

Examining fisheries contributions to community food security: Findings from a household seafood consumption survey on the west coast of Newfoundland

This study was carried out in the Bonne Bay region on the west coast of Newfoundland, Canada. A seafood consumption survey was undertaken as a case study for exploring fisheries contributions to community food security. The findings show that households prefer eating local over imported seafood. Fish plants and networks of family/friends are the main sources for local seafood. However, results also show a decline in consumption of most local fish and shellfish species. Survey results are contextualized by findings from interviews with local households and fish harvesters. The paper concludes with recommendations for strengthening the contributions of fisheries to community food security.

Keywords: fisheries; community food security; sustainable food systems

Introduction

Over the past several decades, a movement towards sustainable food systems has taken shape in North America and Europe. Academic and popular concern has centered on an increasingly global and industrial food system, including centralization and corporate control in food production and processing, rural community disintegration, environmental degradation, unhealthy foods, and the loss of traditional foodways.^{1,2,3,4} Sustainable food systems research has provided a critical analysis of the global food system and alternative possibilities, with particular emphasis on the potential social, economic, and environmental benefits of relocalising food systems.^{5,6,7,8} However, this literature has focused almost entirely on the agri-food system.^{9,10,11} A consideration of fisheries has been largely absent. This absence is particularly striking given that fisheries, like agriculture, are highly globalized and industrialized. Over 40% of world fish production enters the international market, much more than for other food staples including wheat (20%) and rice (5%).¹² Further, fishing is most often done using industrialized methods that have been proven to be unsustainable.¹³ Critical social science fisheries research has raised concerns analogous to those of sustainable food systems research about the corporate control of fisheries resources,¹⁴ industrial fishing practices,¹⁵ centralized governance structures,^{16,17} and threats to coastal communities and livelihoods.^{18,19} At the same time, this research has documented the significant contributions that small-scale fisheries make to catches, conservation, and livelihoods.^{20,21}

Considering fisheries in sustainable food systems research is crucial because fisheries make vital contributions to food systems and food security at global, national, and local levels. Globally, per capita seafood consumption has been increasing from an average of 10 kilograms in the

1960s to 16 kilograms in 2005.²² Most of this demand is supplied by wild marine capture fisheries as a direct source of seafood and indirectly via aquaculture operations that rely on catches from marine fisheries as a major source of feed.¹² In developing nations, small-scale fisheries are vital to food security through contributions to livelihoods and as a source of local food, and these contributions hinge on effective resource governance.^{23,24} In developed countries, including Canada, seafood has been recognized as an important part of a healthy diet because it provides high-quality protein, micronutrients, and essential fatty acids.²⁵ Canada's Food Guide encourages Canadians to eat two servings (150 grams) of fish each week.²⁶ Canadians are estimated to eat an average of 5.4 kilograms of seafood per person each year.²⁷ In comparison, Canadians eat approximately 13 kilograms of poultry per person each year.²⁷ However, an analysis of Canadian food trends shows that fish consumption has been increasing steadily since the mid-1990's and demand is projected to rise through to 2020.²⁸ Fisheries are also an important source of employment and a crucial part of the social fabric of coastal communities. In 2008, over 52 000 people were employed in fish harvesting across Canada and more than 27 000 were employed in fish processing.²⁹

However, there are challenges facing fisheries sustained contributions to food systems. An overarching challenge is the declining state of world fish stocks. Eighty percent of the world's fish stocks were considered fully or over-exploited for the year 2007.²² The globalization of fisheries has also resulted in a net movement of fish onto the tables of affluent nations, posing potential threats to the food security of many developing coastal nations.¹² Across Canada and developed countries, resource constraints and environmental decline are interacting with social and political changes to threaten coastal communities.³⁰ Sustainable food systems research must

consider fisheries if it wants to effectively address concerns of equity and sustainability in food systems. Social science fisheries research can help advance work in this area. This literature has identified strategies for rebuilding fish chains and marine ecosystems^{31,32} and argued for more participatory and community-based governance approaches to assist in fisheries rebuilding.^{33,34}

