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- Appendix 5.1 – Rhode Island Commercial Fishing Infrastructure (excerpt from Fishing Industry Profile, CFRF, 2011)
- Appendix 5.2 – Demand and Market Interaction Analysis of Rhode Island Wild-Caught Shellfish; Hirotsga Uchida, Thomas Sproul, and Pratheesh Sudhakaran, 2014.

CHAPTER 5. Economic Value of Shellfish

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Section 500. Introduction

1. This chapter will outline the current economic understandings of shellfish to the state and highlight the numerous knowledge gaps regarding shellfish-related activities and the economy.
2. Shellfish help support the Rhode Island economy, with direct contributions including commercial sales and associated infrastructure and industries, and indirect including expenditures such as the purchasing of equipment, food and lodging, particularly from recreational harvesters. The shellfish industry as a whole namely consists of wild harvest industries, aquaculture, and restoration activities. While it is recognized that shellfish-related activities have economic value to Rhode Island, no current, comprehensive data set exists to demonstrate the direct and indirect monetary contributions associated with such activities. This is particularly true of indirect costs and the economic component associated with recreational harvest activities and restoration and enhancement efforts, which are not easily quantifiable.
3. The best data sets available are those that report landings and values from commercial wild harvesters and aquaculture operators. For example, in 2013, the overall value of commercial wild harvest of shellfish to the state was approximately \$6.2M (excluding sea scallops, surf clams, and ocean quahogs) (Table 5.1). Furthermore, according to a fishing industry profile report conducted in 2011, shellfish accounted for 45% (34.6 million pounds) of the total landings of seafood in Rhode Island. The landings were valued at \$37.4 million, equivalent to 62% of the total economic value of seafood in the state. Note: These values do include sea scallops, surf clams, and ocean quahogs which account for a significant portion of landings values, but are not state-managed species so were not considered in the SMP process. (Industry Profile, 2011).

Table 5.1. Value of shellfish species (state managed only) in 2013. Note: There were no mussel landings in 2013, but these have been harvested commercially in years prior.

Species	Value in 2013
Soft-shelled clams	\$ 112,795
Blue Mussels	\$ -
Eastern Oysters	\$ 73,699
Bay Scallop	\$ 563
Whelks	\$ 1,295,294
Quahogs	\$ 4,714,876

Table 5.2. Values for all shellfish species for years 2007-2013. Species include soft-shelled clams, oysters, channeled and knobbed whelks, quahogs, blue mussels, and bay scallops. Note: These indicate a generally steady increase since 2009.

Year	Value
2007	\$ 5,809,236
2008	\$ 4,669,774
2009	\$ 4,569,732
2010	\$ 5,237,106
2011	\$ 5,658,481
2012	\$ 6,935,735
2013	\$ 6,197,226

4. For aquaculture, the total farm gate value (i.e. wholesale price of shellfish, primarily oysters) was over \$4.2 million in 2013, with farms employing 127 people on over 176 acres within Narragansett Bay and the coastal salt ponds. Many farmers are also shellfish dealers, allowing them to sell directly to restaurants, farmers markets, etc. This likely means the farm gate value is underestimated.
5. There is no information on the value of recreational harvest activities as no license is required for in-state residents and a statewide database does not exist for out-of state licenses. Some research has been conducted and is underway to gain a better understanding of exact values associated with recreational shellfishing, however, further work is still needed to properly characterize the economics of this activity.
6. Restoration and enhancement of shellfish offer many benefits, to the ecosystem and likely to the economy in Rhode Island; however, information is sparse as to how to measure these contributions and what these actual values are. Obtaining economic values for restoration activities is challenging because the contribution of these activities comes largely in the form of environmental benefits such as water quality improvement, habitat construction, shellfish recruitment, etc. These types of indirect benefits have different “currencies”, making economic dollar calculations difficult. It is also a challenge determining the economic trickle-down effect of these activities such as increased recreational use of cleaner waters, harvest value potential, and even preserving property values through oyster reef storm damage protection.
7. Generally speaking, different industries impact the overall economy in three primary ways: 1) Direct effects, through generation of products, value-added, and employment; 2) Indirect effects, including the purchase of goods and services from other industries, stimulating additional economic activity; and 3) Induced effects which include expenditures by direct and indirect employees which feed the local and regional economy. The sum of these three effects is often used as an estimate of the total economic impact. Several software systems are available that estimate economic impacts, applying multipliers to federal data. Specifically, an Economic Impact Analysis or Model is a tool often used to examine the overall effect a particular activity, event, or industry has on the wider economy. While economic impact models in most cases attempt to discern differences before and after certain activities or industries exist, they can also be helpful in measuring the combined inputs of that industry on the wider economy at its current state. There have not been specific analyses for shellfish (nor have there been for the seafood industry in general) in Rhode Island, however this type of analysis would be helpful in better understanding the various ways shellfish contribution to the overall state economy. However, the models are not able to capture every possible effect, leaving gaps in our understanding. Hodges *et. al*, 2002).

