quality of the product mix over the historical period etc., 3) the fact that demand is very seasonal an issue that can not be accommodated in analyzing annual time series data, and 4) the fact that significant increases in supply of a perishable live product can overwhelm the market and its distribution systems.

4.0 Conclusions

North American producers supply the geoduck market in Asia with a quality live product that goes mainly to high end restaurant use. Demand is seasonal with a winter peak in demand around Chinese New Year. End users do not differentiate between wild and cultured product.

The market generally is short or under-supplied with geoduck, especially during the peak winter demand period. An important feature of supply logistics is the limited capability of the Asian seafood distribution system to handle surges in shipments of live seafood.

Price increases to North American producers over the past 20 years have been fuelled by:

- the product shift from frozen meat to live sales,
- economic growth in China, and
- greater consumer awareness.

However, prices in real, inflation - adjusted Chinese currency actually have declined since 1995.

Existing sources of supply are unlikely to show production growth, in fact they may decline. The economy in China is expected to continue to grow, improvements in air transportation and cold chain seafood distribution in China are expected to continue, and awareness within China of geoduck as a high quality seafood choice will expand.

This offers the potential to expand geoduck sales to existing market areas in China as well as to the relatively untapped North China and Interior China regions. That is, prices are expected to increase in the absence of new sources or supply.

However, increases in supply from a new source, for example geoduck aquaculture from British Columbia, would have some negative effect on the overall price or more specifically the growth in price. The actual price impact would depend critically on the size of the supply increase, the timing of supply within the year, any new marketing efforts, the strategic behaviour of industry and how orderly the new supply was introduced.

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Appendix A

Interview List

Exhibit A.1: List of People Interviewed

Name	Affiliation	Location
Government/Other		
1. Barnett, Jane	DFO	Toronto, ON
2. Calderon, Luis Eduardo	CICESE	Mexico
3. Hutter, Shellene	ADF&G	Alaska
4. Johnson, Neville	DFO	Ottawa, ON
5. Matthews, Carmen	BC Ministry of Agriculture	Victoria, BC
6. Sizemore, Bob	Washington Dept. Natural Resources	Washington State
Industry		
1. Austin, Jamie	UHA President	Comox, BC
2. Doherty, Philip	SARDFA	Alaska
3. Gant, Eric	Manatee Holdings Ltd.	Comox, BC
4. Gibbons, Jim	Seattle Shellfish	Washington State
5. Hayes, Tom	Taylor Shellfish	Washington State
6. James, Michelle	UHA Executive Director	Vancouver, BC
7. Jordon, Robin	Suquamish Seafoods	Washington State
8. Lochmatter, Fred	Fan Seafoods	Comox, BC
9. Pearson, Jeff	Taylor Shellfish	Washington State
10. Rice, Scott	Pacific Rim Shellfish	Vancouver, BC
11. Sorenson, Chris	UHA Director	Nanaimo, BC
12. Steckler, Ron	Chang International Inc.	Washington State
13. Suzuki, Kasutoshi	KSI Food Service	Bedford, Nova Scotia
14. Taylor, Bill	Taylor Shellfish	Washington State
15. Wong, Tony	Sea World Fisheries Ltd.	Vancouver, BC
16. Yi, Charles	O Fine Foods	California
17. Yu, Tony	Tri-Star Seafood	Vancouver, BC
18. xxx	Worldwide Seafood Ltd.	Hong Kong
19. xxx	Tokai Denpun Japan & USA	Washington State
20. xxx	Oregon Oyster Farms	Washington State
21. Chol Pak	Pacific Fresh Fish Co.	California
22. xxx	Brighton East Co.	China