Considering fisheries in sustainable food systems research is also particularly crucial in the context of growing consumer demand for sustainable seafood.³⁵ While not yet picked up in sustainable food systems research, there are examples of fisheries being integrated into local food systems. Community-supported fisheries (adapted from the community-supported agriculture model) have arisen in the U.S. and Canada including *Off the Hook* in Nova Scotia³⁶ and the *Port Clyde Fresh Catch* brand in Maine.³⁷ Various sustainable certification schemes, and in particular Marine Stewardship Council (MSC) certification, have also successfully brought sustainable fisheries into the mainstream. However, parallel to criticisms of some food labeling schemes,³⁸ some fisheries researchers have critiqued MSC certification as a “soft” market-based form of environmentalism that hasn’t truly addressed concerns of social equity and environmental sustainability in fisheries.^{35(p.313)} Significantly, there has been mention of fisheries in some recent food policy discussions. MacRae looked at the challenges and opportunities for creating a “joined-up” Canadian food policy including changes needed to both agricultural and fisheries planning.³⁹ *Resetting the Table: A People’s Food Policy for Canada* by Food Secure Canada also devoted a chapter to sustainable fisheries and livelihoods, emphasizing the role of Canadian fisheries in providing healthy and sustainable seafood.⁴⁰

In this paper, the Bonne Bay region on the west coast of the island of Newfoundland is used as a case study for examining fisheries contributions to sustainable food systems, and in particular the role of fisheries in community food security. Community food security is a more recent approach to food security, attempting to bridge anti-hunger and sustainable food systems perspectives.⁴¹ It is most often understood as “a situation in which all community residents obtain a safe, culturally acceptable, nutritionally adequate diet through a sustainable food system that maximizes community self-reliance and social justice.”^{41 (p.37)} To look at fisheries contributions to community food security, results from a seafood consumption survey of Bonne Bay households are presented and contextualized with findings from interviews with local households and fish harvesters.

The study context

Bonne Bay is a fjord located in Gros Morne National Park on Newfoundland’s west coast (see Figure 1) and is part of the Northern Gulf of St Lawrence fishing region, one of ten regional management Northwest Atlantic Fisheries Organization (NAFO) zones. The region consists of six communities surrounded by the Park with a year-round population of approximately 3000 people. Bonne Bay has a rich fishing heritage in which fishing for sale and subsistence was combined with gardening, hunting, and woodcutting. Fishing remains an important industry, employing about 17% of the region’s workforce in harvesting and processing in 2005.⁴² The area has three seafood processing facilities and one seafood retail outlet.

Figure 1. Map of the Bonne Bay region

As throughout the province of Newfoundland and Labrador, the fishing industry in this region has experienced substantial changes over the last two decades. In the early 1990s, almost all cod fisheries in the province were placed under moratoria because of severe resource declines. In the Bonne Bay region a moratorium was imposed on cod fishing in 1994-1996 along with a moratorium on the commercial Atlantic salmon fishery in 1992. This had a substantial impact, putting fish harvesters, processing workers and other local businesses in jeopardy. The cod stock collapse affected young people who would have entered the fishery. It ended some fishing traditions while changing others. Since the moratorium there has been a shift to shellfish harvesting and processing. For the past number of years a commercial cod fishery has reopened in the region, although the total allowable catch has been reduced to about 90% of historical levels.⁴³ While most part-time harvesters left the industry after the moratorium,⁴⁴ in recent years the number of full-time fish harvesters in the region has declined.⁴² In this context of ongoing fisheries restructuring the major goal of this study is to provide an understanding of the changing

contributions of local fisheries to community food security.

Methods

To examine changing fisheries contributions to community food security, this research used mixed methods, including a quantitative survey about household seafood consumption, interviews with households about their food provisioning practices, and interviews with fish harvesters about the challenges and opportunities facing their enterprises.

Survey

In April, 2011, a survey about seafood consumption was distributed by mail to all residential post office boxes in the Bonne Bay region including the towns of Sally's Cove, Rocky Harbour, Norris Point, Glenburnie/Birchy Head/Shoal Brook, Woody Point, Trout River, and St. Paul's (see Figure 1). The survey was anonymous and to be completed by a household member responsible for shopping and cooking. Surveys were returned to the researcher in a self-addressed stamped envelope. The response rate was 27% (307 surveys were returned). It consisted of five sections: frequency and types of seafood eaten; sources of seafood; ways of eating seafood; seafood in the community; and demographics. All the questions were quantitative and most were multiple choice. Questions about seafood in the community used a Likert-type ranking scale to measure satisfaction with availability, affordability, and quality of seafood.

Interviews

Following the survey, semi-structured interviews were undertaken by the researcher with 37 households in the region to determine their food provisioning practices, including what the household eats in a typical week, where the food they eat comes from, and how important

seafood is to their diet. Additional interviews were done with fish harvesters to learn about the challenges and opportunities facing their enterprises. Fish harvesters were asked to describe where they fish and the species they catch; where they sell their catches; the role seafood plays in their diet; and their perspectives on seafood marketing.

Analysis

Data were entered from the completed surveys into a database file and analyzed using the Statistical Package for the Social Sciences (SPSS) version 19. Response frequencies were computed to provide a baseline of information for each question. Unless otherwise noted results reported are based on valid percent's which exclude any missing data. Chi-square tests were used to look at the relationships among variables. For interview data, thematic analysis was undertaken using the NVivo software program, version 7.