As mentioned above, while there have been no directed studies on the economic impacts overall for the shellfish industry in Rhode Island, other states have conducted similar studies, including Florida and Alaska. The economic contributions and impacts of the seafood industry to the overall economy of Rhode Island extend beyond the simple measurement of income and employment generated from the dockside sales of commercially harvested fish and shellfish. Value added businesses that distribute and process seafood, and the retail establishments that sell seafood are also part of the seafood industry in Rhode Island, and contribute significantly to the state’s economy. Included in this portion of the industry is the seafood landed in other states by Rhode Island vessels, and seafood shipped into the state for processing/distribution.

Section 510. Issues Identified by Stakeholders

1. Throughout the SMP process, the SMP team met with stakeholders to identify issues and concerns they had regarding all aspects of shellfish, including but not limited to environmental issues, management, marketing, capacity building, and decision making. The following are the major themes concerning the economic value of shellfish (the full list of all issues identified by stakeholders can be found in Appendix 2.2). There is a need for:
 - a. Better understanding of the role shellfish play in the Rhode Island economy.

- b. Further research to gain an increased understanding of the value of recreational shellfish harvesting in the state.
- c. More information on whether ecotourism operations hosted in coordination with shellfish harvesters and growers would add value to these businesses.
- d. A cost-benefit analysis or other tools to assist managers in further understanding closed waters, use conflicts, and overall the best use of space in the Bay and coastal salt ponds.
- e. Shellfish industries to better understand how to incorporate value-added opportunities like direct marketing, local branding, and connecting with local buyer initiatives to improve their bottom line.
- f. Discussions and actions to better consider overall economic strategies, such as a lack of resources and funding to support improved management efforts.

Section 520. Current Economic Status and Trends

1. While little information exists on the indirect and trickle-down effect shellfish industries and sales (including wild harvest, aquaculture, and restoration) have on the Rhode Island economy, it is believed to be significant. In addition to the monetary contribution of shellfish activities, there are non-economic values that residents and visitors attribute to shellfish. Many who engage in wild harvest, aquaculture, and restoration assign a cultural connection to their activities, valuing the recreational aspects or the closeness to the sea that shellfishing brings. Some who grow and restore shellfish value the environmental benefits of enhancing the resource or farming a product that has significantly positive ecosystem benefits. While research is underway to better quantify the non-monetary contribution and values of shellfishing, it is important to recognize this contribution does exist and plays a role in how Rhode Island interacts with and manages shellfish. More work is needed, some of which is currently underway, to understand the various economic contributions shellfish-related activities bring to Rhode Island.
2. *Commercial Wild Harvest* – In 2013, the total landings of quahogs (all market categories) was 3,158 metric tons (6.96 million lbs), amounting to a total value of over \$4.7 million. This number equates to just over 39 million quahogs harvested from the waters of the state by commercial fishermen. Of this total, 64% of the quahogs landed were “littlenecks” that had an average ex-vessel price of \$0.15 per piece. “Top necks” made up 23% of the catch with a per piece average of \$0.10 per piece. “Chowder” clams made up the next largest portion of the landings accounting for 10% of landings. Shellfishermen are typically paid for chowders by the pound, instead of by the piece, but the average weight of a chowder can be used to estimate that the average price paid per chowder is \$0.11 per piece. “Cherrystones” make up only 3% of the total landings and are sometimes bought by the pound and sometimes by the piece. The average price paid per cherrystone is estimated to be \$0.08 per piece.
 - a. Quahogs were the fourth species by value (not volume) landed in Rhode Island in 2010, with lobster, squid, and summer flounder bringing in a higher percentage of the total seafood landings value for that year (Industry Profile, 2011).
 - b. The price paid to commercial shellfishermen per quahog has varied very little over the years, remaining about the same as it was in during the height of shellfishing in the 1980’s at \$0.10-\$0.18 per piece. Many shellfishermen have expressed the challenge of maintaining a viable livelihood with the current pricing as compared to the increased living wage. The average annual price paid for shellfish can be an indicator of the market conditions and various other effects on the industry. According to NOAA Fisheries, the average annual price per pound of shellfish steadily decreased between 2006 and 2010, from \$1.35/lb to \$1.08/lb. These values for shellfish include squid and do not reflect current 2014 values (NOAA Fisheries, Office of Science and Technology, 2010).