Note: "xxx" means confidential

Appendix B

Canadian Geoduck Trade

Exhibit B.1: Canadian Geoduck Trade - Exports*

Year	tonnes Exports					\$000 CDN Export Value				
	US	China/Hong Kong	Japan	Other	Total	US	China/Hong Kong	Japan	Other	Total
1989	601	358	250	35	1,244	2,946	3,779	4,249	387	11,361
90	225	426	280	30	961	1,275	3,174	3,041	305	7,795
91	345	653	51	43	1,092	2,140	5,224	590	440	8,394
92	901	844	18	40	1,803	4,623	10,446	320	479	15,868
93	486	1,199	43	72	1,800	3,005	19,219	1,045	1,291	24,560
94	478	1,463	6	109	2,056	3,501	29,833	173	2,290	35,797
95	292	1,763	5	94	2,154	4,607	43,775	138	1,857	50,377
96	174	1,413	3	66	1,656	1,875	33,390	98	1,248	36,611
97	92	1,495	36	8	1,631	1,740	38,921	413	229	41,303
98	123	1,406	69	14	1,612	2,274	35,123	779	141	38,317
99	101	1,640	1	25	1,767	2,111	43,397	11	418	45,937
2000	121	1,280	0	15	1,416	3,178	36,907	3	390	40,478
01	73	1,180	1	39	1,293	1,766	33,287	20	1,150	36,223
02	100	1,061	1	24	1,186	1,752	30,887	17	497	33,153
03	143	1,500	2	57	1,702	1,765	35,364	50	502	37,681
04	113	1,834	1	31	1,979	1,914	39,549	19	507	41,989
05	64	1,883	3	27	1,977	1,247	36,312	122	536	38,217
06	50	1,769	1	21	1,841	992	38,381	57	604	40,034
07	67	1,594	1	16	1,678	1,156	37,894	13	591	39,654
08	32	1,712	0	10	1,754	344	36,488	0	265	37,097
09	6	1,683	1	9	1,699	114	38,326	19	241	38,700
10	1	1,606	1	40	1,648	27	42,657	22	655	43,361

* includes both processed and live product

Source: DFO (from Statistics Canada Trade Division)

Exhibit B.2: Canadian Geoduck Trade - Imports*

Year	tonnes Imports			\$000 CDN Import Value		
	US	Other	Total	US	Other	Total
1989	522	7	529	2,170	36	2,206
90	484	10	494	1,848	36	1,884
91	580	3	583	2,219	24	2,243
92	180	0	180	927	0	927
93	219	0	219	1,308	0	1,308
94	420	0	420	3,717	0	3,717
95	289	0	289	2,714	0	2,714
96	543	0	543	3,973	0	3,973
97	823	0	823	8,946	0	8,946
98	1,008	0	1,008	16,199	8	16,207
99	1,631	0	1,631	24,869	13	24,882
2000	1,539	90	1,629	20,231	476	20,707
01	1,365	62	1,427	21,251	366	21,617
02	2,119	75	2,194	26,421	630	27,051
03	1,490	23	1,513	19,114	265	19,379
04	1,841	27	1,868	24,500	320	24,820
05	1,786	41	1,827	24,278	517	24,795
06	2,001	8	2,009	27,328	105	27,433
07	1,527	19	1,546	22,475	294	22,769
08	1,716	51	1,767	25,161	223	25,384
09	1,267	16	1,283	20,123	67	20,190
10	1,173	1	1,174	19,374	5	19,379

* includes both processed and live product

Source: DFO (from Statistics Canada Trade Division)

Exhibit B.3: Canadian Geoduck Trade - Re-Exports*

	tonnes Re-Exports			\$000 CDN Re-Export Value		
	China/Hong Kong	Other	Total	China/Hong Kong	Other	Total
1993	4	0	4	59	0	59
94	35	5	40	511	90	601
95	0	1	1	0	54	54
96	6	0	6	50	0	50
97	0	0	0	0	0	0
98	1	0	1	39	0	39
99	421	1	422	10,463	8	10,471
2000	428	2	430	11,311	77	11,388
01	737	31	768	20,565	1,040	21,605
02	931	0	931	25,510	15	25,525
03	775	3	778	20,062	88	20,150
04	1,090	2	1,092	27,273	91	27,364
05	928	6	934	23,025	168	23,193
06	898	4	902	22,344	138	22,482
07	715	9	724	18,839	330	19,169
08	771	6	777	18,850	151	19,001
09	581	1	582	15,447	38	15,485
2010	371	3	374	11,260	84	11,344

* includes both processed and live product

Source: DFO (from Statistics Canada Trade Division)