Survey results

Demographics

Demographic data were collected for household income, number of members, household employment in the fishing industry, and if there were children in the household. Data on sex, age, and education were collected for the household respondent. See Table 1. A comparison of the survey sample with regional demographic data from Newfoundland and Labrador Community Accounts⁴² indicates the survey sample is fairly representative of the larger population. Over 50% of the surveyed households had an annual income of under \$40 000 which is consistent with a regional median income across family types of \$33 700 in 2007. There were fewer young respondents which is consistent with regional trends showing fewer people in younger age categories. Employment in the fishing sector among the surveyed households was

13%, which is slightly less than in the larger population at 17% in 2005. A main difference between the survey sample and the regional population is education. Of the survey respondents, 71% had a high school diploma or higher compared to only 53% of people in the region with a high school education or more in 2005.

Table 1. Demographic characteristics of surveyed households

Demographic characteristic	N	% Households
SEX		
Male	111	36
Female	196	64
AGE		
21 and under	0	0
22-34	19	6
35-44	47	16
45-54	72	24
55-64	92	30
65 and over	73	24
EDUCATION		
Less than high school	31	10
Some high school	56	19
High school diploma	66	22
Some college	10	3
College diploma	21	7
Trade certificate/diploma	48	16
Some university	20	7
Bachelor degree	36	12
Graduate degree	13	4
HOUSEHOLD GROSS ANNUAL INCOME		
Under \$10 000	16	6
\$10-19 999	41	15
\$20-\$29999	41	15
\$30-\$39 999	43	16
\$40-\$49 999	35	13
\$50 -\$59 999	25	9
\$60-\$69 999	21	8
Over \$75 000	22	8
Over \$100 000	22	8
HOUSEHOLD MEMBER EMPLOYED IN FISHING INDUSTRY		
Yes	37	13
No	260	88
CHILDREN IN HOUSEHOLD		
Yes	76	25
No	229	75
NUMBER HOUSEHOLD MEMBERS		
1	39	13

2	162	54
3	51	17
4	33	11
5 or more	15	5

Frequency of local and non-local seafood consumption

The first section of the survey asked households how frequently they eat local and non-local seafood during the fall, winter, spring, and summer. Local seafood was defined as seafood from Newfoundland and Labrador and non-local seafood was defined as seafood from other places. Results indicate very different trends in the frequency of consumption of local and non-local seafood (see Figures 2 and 3). Overall, households reported eating local seafood much more than seafood from out of the province. The frequency of local seafood consumption varied across seasons while the frequency of non-local seafood consumption changed little.

Specifically, households reported eating local seafood most often in the summer, followed by the spring, fall, and winter. Thirty percent of households said they eat seafood more than twice weekly in the summer, compared to 18% in spring, 13% in fall, and 11% in winter. More households ate seafood once a week in the fall and winter compared to the spring and summer. The higher frequency of seafood consumption in the summer corresponds with the season for most local fisheries.

In contrast to local seafood consumption, 56% to 59% of households reported eating non-local seafood less than once a week during all seasons. Eating non-local seafood once a week ranged from only 8% of households in the summer to 14% in the winter, suggesting households are not eating more non-local seafood in the winter to make up for the lack of fresh local seafood.