- c. Other species of commercial importance include soft-shell clams, whelks (channeled and knobbed), oysters, bay scallops, and blue mussels. The highest values for these species between 2007 and 2013, was 2007 for soft-shell clams (\$1,731,008), due to the opening of the Conimicut Triangle); 2009 and 2010 for blue mussels (\$145,406 and \$145,501); 2013 for oysters (\$73,699); 2012 for bay scallops (\$5,111) and 2012 for all whelk species (\$1,635,707). While there is no information for other years, in 2010 the value of Atlantic razor clams was \$25,555 (Industry Profile, 2011).
- d. In addition to being harvested here, quahogs are also imported into Rhode Island. In 2001 the value of imported quahogs was over \$1.4M with a steady decrease in imports to over \$610,000 in 2010 (Industry Profile, 2011).
- e. No information exists on the expanded contribution quahogs and other commercially harvested shellfish have on the state economy. Such contributions are likely significant when considering the trickle down effect. However, other contributions that have been identified for the finfish and lobster industries in Rhode Island may also apply in whole or part to shellfish. These include:
 - i) Vessel and engine purchase, maintenance, general supplies, safety gear, oil, etc.
 - ii) Fishing gear purchases and maintenance
 - iii) Fuel
 - iv) Docking and slip fees
 - v) Seafood processing and distribution businesses, equipment, rent
 - vi) Shipping costs
 - vii) Retail establishments/ fish markets
 - viii) Restaurants and associated costs
- f. In addition, a tremendous data gap exists in understanding the total food value of shellfish on the economy – sales from restaurants and markets – both locally and out of state. The Industry Profile (2011) did create a list of all fishing-related infrastructure and by towns and includes information on shellfish, namely that 70% of shellfishermen in the state (in 2010) use Warwick to access the resource (See Appendix 5.1).
- g. SAFIS – The Standard Atlantic Fisheries Information System (SAFIS) is an online fisheries data reporting system for the Northeast and adopted by Rhode Island in 2003. Shellfish dealers are required to report landings from fishermen, however shellfish growers are not required to report. SAFIS is accessible to the public and is often used by resource managers to understand trends in the fishery. SAFIS records total landings and total values by state, but does not track auxiliary information or economic data.
- h. Adjusting for inflation – It is important to note that any economic analyses should account for inflation rates, especially when comparing values and contributions to the economy over time. While not specific to shellfish, the Industry Profile (2011) states: *“The volume of landings for all species of finfish and shellfish in 2000 was 36% higher than 2010, while the unadjusted value of all species of finfish and shellfish in 2000 was 25% higher than 2010. When adjusted for inflation, the 2000 value in 2010 dollars is \$101,474,041 and is 60% greater than 2010. The overall value of shellfish landings declined relative to finfish with shellfish accounting for 67% of landings revenue in 2000 and 62% in 2010”* (Industry Profile, 2011).