Appendix C

US Geoduck Trade

Exhibit C.1: US Geoduck Trade - Exports

	tonnes Exports				\$000 US Export Value			
	Canada*	China/Hong Kong	Other	Total	Canada*	China/Hong Kong	Other	Total
Processed Product								
2000	314	18	0	332	1,041	100	0	1,141
01	47	0	9	56	297	0	476	773
02	41	0	1	42	268	0	25	293
03	62	2	0	64	366	51	0	417
04	36	6	1	43	266	81	4	351
05	53	48	0	101	602	394	0	996
06	33	61	0	94	327	987	0	1,314
07	15	18	1	34	141	189	6	336
08	5	38	1	44	29	411	0	440
09	2	31	1	34	13	410	3	426
2010	2	20	5	27	14	145	31	190
Live Product								
2000	0	2	0	2	0	30	0	30
01	0	9	1	10	0	121	6	127
02	0	135	1	136	0	1,132	6	1,138
03	1,295	296	0	1,591	12,472	2,617	0	15,089
04	1,791	287	10	2,088	18,774	2,634	75	21,483
05	1,724	143	6	1,873	19,761	1,543	52	21,356
06	1,600	350	58	2,008	18,818	5,508	349	24,675
07	1,190	716	65	1,971	16,157	10,944	320	27,421
08	1,342	1,022	10	2,374	18,788	18,211	119	37,118
09	1,077	1,442	1	2,520	14,569	26,082	18	40,669
2010	1,139	1,538	1	2,678	14,028	25,975	18	40,021

* essentially all exports to Canada are re-exported to other countries

Source: NMFS Trade Database

Exhibit C.2: US Geoduck Trade - Imports

Year	Imports - Processed						Imports - Live					
	tonnes			\$000 US Value			tonnes			\$000 US Value		
	Canada	Other	Total	Canada	Other	Total	Canada	Other	Total	Canada	Other	Total
1990	118	5	123	567	20	587	114	1	115	529	2	531
91	108	1	109	703	3	706	236	2	238	1,157	7	1,164
92	118	1	119	778	4	782	784	28	812	3,058	46	3,104
93	30	0	30	425	0	425	457	3	460	1,888	19	1,907
94	9	0	9	207	0	207	468	1	469	2,326	3	2,329
95	10	0	10	140	0	140	282	0	282	3,167	0	3,167
96	8	0	8	186	0	186	167	1	168	1,188	49	1,237
97	3	1	4	81	2	83	89	0	89	1,171	0	1,171
98	6	10	16	54	26	80	117	0	117	1,490	0	1,490
99	4	0	4	85	0	85	98	0	98	1,334	0	1,334
2000	9	0	9	194	0	194	112	0	112	1,945	0	1,945
01	2	0	2	39	0	39	71	0	71	1,098	0	1,098
02	12	7	19	140	66	206	88	0	88	971	0	971
03	7	1	8	108	45	153	135	0	135	1,142	0	1,142
04	3	0	3	79	2	81	110	1	111	1,386	3	1,389
05	10	1	11	210	39	249	54	7	61	814	24	838
06	2	0	2	48	6	54	48	20	68	822	93	915
07	6	0	6	129	0	129	61	98	159	935	454	1,389
08	1	0	1	32	0	32	30	57	87	304	251	555
09	2	67	69	30	221	251	5	0	5	65	0	65
2010	1	62	63	23	349	372	0	25	25	3	146	149

Source: NMFS Trade Database

Exhibit C.3: US Geoduck Trade - Re-Exports

	tonnes Re-Exports				\$000 US Re-Export Value			
	Canada*	China/Hong Kong	Other	Total	Canada*	China/Hong Kong	Other	Total
Processed Product								
2000	1	0	0	1	5	0	0	5
01	3	2	0	5	14	0	10	24
02	21	0	0	21	80	0	0	80
03	2	0	0	2	18	0	0	18
04	11	0	0	11	53	0	0	53
05	3	5	0	8	28	46	0	74
06	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0
08	1	0	0	1	10	0	0	10
09	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0
Live Product								
2000	0	0	0	0	0	0	0	0
01	0	0	0	0	0	0	0	0
02	0	0	0	0	0	0	0	0
03	0	0	0	0	0	0	0	0
04	1	0	0	1	6	0	0	6
05	0	0	0	0	0	0	0	0
06	0	0	0	0	0	0	0	0
07	0	0	0	0	0	0	0	0
08	0	1	2	3	0	6	25	31
09	0	94	3	97	0	1,191	38	1,229
2010	0	206	4	210	0	3,742	82	3,824

* essentially all exports to Canada are re-exported to other countries

Source: NMFS Trade Database

Appendix D

Geoduck Market Assessments

Exhibit D.1: The World Geoduck Market - a 2004 Assessment

The Department of Natural Resources in Washington State sponsored a 2004 study of the geoduck market and the potential for geoduck aquaculture in Washington State.

Supply & Demand Dynamics

The majority of US product is exported to Canada. Smaller amounts are retained for domestic consumption and shipped directly to the main markets of Hong Kong and China. Canada exports its own production and re-exports much of the product produced by Alaska and Washington. The majority of the product goes to Hong Kong and then on to China. A small, but growing amount is shipped directly to China.