Figure 2. Frequency of local seafood consumption

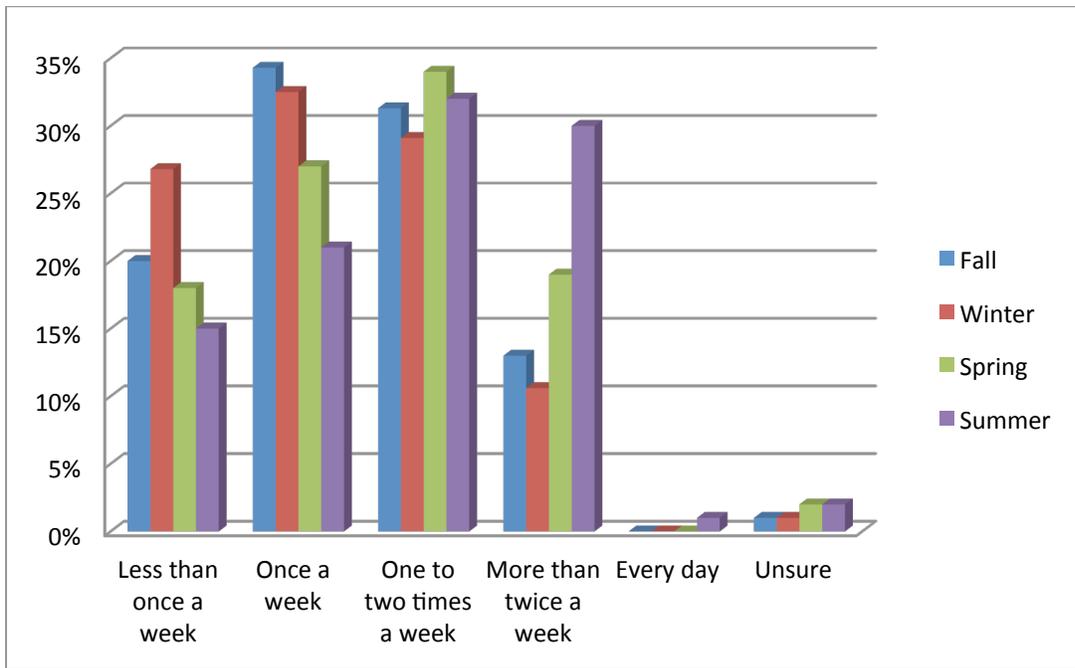
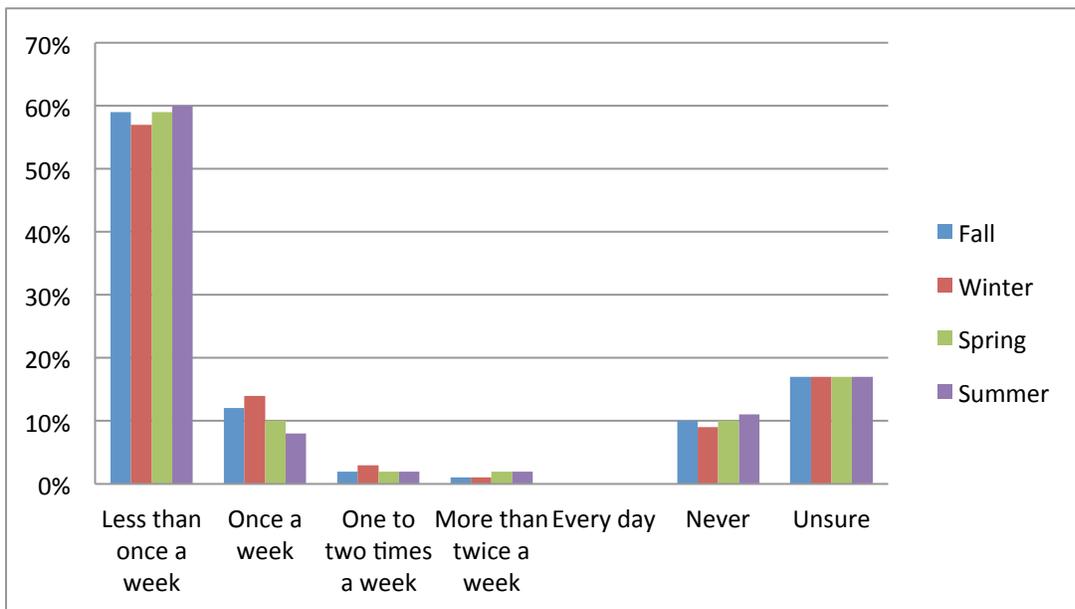


Figure 3. Frequency of non-local seafood consumption



Types of local seafood eaten over time

The survey also asked about changes in frequency of eating local seafood over time. For a list of 15 types of local seafood, households were asked to indicate if they ate them “often,” “now and then,” or “never” for the present day and five years ago. The “present day” at the time the survey was administered was 2011. There are fisheries for most of these 15 types of seafood in the Bonne Bay area (part of NAFO fishing division 4R). These include commercial fisheries for crab, lobster, cod, mackerel, halibut, herring, capelin, shrimp, and turbot as well as recreational fisheries for cod, trout, smelt, and salmon. There is a small fishery for squid in the region, some of which is caught for bait, and there is no directed fishery for catfish. Sea scallops are harvested in surrounding areas. Table 2 shows the percentage of households that ate each type of seafood often, now and then, and never for the two time periods. The final column shows the percent difference in consumption for each species over this time period. The types of seafood in Table 2 are ranked from highest to lowest frequency of consumption according to “often” consumption in the present day.