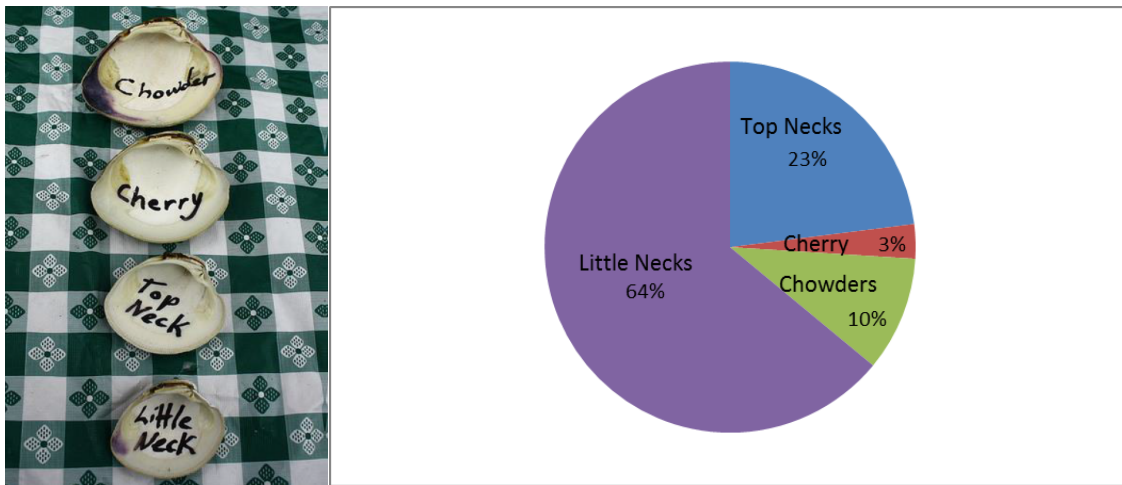


Figure 5.1. The four market categories of quahogs (left) and percentage of total quahog sales by market category in 2012 (right).

Table 5.3. Total value of the four market categories of quahogs between 2007 and 2014.
Note: Incomplete totals for 2014.

Year	Market Category	Value	lbs	Total pieces	Price per piece	Price per lb
2007	Little Neck	\$ 2,528,114	1,673,167	14,728,040	0.17	1.51
2008	Little Neck	\$ 2,207,671	1,438,766	12,664,729	0.17	1.53
2009	Little Neck	\$ 1,852,651	1,201,896	10,579,677	0.18	1.54
2010	Little Neck	\$ 2,214,736	1,461,564	12,865,401	0.17	1.52
2011	Little Neck	\$ 2,746,806	1,996,770	17,576,553	0.16	1.38
2012	Little Neck	\$ 3,702,230	2,822,014	24,840,755	0.15	1.31
2013	Little Neck	\$ 3,459,150	2,540,066	22,358,909	0.15	1.36
2014	Little Neck	\$ 828,679	568,915	5,007,871	0.17	1.46
Year	Market Category	Value	lbs	SumOfCount SUM	Price per piece	Price per lb
2007	Top Neck	\$ 660,844	1,188,142	5,177,062	0.13	0.56
2008	Top Neck	\$ 626,320	1,160,688	5,057,436	0.12	0.54
2009	Top Neck	\$ 572,252	1,111,745	4,844,179	0.12	0.51
2010	Top Neck	\$ 620,401	1,300,618	5,667,153	0.11	0.48
2011	Top Neck	\$ 702,716	1,493,739	6,508,631	0.11	0.47
2012	Top Neck	\$ 911,784	2,038,176	8,880,895	0.10	0.45
2013	Top Neck	\$ 838,578	1,796,445	7,827,608	0.11	0.47
2014	Top Neck	\$ 182,396	357,030	1,555,678	0.12	0.51
Year	Market Category	Value	lbs	SumOfCount SUM	Price per piece	Price per lb
2007	CHERRYSTONE	\$ 76,709	264,519	728,986	0.11	0.29
2008	CHERRYSTONE	\$ 91,942	340,591	938,631	0.10	0.27
2009	CHERRYSTONE	\$ 70,848	306,100	843,579	0.08	0.23
2010	CHERRYSTONE	\$ 74,016	329,418	907,841	0.08	0.22
2011	CHERRYSTONE	\$ 70,322	308,389	849,888	0.08	0.23
2012	CHERRYSTONE	\$ 92,259	439,210	1,210,416	0.08	0.21
2013	CHERRYSTONE	\$ 56,850	289,824	798,723	0.07	0.20
2014	CHERRYSTONE	\$ 8,133	47,151	129,944	0.06	0.17
Year	Market Category	Value	lbs	SumOfCount SUM	Price per piece	Price per lb
2007	Chowder	\$ 431,425	2,098,841	3,459,871	0.12	0.21
2008	Chowder	\$ 342,921	1,861,531	3,068,674	0.11	0.18
2009	Chowder	\$ 333,728	1,854,391	3,056,904	0.11	0.18
2010	Chowder	\$ 360,792	2,104,556	3,469,293	0.10	0.17
2011	Chowder	\$ 384,793	1,946,492	3,208,729	0.12	0.20
2012	Chowder	\$ 419,009	2,383,574	3,929,246	0.11	0.18
2013	Chowder	\$ 360,298	2,052,550	3,383,563	0.11	0.18
2014	Chowder	\$ 74,794	387,368	638,564	0.12	0.19

Table 5.4. Number of trips by individual shellfish species by port for 2010 (Courtesy of Industry Profile, 2011).