...the geoduck market transformed from a market primarily dependent on selling a frozen or canned product to one that now sells high quality, live product to a growing market. The end of the Cold War and the transformation of the Chinese economy from a planned economy to a market-based economy have facilitated transporting a live product to market and expanded the total market for geoduck.

Restaurant consumption of hot pot dishes declined markedly [in China] during the SARS outbreak because of concerns about how the virus spread from person to person.

So far, the sub-tidal production process [in British Columbia] has proven difficult with longer growing times, lower survival rates, and a smaller product [than the inter-tidal production process in Washington State].

The price of geoduck is remarkably stable for a wild harvest product.

Alaska producers have traditionally had difficulty in the live market because of PSP issues and the logistical difficulty of transporting a live animal from remote communities. Alaska producers are furthered disadvantaged because the current dominant market for live geoduck, China, demands a stable and constant product stream.

...the product coming from Mexico was of an inferior grade. The sub-species in that area is accustomed to much warmer water...dies when chilled below 45 degrees. This fact means it is illegal to ship the product live through the United States because the temperature required to keep the animal alive is higher than allowed by US law for live transport of shellfish. The study was also told that the animal expels a significant amount of its harvest body weight in water during transport, which results in a dehydrated and flaccid product when the animal reaches the market.

The Market in China

China, the largest market, has one of the fastest growing economies in the world. Past experience shows that when per capita income increases, the demand for luxury products and protein grows as well.

Exhibit D.1: cont'd

The market supplies the Chinese market with a tiny amount of geoduck relative to the size of the Chinese population and currently the geoduck market is concentrated in the major cities of Hong Kong, Guangzhou, Shanghai, Beijing, and Shenzhen. This distribution means that there are dozens of other cities with populations of more than a million people who don't have access to geoduck.

Simple demographics indicate the potential for increasing the demand for geoduck is quite high even if the product remains a luxury item.

We have heard from Canadian wholesalers that the cachet of geoduck has increased as price has risen and that the Chinese market appreciates foreign brands with cachet and limited supply.

Canadian wholesalers control nearly all of the distribution routes to the main geoduck market, China. Many of these wholesalers are of Chinese descent and use their family ties and innate knowledge of Chinese culture to distribute geoduck in a highly effective and profitable manner.

These wholesalers are also aligned closely with some of the 55 license holders in the Canadian geoduck fishery. This alignment has allowed the wholesalers to create the current market conditions of high prices and tight supplies, as they are able to tell the license holders when to fish and when to stay in port.

Price Sensitivity to Increased Supply

The study interviewed several [Canadian] wholesalers. All indicated that the market could absorb measured amounts of additional supplies without significant price disruptions. The most common estimate that we heard was that a ten to fifteen percent increase in supply would not result in significant price declines.

However, these wholesalers also said that significant increase in supply of wild or cultured product would result in severe price declines. Their argument was that geoduck is a super luxury item which only the rich can afford. The product's price in the Chinese market can reach \$60 to \$100 per pound.

Wild vs Culture Geoduck

...these Canadian buyers also said that they had no doubt that cultured geoduck would find a place in the market. They said that cultured geoduck would trade at a discount to the wild product because the cultured product isn't old enough to have acquired the texture the market wants in the product.

...conversely, geoduck growers in Washington assert that the cultured product's consistency of size, colour, and supply will win out over the texture issues in the long run.

...culture product will also exhibit a higher product recovery rate than wild product.

...the study doesn't find conclusive evidence to support the expectation that cultured product will trade at a discount to wild product.

Source: Northern Economics Inc., "The World Geoduck Market and the Potential for Geoduck Aquaculture in Washington State Lands", Prepared for Washington Dept. Natural Resources, September 2004

Exhibit D.2: The Geoduck Market in China - a 2008 Assessment

The Underwater Harvesters Association (UHA) sponsored a 2008 study of the geoduck market in China.

Quality & Grading

In Canada, grading is done at plant...buyers in Canada pay fishermen one price for all geoduck harvested, a price which is called "ocean run price"...this ensures there is no incentive for high grading. Grade A of BC geoduck is generally half a grade higher than Grade A of Washington geoduck.

...[Chinese] importers complain that grading is not standardized and each individual exporter has their own grading standard...geoduck grading is very subjective and can change with changing market conditions.

...geoduck grading is mainly based on shape and colour of geoduck syphon...not very much based on size and weight of each animal...there is a strong demand from the importers to have geoduck grading...also based on the animal weight and shell weight.