Table 2. Frequency of local seafood consumption over time

Type of local seafood	I now use (%)			5 years ago I used (%)			% difference		
	Often	Now and then	Never	Often	Now and then	Never	Often	Now and then	Never
Cod	81	19	0	86	14	0	-5	+5	0
Salmon	42	55	4	43	55	2	-1	0	+2
Shrimp	31	57	12	24	62	14	+7	-5	-2
Lobster	27	69	4	32	64	4	-5	+5	0
Halibut	27	63	10	31	61	8	-4	+2	+2
Scallops	21	58	21	15	64	21	+6	-6	0
Crab	17	75	9	24	66	10	-7	+9	-1
Trout	17	71	12	21	67	13	-4	+4	-1
Turbot	10	48	42	16	43	41	-6	+5	+1
Mackerel	9	45	45	11	44	44	-2	+1	+1
Capelin	7	72	21	22	65	13	-15	+7	+8
Herring	7	57	35	14	55	31	-7	+2	+4
Smelts	6	36	58	8	35	56	-2	+1	+2

Squid	3	43	54	7	41	52	-4	+2	+2
Catfish	0	12	88	1	14	85	-1	-2	+3

Note: Data were only included for households that answered both parts of the question (i.e. now and five years ago) for each type of seafood. Percentages may not total 100% due to rounding.

A main trend in local seafood consumption over the five-year period is that households are eating most types of local seafood less “often” in the present day than five years earlier. For example, 81% of households said they eat cod often in the present day compared to 86% five years earlier, a 5% decline over the five-year time period. This decline holds for nearly all types of seafood with the exception of shrimp and scallops which households reported eating more often in the present day. The supermarket was a more important source for shrimp and scallops compared to other types of seafood, suggesting an increase in these species consumption may be related to how they are sourced.

Sources for local seafood

For the same 15 types of local seafood, households were asked to identify the sources for each type of seafood they eat. Sources included friends/family, local fish plant, local grocery store, supermarket, superstore (such as Walmart), and other (such as own catch or recreational fishery). A definition of friends/family was not provided but potentially includes seafood given to households or purchased from friends/family working in the fishing industry. Table 3 shows the percentage of households that used each of these sources for 15 types of seafood. For all types of seafood with the exception of shrimp, friends/family or the local fish plant was the main source. The supermarket was an important source for shrimp, scallops, and salmon. Other sources, such as the recreational fishery, were important for capelin, cod, mackerel, and trout.

Table 3. Sources for local seafood

Type of local seafood	Seafood sources (%)					
	Friends/family	Local fish plant	Local grocery store	Supermarket	Super-store	Other/own catch/recreational fishery
Capelin	53	14	3	3	0	28
Catfish	5	7	1	1	0	4
Cod	58	56	15	17	1	44
Crab	41	53	4	5	0	11
Halibut	36	50	4	10	0	9
Herring	46	18	3	3	0	10
Lobster	41	70	5	5	0	13
Mackerel	29	7	1	3	1	22
Salmon	21	49	20	38	2	18
Shrimp	15	32	16	37	7	3
Scallops	17	42	11	24	2	4
Smelts	31	4	1	1	0	16
Squid	26	7	1	6	0	10
Trout	46	7	2	8	1	39
Turbot	26	24	8	7	1	6

Note: The numbers shown are actual percent's based on 307 households for each type of seafood. Percentages do not total 100% for each type of seafood type because households could select multiple sources for each type of seafood they ate.

Favourite types of local seafood

Households were asked to list their five favourite types of local seafood. Cod was listed as a favourite type of seafood by 97% of households followed by lobster (77%), salmon (74%), halibut (57%), and crab (50%). These were also among the most frequently eaten (Table 2).

Ways of eating seafood

The survey also asked about ways of eating seafood. Nearly all households (98%) said pan-fried was a preferred cooking method, followed by fish and brewis (a dish of salt fish and hard bread) (73%), baked (63%), au gratin (43%), deep fried (47%), barbecued (39%), chowder (33%), poached (24%), and smoked (20%). In addition to eating fish fillets, 91% of household said they

eat fish tongues, followed by cheeks (77%), heads (45%), and britches (eggs) (43%). In terms of preserving seafood, 95% of households said they freeze seafood, followed by salting (70%), pickling (38%), and other methods such as bottling (20%).

Factors influencing frequency of local seafood consumption

To examine factors that may influence local seafood consumption, Pearson's chi-square values were generated using cross-tabulations. Relationships between demographic characteristics and frequency of eating local seafood were examined as well as the relationship between preserving seafood and frequency of local seafood consumption. The threshold for significance was set at $P = <0.05$. For the purpose of these tests, the response categories "unsure" and "every day" were excluded from frequency of local seafood consumption. There were very few respondents in these categories so their removal had minimal impact on the results. Some analyses did not meet the assumptions of the chi-square test because of low cell counts (e.g more than 20% of cells had an expected count of less than 5). Less weight can be attributed to these results and these are noted in the text.