Table 2.6: Number of Trips by Individual Shellfish Species by Port 2010

PORT	CLAM, RAZOR, ATLANTIC	CLAM, NORTHERN, QUAHOG	CLAM, SOFT	MUSSEL, BLUE	OYSTER, EASTERN	SCALLOP, BAY	SCALLOP, SEA	TOTAL
Bristol		2,877	148		7			3,032
Charlestown		8	2					10
East Greenwich		5,098	325		13			5,436
Jamestown		8						8
New Shoreham							5	5
Newport		122	9				6	137
North Kingstown (local name Wickford)	10	3,338	252	139	9			3,748
Point Judith		797	174	1	6	1	94	1,073
Portsmouth		1,588	84					1,672
Rhode Island (State)							2	2
South Kingstown (Town of)		1	6					7
Warren		2,512	119				5	2,636
Warwick (RR name Apponaug)		6,955	532	38	4			7,529
Total Trips								25,295

Information provided by Daniel Costa ACCSP Coordinator Division of Fish & Wildlife RIDEM -SAFIS data (Dealer Reports)

Table 5.5. Average landing values for all whelks, soft-shelled clams, bay scallops, blue mussels and oysters between 2007 and 2013.

Species	Average Landings per year
All Whelks	\$ 977,984
Soft-Shelled Clams	\$ 693,811
Bay Scallops	\$ 876
Blue Mussels	\$ 48,099
Oysters	\$ 31,542

3. *Recreational Harvest* – The popularity of shellfishing is widely recognized by the state, and can be witnessed on a summer low tide by anyone visiting the clam flats, such as those at Point Judith Pond and Potter’s Cove. The majority of recreational harvesting activity takes place within the summer months, though harvesting does occur year-round. The location of recreational clamming spots is believed to be largely dictated by accessibility to the shore, parking, and tides (See Section 440 for more information). Aside from this general understanding, however, harvest trends and overall contribution to the economy is largely unknown and is not easily quantifiable. This knowledge gap exists for several reasons:
 - a. Rhode Island residents are not required to have a shellfish license, making it challenging to determine the number of harvesters, both spatially and temporally. In addition, licenses from non-residents are not tracked in a database, which would allow for some trends to be discerned. Furthermore, there is no documented information on harvester demographics to gain an understanding of who is harvesting what species and where.
 - b. Though there are harvest limits in place, recreational shellfishers are not required to report their catch to state agencies. As a result, there is a lack of information on the species and volume of shellfish that is extracted from recreational use.
 - c. The benefit from indirect purchases as a result of recreational shellfishing is poorly understood. Such purchases may include tools (rakes, gauges, snorkels, etc.), storage containers (baskets, coolers, etc.), and logistical needs (food, lodging, gas, etc.).

4. *Aquaculture* – Farming shellfish (mostly oysters) has been a growing trade in Rhode Island in recent years. While the 2013 farm gate value was over \$4.2 million, this represents a significant increase from previous years (See Figure 5.2).