Geoduck Cuisine & Restaurants in China

Geoduck is prized for its incredibly sweet flavour and crunchy texture. The geoduck syphon is consumed mainly in three ways in China: 1) sashimi with sauces, 2) quick-fry with seasoning, and 3) hot pot (Chinese broth fondue).

For sashimi, there are three styles of sauces - Chinese style sauces such as soy sauce with ginger-strip or pepper-strip, western style sauces such as lemon juice, Japanese style sauces such as Japanese soy sauce with wasabi.

Apart from syphon meat, the gut ball will be cooked with rice to prepare geoduck-rice soup, and this geoduck-rice will be prepared for client free of charge.

The market in Hong Kong and China for geoduck is mostly a foodservice market with geoduck being enjoyed in restaurants rather than directly purchased by retail consumers. The current market is largely in Hong Kong and wealthy coastal cities such as Shanghai, Guangzhou, Shenzhen, Wenzhou, Hangzhou and Fuzhou.

High demand takes place during Chinese festivals such as before and during Chinese New Year, but also takes place in June, July and August, as consumers will enjoy geoduck and other seafood sashimi in summer months.

...the geoduck size...preferred by clients...is a weight of 1.5 to 2 lb/animal...this size can deliver the necessary quantity of geoduck meat for treating four guests...if the size is too big such as more than 3 lbs, the cost would be too high.

...the leading [high end] seafood restaurants don't sell US geoduck and Mexican geoduck, they only sell Canadian geoduck. Their purchasing people have knowledge about the origin of different geoducks, but consumers don't have any knowledge about place of origin.

Exhibit D.2: cont'd

They judge the geoduck mainly based on the syphon colour - they prefer the light color. After buying from the wholesale market, they put the geoduck into a salt water tank. The water temperature is 12C - the Canadian geoduck tank temperature is lower than others for seafood because it comes from cold water. They adjust the retail price of geoduck based on the purchasing price.

...the clients prefer 1,000-1,250 gram size geoduck. Consumers don't know the difference between Canadian geoduck and US or Mexican geoduck, but experienced consumers can judge the taste differences. Consumers prefer the "crispy" taste of geoduck meat.

90% of the customers who order geoduck [in high end restaurants] are there for business entertainment and their per meal budget is above RMB 2000. Customers normally order moderate size (1,000-1,250 gram) geoduck. When customers are entertaining business clients, they normally order several different high priced seafood items including live wild groupers for steaming, live lobsters for sashimi, live crab for stir fry, geoduck for sashimi, abalone for soup. The priority will be live fish and live lobster, geoduck, crab, abalone...only 10% of customers reflect personal consumption and this kind of customer normally orders a smaller size of geoduck.

...among high end seafood, Canadian geoduck is just a "middle class" item, even if it is already very expensive for normal people.

Sales & Distribution Channels

Vancouver is more important than Seattle for shipping geoduck to China but in recent years more direct exports from Seattle to Hong Kong and China are occurring.

The four markets of Hong Kong, Shenzhen, Guangzhou and Shanghai are key places for geoduck wholesaling and distribution.

About 60-70% of geoduck imported into Hong Kong is re-exported into the Chinese mainland - there are 5 or 6 key importers in Hong Kong who have been in business a long time, some are very close to BC exporters, some are even relatives. These key BC exporters sell exclusively to these Hong Kong importers who re-export to South China importers.

There are 800 or more seafood or hot pot restaurants in Hong Kong two thirds of which offer geoduck...Hong Kong is a mature market...Canadian geoduck has the top reputation.

The Guangzhou market is a transfer centre for geoduck and much other fresh and live seafood.

Shenzhen is opposite Hong Kong - it is an important location for importing and distribution of high value seafood including geoduck.

Shanghai is a wholesale and distribution centre for geoduck to Eastern China - geoduck is supplied directly from shipments arriving at Shanghai airport or from Shenzhen or Guangzhou markets.

Importers and wholesalers have paid less attention to marketing geoduck in Beijing and North China - compared to Guangzhou and Shanghai, the Beijing market has more potential to grow.

Source: UHA Research 2008 pers. comm.

Appendix E

Interview Comments

Exhibit E.1: Interview Comments

The team of consultants interviewed over 25 producers, buyers, and marketers from Canada, the US, and Asia

The results of the interviews are presented under 6 headings. The intent is to convey the flavour and diversity of views on geoduck markets. The consultants do not necessarily endorse the views presented.