For income, the hypothesis was that household income would influence the frequency of eating local seafood. However, the results indicate no significant relationship between income and frequency of eating local seafood throughout the year. See Table 4. For household food security, this is a positive finding because it suggests equitable access to local seafood across income levels. Household size, having a household member employed in the fishing industry, as well as age, sex, and educational level of the household respondent, similarly had no significant relationship with how often a household ate local seafood throughout the year. However, age,

sex, education, and household size had low cell counts so less weight can be attributed to these results.

Table 4. Cross-tabulation of household income and frequency of local seafood consumption

Frequency of local seafood consumption	Household gross annual income				Total N	P value
	\$29 999 or less	\$30 - \$49 999	\$50 - \$69 999	Greater than \$75 000		
FALL					257	.946
Less than once a week	21% (20)	22% (16)	18% (8)	23% (10)		
Once a week	32% (30)	39% (29)	38% (17)	39% (17)		
1-2 times a week	31% (29)	26% (19)	36% (16)	27% (12)		
More than twice a week	16% (15)	14% (10)	9% (4)	11% (5)		
WINTER					259	.155
Less than once a week	24% (23)	24% (18)	29% (13)	43% (19)		
Once a week	30% (29)	45% (33)	31% (14)	25% (11)		
1-2 times a week	32% (31)	22% (16)	33% (15)	21% (9)		
More than twice a week	14% (13)	10% (7)	7% (3)	11% (5)		
SPRING					252	.899
Less than once a week	18% (17)	23% (16)	13% (6)	21% (9)		
Once a week	26% (24)	34% (24)	31% (14)	26% (11)		
1-2 times a week	34% (32)	30% (21)	36% (16)	33% (14)		
More than twice a week	22% (20)	14% (10)	20% (9)	21% (9)		
SUMMER					254	.852
Less than once a week	18% (17)	14% (10)	13% (6)	16% (41)		
Once a week	22% (21)	28% (20)	22% (10)	23% (59)		
1-2 times a week	25% (24)	34% (24)	31% (14)	30% (76)		
More than twice a week	35% (33)	24% (17)	33% (15)	31% (78)		

Note: Percentages may not total 100% due to rounding.

The relationship between preserving seafood and frequency of eating local seafood was also examined. The hypothesis was that preserving seafood would influence how often local seafood was eaten. For freezing, pickling, and other activities such as bottling, results show no significant relationship with frequency of local seafood consumption. Freezing seafood had low cell counts so this result is less reliable. However, the results show that salting fish is significantly associated with frequency of eating local seafood during all seasons at the $P < 0.05$ significance level. See Table 5. Households that salted fish were significantly more likely to eat more local seafood throughout the year. During all seasons households that salted fish were

more likely to eat seafood 1-2 times a week than households that didn't salt fish. For example, in the fall, 35% of households that salted fish ate seafood 1-2 times a week compared to 24% of households that didn't salt fish. Conversely, households that didn't salt fish were more likely to eat seafood less than once a week during all seasons. These results suggest salting fish is a positive indicator of how often a household eats local seafood throughout the year.

Table 5. Cross-tabulation of salting fish and frequency of local seafood consumption

Frequency of local seafood consumption	Household participation in salting fish			
	No	Yes	Total N	P value
FALL			295	.043
Less than once a week	29% (26)	17% (34)		
Once a week	32% (28)	36% (75)		
1-2 times a week	24% (21)	35% (71)		
More than twice a week	16% (14)	13% (26)		
WINTER			297	.001
Less than once a week	42% (38)	21% (43)		
Once a week	29% (26)	35% (72)		
1-2 times a week	19% (17)	34% (70)		
More than twice a week	10% (9)	11% (22)		
SPRING			289	.021
Less than once a week	27% (24)	14% (29)		
Once a week	30% (26)	27% (54)		
1-2 times a week	32% (28)	37% (74)		
More than twice a week	11% (10)	22% (44)		
SUMMER			292	.007
Less than once a week	24% (21)	12% (25)		
Once a week	28% (25)	19% (39)		
1-2 times a week	24% (21)	36% (73)		
More than twice a week	24% (21)	33% (67)		

Note: Percentages may not total 100% due to rounding.

Seafood in the community

Households were asked to rate their satisfaction with the availability, affordability, and quality of local seafood in their community. About 40% of households were satisfied with availability and affordability and a further 30% were dissatisfied or very dissatisfied. Quality of seafood rated the highest with 52% of households satisfied and less than 10% dissatisfied or very dissatisfied.