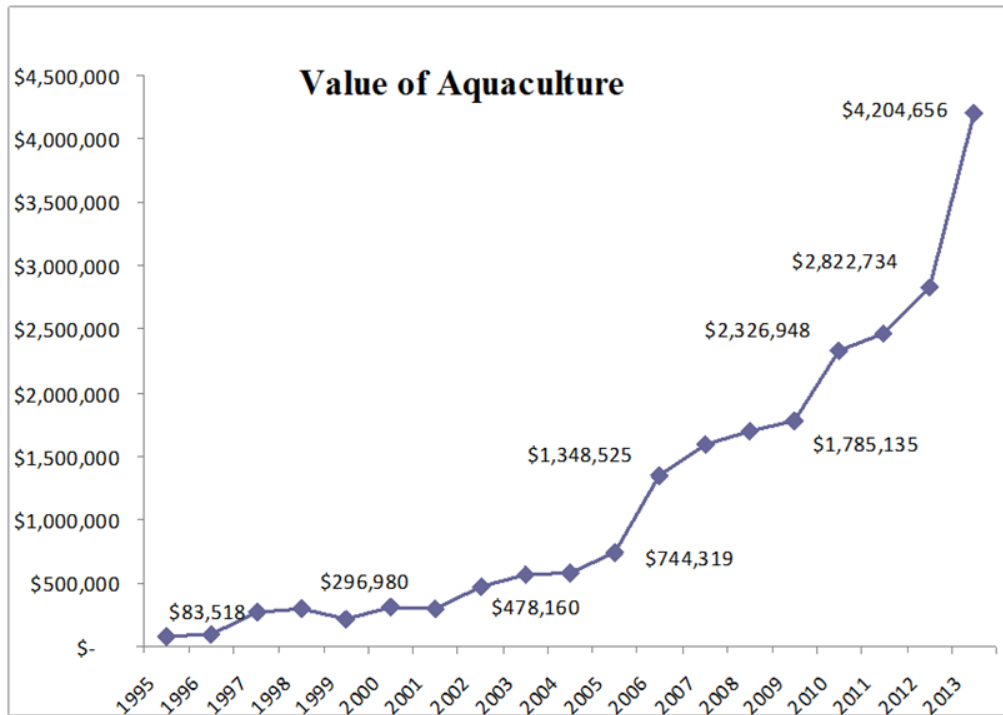


Figure 5.2. Total value of aquaculture (shellfish grown for consumption) in Rhode Island from 1995 to 2013 (CRMC, 2013)

- a. CRMC documents farm gate values, employment, and acreage – the agency does collect information on the amount of money growers spend on gear (i.e. mesh bags, tumblers, sorters, etc.), seed, vessel maintenance, fuel costs, or other business-related needs; however this information not considered reliable enough to report. Each grower does maintain a business plan, but this is not required by DEM or CRMC on a regular basis (only when applying for a lease or by request) and does not include an expense forecast or spending plan.
 - b. Rhode Island cultivated product is distributed throughout the U.S. and Canada, including New York City and Washington D.C., though the amount of product sold or where it is distributed to is not reported in any public or state agency database. The influence of such sales on the local and wider economy is not known.
5. *Restoration* – The economic value of restoration efforts, in the form of improved water quality, renewed habitat, recreational opportunities provided, etc. are not easily quantifiable, yet are important contributions to Rhode Island. The Nature Conservancy has designed various guidelines for measuring the value of restoration in terms of habitat rebuilding, recruitment of shellfish to the established reef and other areas, water quality effects, and shoreline protection (TNC, Practitioners Guide). However, there is little assignment of monetary value to these services in the Rhode Island environment. Research is underway to quantify the various ecosystem services provided by oyster reefs, with some estimates citing \$5,500 - \$99,000 per hectare per year (excluding oyster harvesting) (Gabowski et al, 2012). While some efforts like the one cited here focus on nation-wide restoration values, there is little information on Rhode Island oyster reef valuation.

Section 530. Marketing of Shellfish

1. *Current Structure* – While it is not a formal mandate or charge of DEM, it has become common management practice to include economic considerations in determining harvest schedules and

making management decision for shellfish (See Section 430). However, fishermen and growers are often their own best marketing advocates, providing catchy brand names and securing well-planned distribution channels to ensure a successful business. Furthermore, there has been a national movement in recent years for fresh, local food, resulting in an increasing demand for local seafood, among other products. Many growers take advantage of farmers markets, cooperatives, and directly sell their product to a variety of dealers and restaurants to maximize the return on their investment. There also exist several venues that fishermen and growers can take advantage of in the state, including the RI Seafood Marketing Collaborative and its associated brand and Community Supported Fisheries (CSFs) throughout the state.