1. Competing Sources of Supply & Competing Seafood Products

- we buy mainly out of Canada but we also buy wild from Alaska, Washington State and Mexico - and we also buy cultured product
- king crab, abalone, sea urchin, and live lobster are in the same class
- no products are direct substitutes
- the principal substitute in Japanese cuisine is other gai/clam products - there are a number of clam species emerging in the world that will compete with geoduck e.g., a clam from Argentina
- when Alaska in season, we stop buying Canadian product and buy Alaskan
- the Mexican product dominates the Taiwan market with 70-80% market share
- whelk is the main substitute or competitor for geoduck in Japan - due to the high price of geoduck, whelk has become more popular in sushi restaurants
- competitive high end dishes are Australian lobster, abalone, shark fin soup, hairy crab

2. Demand Characteristics & Logistics

- end users do not know or care whether the geoduck is from Canada, Washington, Alaska or Mexico
- BC appears to be a closed club of Chinese suppliers
- we sell our Washington State wild through local exporters - we do not want to take the credit risk of selling more directly into the market
- there is always a shortage around Christmas & Chinese New Year - generally supply is never abundant at any time to year
- Canadian product offers the advantage that supply chain logistics are simpler
- Chinese consumers are not that familiar or comfortable eating raw seafood, so only 10% of current consumption is sushi although this restaurant segment is growing
- there was a significant change in PSP testing protocol in Alaska in 2003, a change that allowed much more product to be shipped live

- live geoduck works very well in a hot pot or stir fry format because heat does not produce a tough chewy texture as it does with applying heat to a blanched product like hokkigai (Arctic surf clams)
- live markets have limited capacity to absorb sudden, exponential supply increases without large scale price adjustments
- we can not find enough geoduck to meet our orders for most of the year
- winter product is always short and the price is very good, the coolest months are the highest demand months
- Mexican product can't enter the US or Canada because the water quality testing is not up to standards
- geoduck consumption in Hong Kong hotels and casinos in Macau is mainly for hot pot
- hot pot is more prevalent in winter - a lot is cooked with traditional style of blanching - very important not to overcook the product - most consumption if not raw is semi raw
- the market tends to be short in November and very short in December and January
- as Chinese people become richer demand grows
- summer demand slows as the Chinese do not eat hot pot as much - but BC wild production falls during summer as well so the price does not decrease very much
- if the food moves, the Chinese are interested in eating it
- demand is growing much faster than supply as the Chinese people become more affluent
- distributors no longer buy on spec - now only make small orders which they have presold as they do not want to get caught with expensive inventory
- the Asian market is set up to absorb a certain amount of live product per day - easily knocked off kilter if sudden short term increase
- air connections to China are better from Vancouver than from Seattle
- a market glut occurs when Alaska enters the market in October
- Mexico can be a problem - illegal harvest, product often dumped into market leading to price instability
- the auction prices in Washington State have increased substantially in the last 2 years as new bidders from Mainland China have appeared
- all wild product from BC is sold "run of catch" - grading is done by first receiver
- the Washington State tribes can disrupt the market
- the pricing to wild BC harvesters is a blended price to create price stability over the year - but processor prices received vary by source region, timing, and grade mix
- the price to Alaskan harvesters traditionally has been low due to: 1) lack of competition on buying, and 2) fragmented/unknowledgeable harvesting sector - but there has been a substantial price increase recently as more buyers have appeared

- Canadian exporters seem to be very passive, most not at China Seafood Show, often they don't respond to information requests that we pass on from contacts that the UHA makes at the Show
- the Canadian price in China has been higher the last 2 years: 1) better air transport to new areas of China, and 2) better matching of supply and demand during the year
- once an individual proves a steady year-round presence in the market, we are interested in supplying them
- there is seasonality in demand for geoducks just as there is seasonal peak demand for turkeys at Thanksgiving and Christmas - why should geoduck buyers be forced or expected to purchase all year round?
- in 2011 the BC wild industry harvested most of their product early - the market became short at year end
- factors underlying recent increase in BC prices are: 1) global increase/interest in seafood especially live seafood, and 2) increasing incomes and economic growth in China
- Ketchikan - the main Alaskan producing area has had significant closures so far in 2011 due to PSP, the market is short and there is a price bump
- product awareness in China is increasing - started in Hong Kong, then Shanghai and now has gone to Northern China
- hot pot season is October to early March - we never fill our orders during this time, we have to ration out product
- Tribal production starts April 1 - the market may drop at this time
- the infrastructure for seafood has improved dramatically in China over the past 10 plus years - this has helped geoduck penetrate new markets
- more direct flights to interior cities in China plus greater product awareness in China has expanded the market for geoduck
- the philosophy of farmed is: 1) steady flow of supply, 2) don't ever sell at a discount, and 3) have predictable prices
- it is harder, more expensive to harvest farmed from October to March
- in China, there is a saying to the effect...without fish there is no real dinner
- the more expensive the seafood in Chinese restaurants, the better - conspicuous consumption is expected in restaurants, home consumption without guests is much more modest
- the real trick to selling geoducks is selling the lower grades - there is unlimited demand for the #1's
- the sushi market in China is growing - young people are attracted to it