Survey limitations

There are several limitations to the survey results. First, the education level of respondents in the survey sample is higher than in the regional population, indicating the survey may have been biased to those with a higher education level. Further, data on age, education, and sex were only collected for the household respondent, limiting analysis of the influence of these characteristics on seafood consumption. For chi-square tests, some analyses did not meet the assumptions of this test and less weight can be attributed to these results.

Interview results

Table 6 summarizes the main themes about accessing and eating seafood that emerged from the qualitative analysis of 37 household food provisioning interviews. These results, along with additional findings from fish harvester interviews, are drawn on in the Discussion section to further contextualize the results of the survey.

Table 6. Main themes from analysis of household interviews

Main themes	Number of households
EATING AND PREPARING SEAFOOD	
Prefer local seafood for quality, taste, freshness	17
Seafood is healthy	14
Using less salt and fat in cooking	11
Need to learn skills from older generation	4
SUBSISTENCE ACCESS TO SEAFOOD	
Becoming more restricted/hard to participate	13
Declining resource conditions	4
Important for taking kids out on the water	4
BUYING SEAFOOD	
Uncertain about quality of seafood from other places	3
	3
Buying local seafood supports the community	3
Seafood becoming harder to buy locally	

Discussion

This is the first seafood consumption survey in the Bonne Bay region. However, in 2006, a food survey including questions about seafood consumption was undertaken in the area directly north of Bonne Bay.⁴⁵ I will now compare the results of these two surveys. I will also draw on findings from interviews with households and fish harvesters to further contextualize the results of the survey described here.

Survey results show that households eat local seafood much more than non-local seafood. In interviews, many households expressed a preference for eating local seafood for reasons such as taste, freshness, knowing where it comes from, and supporting the local fishing industry. Many also believed that eating seafood was healthy. Fisheries are also important to livelihoods in the

region and consumption of seafood can support local businesses. Fish harvesters sell most of their catches to fish processing plants in the region. The majority of these catches are exported although most plants also sell some seafood locally. There are three seafood processing plants in the region. The largest of these plants also operates a seasonal retail storefront where a variety of types of local seafood can be purchased. While fish processing plants are important as both buyers and sellers of local seafood, some fishing families also noted that direct sales in the community are important for allowing them to get a higher price for a portion of their catch compared to selling it all to a licensed buyer or fish processor. In interviews, some households similarly noted that they prefer purchasing seafood directly from fish harvesters. However, there are constraints to developing direct local seafood markets in the region.⁴⁶ First, although direct sales are informally taking place, provincial regulations under the Fish Inspection Act stipulate that fish harvesters are supposed to sell to a licensed buyer or fish processor and are not allowed to sell directly to customers. At the same time, having sufficient sales to a fish processor or licensed buyer is critical for fish harvesters to qualify for employment insurance in the off-season. Further, some harvesters are hesitant to pursue alternative marketing opportunities in case existing markets for their catch are jeopardized and, logistically, it is simpler for them to sell to one or two central buyers rather than smaller diversified markets. Establishing formal direct markets will require regulatory changes along with appropriate local organizational capacity. Aside from direct marketing opportunities, there is a large fish plant in the region that has in place strong working relationships with harvesters and customers. There may be ways to use these existing connections to try out new types of marketing arrangements that support fishing enterprises and local seafood access.

In terms of household access to local seafood, results show no significant relationship between income and frequency of eating local seafood. Equal access to local seafood across income levels may be because it was sourced mainly from friends/family and fish plants and obtained for a lower price from these sources compared to a supermarket, or sometimes was shared. The importance of friends and family as a source of local seafood indicates the significant role of informal economic networks in rural food provisioning.^{47,48} Survey results also indicate that traditional foodways remain important. Salting fish was undertaken by 70% of surveyed households. Traditionally, fish was salted to keep through the winter before refrigeration was available. Households that salted fish were significantly more likely to eat more local seafood throughout the year. The transfer of intergenerational knowledge about salting fish is crucial to maintaining this practice.

However, this survey also found a decline in consumption for most types of local seafood. This is consistent with findings from a 2006 survey in the region north of Bonne Bay which found a small decline (1996-2006) in consumption for all species including cod, herring, salmon, crab, and lobster.⁴⁵ Combined with findings from interviews, a decline in consumption found in both surveys (spanning the period 1996-2011) suggests there are emerging challenges in terms of access and availability of local seafood. Satisfaction with availability of local seafood was not ranked highly among Bonne Bay households in this survey, with approximately one third dissatisfied or very dissatisfied. Although households prefer to eat local seafood and friends/family and fish plants are important to seafood access, many households described local seafood as less available than in the past. Potential factors contributing to this include low

commercial catches, a declining number of commercial fish harvesters, and low participation in the recreational cod fishery.

In terms of catches, the total allowable catch (TAC) for cod is only a fraction of historic levels and the TAC has not been caught for the last several years.⁴³ There is also uncertainty about the crab stock within Bonne Bay, within the fishery reopened in 2011 following a two year voluntary closure due to concerns about the stock. Some harvesters also expressed concerns about short fishing seasons. A related effect of short seasons is that local seafood is available for purchase for fewer months of the year. Also, some residents noted that as fishing seasons vary from year to year, they do not always know when particular types of local seafood are available for purchase. A declining number of commercial fish harvesters in the region also results in potentially less fish being landed and available for consumption locally, including direct consumption by fishing families who can access fish for subsistence from their landings. Fish harvesters described declining catch rates, rising costs for fuel and licensing, and low dockside prices as key challenges facing their enterprises. Some fishing families described making trade-offs between subsistence and enterprise viability, including keeping less catch for their own consumption because of the need for income from sales.

Some households also access cod fish through the recreational fishery. However, the West Coast/Northern Peninsula region had the lowest participation rate in the province in 2007 along with the lowest average number of cod caught.⁴⁹ Interviews suggest the participation rate in the Bonne Bay area may be low because the cod fish in the Bay are very small and there are concerns about how the fishery is managed. In 2011, the recreational fishery was open for about

four weeks between July and October. Catch was limited to a maximum of five fish per day per fisher or 15 per boat if there were more than three fishers.⁵⁰ Some households noted that high fuel costs make it prohibitive to catch very few fish for multiple days in a row and they would prefer to be able to make fewer trips for more fish.

Lastly, the survey shows an increase in shrimp and scallop consumption in contrast to a decline for most other species. Salmon saw only a 1% decline. Households reported getting these three types of seafood more from supermarkets compared to other species. More consistent consumption of these species may suggest greater availability from supermarkets compared to fish plants (which are open seasonally) and friends/family. For example, salmon is farmed in the province and in other parts of the world and is available year-round in supermarkets. Shrimp is an important commercial fishery in the province and is fished year-round by the offshore sector, providing consistent supply for supermarkets. It is also possible that an increase in consumption for shrimp and scallops may be linked to growing consumption of Pacific shrimp, which is available in supermarkets. Scallops may be coming from the large scallop fishery off the southwest coast of Nova Scotia.

To protect and enhance fisheries contributions to community food security there is a need for cross-sectoral policy making in which considerations of nutrition and local food systems are integrated into fisheries management decisions. Most provincial and federal fisheries policy in Canada remains focused on fisheries as commodity production for export, with a lack of policies in place for supporting domestic consumption and marketing of seafood.^{40,51} Further, the structures dealing with food in Canada are widely dispersed, making it difficult to address the

interconnectedness of issues related to food, including those related to food and fisheries.³⁹

Nonetheless, this study shows that many of the core topics dealt with in fisheries policy, including distributional issues such as who can fish, how much they can catch, and the setting of harvest levels for different species, are also community food security issues as they impact who can access seafood, how much, and the types of seafood that can be eaten and sold.

Consequently, decisions in fisheries policy have significant potential to jeopardize fisheries contributions to community food security. A recent example is the push towards rationalization within both Newfoundland and Labrador and Canadian fisheries policy.^{52,53} In the move to rationalize fisheries based on limiting entry and encouraging consolidation in harvesting and processing, there has been very little discussion about the effects for household and community seafood access. As fewer families fish for a living, fewer will be able to directly access seafood. At the same time, if small-scale independent enterprises are encouraged to leave the fishery much of the seafood presently distributed within coastal communities will not be available. Effective governance arrangements that bring together a range of actors and jurisdictions to discuss issues may be important for facilitating more coordinated policy-making that can address joint food security and fisheries issues.^{39,54}

Conclusion

This paper has argued for a greater consideration of fisheries in sustainable food systems research, using the Bonne Bay region on Newfoundland's west coast as a case study for looking at fisheries contributions to community food security. This study highlights a need for more research to take place in coastal regions to increase an understanding of how fisheries contribute to food systems and how fisheries restructuring may be affecting community food security. However, understanding fisheries is important not only to the food systems of coastal regions but

to achieving sustainable food systems more broadly. As global demand for seafood continues to rise, the declining state of fish stocks poses significant food security challenges. Threats to the food security of developing coastal nations are exacerbated by global trade arrangements that contribute to a net flow of seafood from developing to developed countries. At the same time, community-based fisheries projects are becoming established in North America and Europe as consumers are looking for sustainably-harvested seafood. Developing interdisciplinary connections among the study of food and fishing systems will be crucial to responding to these mounting sustainability challenges as well as advancing understanding of the relationships among fisheries, marine ecosystems, and sustainable community food systems.

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