- economists say you can get exponential increase in consumer purchases until the economy reaches \$20,000 US per capita in income - China is still under half this benchmark

3. Product Attributes, Quality & Grading

- Canadian product has very good market reputation, and Canadian suppliers are viewed as reliable
- colour is the key grading criteria, the whiter the better
- Canadian product has excellent reputation for quality, best on West Coast
- colour of syphon is most critical attribute with uniformity of size as next criteria
- overall size not so critical because at foodservice the size of animal served is often a function of party size - a party of 4 will select a live animal of around 1 1/2 to 2 lbs, a party of 8 would be in the 2 1/2 to 3 1/2 lb range (as a live animal, geoduck is usually hand-selected from a live tank by the dining party after which the kitchen prepares for the table)
- Canada is considered to be #1 for reasons of supply and quality consistency followed by Washington State. Mexico is the value alternative trying to respond to increasing demand
- the most important attributes are thin shell, small intestine/long syphon or trunk, chewy/crunchy texture and must taste fresh and crispy
- Canadian product has advantages - larger, price within reason, good quality, consistency of supply
- the colour of the trunk is most important, the whiter the better
- the colour is dependent on the type of ground - where the sand is fine with good wave action you get the whitest geoduck - wave action cleans silt from the sand - in areas with lots of mud the trunks tends to be darker - geoducks from a muddy area tend to have a muddy taste and musty smell
- the bottom also affects trunk length - in sandy bottoms the geoduck can dig deeper and thus have longer necks - in areas with lots of gravel, they tend to have a short neck and a fat body - a long neck makes the geoduck more valuable
- we want to utilize the trunks of big geoducks
- West Coast geoduck is not that crunchy for sushi - there are better textured giant clams like kurogai in Japan that are more valued and prized for texture
- size is not critically important to Chinese cuisine - but it is important to Japanese cuisine where piece dimension on any portioned fish or shellfish is critical
- the Mexican product lasts longer living on average for 1 month in a commercial tank - it also tends to be a whiter clam than wild BC product - but is sold at a lower price

- Canadian product is very well received in Hong Kong and China - but we have difficulty sourcing in December and January, so we buy Washington State farmed
- crunch and colour for the sushi trade are important - you need the right size which aquaculture can provide - broken shells are bad news, more so for wild
- geoduck is more crispy/crunchy than whelk - preferred over whelk for sushi but is too expensive
- size is the most critical - we have a problem now with large size geoduck - ideal animal weight is 1 to 1.5 kg - size is more important than syphon colour in determining grade
- our wild catch is sold as “ocean run” to local buyers i.e. ungraded
- size is the most important followed by syphon colour
- hot pot can take lower grade but sashimi-style needs a higher grade
- the syphon is the primo part of the animal, like tenderloin in beef
- the number one attribute is colour of syphon
- Shanghai doesn't take anything over 3 lbs, Hong Kong doesn't want 3 lbs + product but will take - the ideal weight is 2 to 2 1/2 lbs
- wild is a stronger product, will travel better
- the blended farmed price will be higher than the blended wild price since you get substantially more Grade #1's from farmed
- the shelf life for BC product may be 2 weeks max in winter but Mexico gets longer shelf life, they tank in North America before shipping
- neck meat is the most important element
- wild geoducks from Canada tend to be whiter than wild geoducks from Washington State
- the colour and neck length is better from Canada, Canada has better substrate
- wild is hardier, it lasts longer in the box
- shelf life for summer product is 1 week, 2-3 weeks for winter product, Mexican product will last longer
- Mexico has all large product, Mexican product has much higher water content
- East Pacific geoduck is smaller and darker than Pacific geoduck
- wild has a higher shell weight to total weight ratio

4. Farmed vs Wild

- the cultured product is very much like a wild product - you do not grow it in cages or on ropes or socks - it is difficult to differentiate from traditional wild harvested

- cultured has more size uniformity
- little if no distinction in the marketplace between wild and farmed geoduck, nothing like say farmed vs wild salmon
- Washington State farmed gets much higher share of #1's - 60% to 90%, farmed is smaller than wild
- wild product can be ugly with poor colour and dark spots - the size is irregular - the big problem is that the shell can be big relative to the meat, customers do not like a big heavy shell with poor meat recovery
- farmed shells are more uniform and the right size for the amount of meat - they have better colouring than the wild product - tend to be more uniform in size - but the downside is that they die easier than wild
- willing to buy live cultured geoduck - wild tends to be chewier & larger than cultured
- aquaculture product tends to be whiter
- cultured product tends to be smaller and more uniform in size, cultured is whiter and makes better presentation - but cultured have thin shells and there is a problem with shrinkage in cultured
- wild have denser/thicker meat, a plus - wild product that dies is still marketable - everything being equal we prefer wild
- farmed geoduck lose more water when shipped so we have to allow for a discount on shrinkage
- cultured has recovery issues
- broken shell is a problem with wild
- cultured is preferred to wild - but we have problems finding it
- cultured has more size uniformity - only negative can be texture, not generally considered to be as crunchy and firm as wild - sashimi experts will choose wild over farmed for that reason
- aquaculture pricing can be more stable due to more uniform product attributes
- aquaculture product tends to be younger - meat less dense and therefore less crunchy - sediment colour can affect syphon colour
- currently in BC, cultured product tends to run smaller to an average of 1.5 lbs compared to 2.2 lbs for wild
- wild vs farmed is irrelevant when demand is high
- farmed has a thinner shell, a function of its younger age

5. Growth Potential

- we are currently working on a project to source and sell Mexican geoduck to China
- we will be meeting with a representative from the Marshall Islands that claim to be culturing geoduck and are seeking sales representation in the Chinese market
- some people are trying to establish farming in Mexico
- farming would be good in Mexico as the animals would grow faster and healthier due to more natural food - farms would be located on the outer coast of Baja on the Pacific side as the inner Sea of Cortez does not have the correct conditions - we have already identified good areas for seeding
- many areas of China have not been touched with geoduck offerings - there is an expansive market that would allow for marketing of geoduck - infrastructure is being built up quickly for the logistics of seafood in China
- it is hard to develop the market if you don't have supply, you will just create disappointment, you will get beat up by your customers
- there is real opportunity for growth in the sushi segment where raw product is accepted - the traditional market share has been heavily skewed towards hot pot & stir fry - frozen, sliced and vac-packed trays of 8-10 grams slices of geoduck for conveyor belt sushi business could be future opportunity - sushi is a growth area worldwide, demand for pre-cut product is increasing, pre-cut for other clam products sells for a premium over production costs
- potential to expand sales in Hong Kong and China
- the geoduck market is characterized by static supply and growing demand - aquaculture is needed
- Washington State is limited in good culturing areas i.e., deep sandy bottoms ideally, 3 feet or more in depth, that are away from sewage outfall pipes - therefore limited growth potential for Washington State farmed
- timing is good for more cultured production - the market can absorb the increase if sensibly introduced
- the geoduck TAC in British Columbia will decline, largely due to sea otter predation
- sea otter issues may result in the 20% decline in the Guideline Harvest Limit (GHL) for geoducks from Alaska
- the wild fishery is shrinking

6. Price Sensitivity to Supply

- price will be a function of the prevailing supply/demand conditions at time cultured product introduced to the market

- because of long time horizon to grow geoduck, it should be easy to predict and plan for supply increases
- the Chinese are very aggressive in seeking a discounted price - if there is a supply increase, the impact could be dramatic
- price increases in recent years has dampened interest in the sushi trade - a large secondary processor in China that does lots of cutting, tray packing and vac-pack freezing of shellfish for sushi has little interest in processing geoduck at recent prices
- increase in supply would decrease the price & this would be a good thing
- an increase in supply would only decrease price a little below the current level - everyone in the supply chain would still do well - the market would not be short of product
- in winter when the market is short, cultured product would support a high price
- geoduck 20 years ago was a big business when the price was in the single digits - when the price jumped, demand waned and people moved to substitutes
- if supply increased substantially, we would hope price would come down so geoduck demand would increase especially for middle tier restaurants
- we could sell 3 times the current volume at certain times of year - but a permanent expansion of the geoduck market is not possible without the price falling
- in fall of 2010, Alaska dumped a lot of cheap geoduck in the market and the BC wild price crashed temporarily - BC halted production
- the market is not the problem, lack of supply is
- if Washington State farmed doubled, it would not affect the price