2. *Branding Efforts* – There have been attempts in the past to brand local Rhode Island quahogs, but these were not sustained. Each aquaculture lease often brands their oysters with names that reflect the water body or area in which they were grown; Some examples are Salt Pond’s, Quonsets, Moonstones, Watch Hills, Potter Moons, East Beach Blonds, and Bristol Bays. American Mussel Harvesters have promulgated a successful brand for their mussels, in addition to patenting a “restaurant ready” mussel through use of sterile seawater. In 2014, the Rhode Island Seafood Marketing Collaborative received dedicated grant funding to bolster the state’s marketing plan for local seafood. While this does not include a shellfish specific brand, this may result in future efforts.
3. *Rhode Island Seafood Marketing Collaborative (RISMC)* – The Rhode Island Seafood Marketing Collaborative (RISMC) was created through the General Assembly in 2011, with the overall goal to promote local seafood, including finfish and shellfish. The RISMC aims to identify opportunities for local fishing and aquaculture businesses to thrive, through consumer awareness and urged purchasing of various local products that are available by seasons. DEM is responsible for organizing meetings of the RIMFC and Advisory Council (members appointed by the Governor). Funding for the RISMC comes from the van Beuren Charitable Foundation and the program and funds are administered by Farm Fresh Rhode Island. The RISMC hosts monthly to bi-monthly meetings of its Advisory Council and DEM; these meetings are open to the public.
 - a. The RISMC supports seafood events and has created a local seafood brand (Figure 5.3). The brand can be used by seafood dealers to identify and market Rhode Island-landed seafood. It was developed in 2013/14 with the hopes that increasing numbers of dealers will utilize the brand, garnering more recognition by consumers for buying local seafood, thus adding value to their businesses. Any licensed Rhode Island seafood dealer selling product landed or grown in the state can apply to use the logo.



Figure 5.3. RISMC logo created in 2013-14.

4. *Community Supported Fisheries* – Community Supported Fisheries (CSFs) were developed using the Community Supported Agriculture model, allowing consumers to buy directly and regularly from the producer. In the case of CSFs, there are several throughout Rhode Island, all offering various seafood (including shellfish) products that are distributed weekly, monthly, or by other arrangements, directly to the customer. Two are described below however this is not a comprehensive list of all CSFs in the state.
 - a. The first CSF in Rhode Island was Ocean State Fresh, founded in 2010 and based in Newport, RI. Others include Local Catch, offering full-shares (24 pounds) or half-shares (12 pounds) between

\$158 and \$317. This arrangement is similar to a debit system, where customers pay up front and can decide weekly whether they would like to purchase the products available that week.

- b. Gabe the Fish Babe is a small company in Rhode Island, offering membership to the public and offers local seafood, specializing in underutilized, sustainably caught products. They focus on seasonal products which often included shellfish.
5. *Direct Marketing* – The direct marketing of shellfish refers to selling product without going through a shellfish dealer. These venues may include dockside sales, farmers markets, involvement and distribution through a fisheries cooperative, or selling directly to restaurants and markets. The intention is to receive added value by removing the middle man (the seafood dealer) thereby increasing the value of sales going directly to the fisherman or grower. Commercial harvesters and shellfish growers are permitted to sell their products directly, provided they obtain the proper licenses from DOH and have a certified “facility” (this is often the grower’s lease). In addition to selling one’s own product directly, a licensed dealer can also purchase and re-sell other wild harvested or grown product, and, thus, act as the middle man for others.
- a. In order to directly market shellfish, growers and fishermen must obtain a Shell State Shipper’s License from the Rhode Island Department of Health (DOH) and be a certified shellfish dealer. This requires HACCP certification and the proper infrastructure such as coolers and refrigeration trucks to ensure safe processing of shellfish products. DOH is responsible for setting and enforcing these rules and should be contacted before engaging in any direct sales activity.
 - b. DOH is charged with regulating the post-harvest handling, processing, and shipping of shellfish once they are in the hands of the shellfish dealers. DOH is concerned with public health risks related to the consumption of shellfish that are not properly handled (i.e. kept cold, etc.) and may harbor various pathogens that can cause illness to consumers. In this regard, DOH issues permits to dealers who meet certain requirements (i.e. submit an operations plan, possess proper handling and processing equipment, keep adequate records, etc.). Addition requirements will allow these dealers to be included on the Federal shellfish shippers list, allowing them to sell shellfish out of the state (See Section 820).
 - c. Individuals or small companies can also obtain a dealer’s license, if they meet the DOH requirements. Often shellfish growers will obtain a dealer’s license, purchase a refrigeration truck and other equipment that allows them to distribute their product to restaurants and markets, and often obtain higher prices in return. DOH does, however, conduct regular inspections of these operations to ensure proper protocol is being followed.
 - d. A study by Grimley and Roheim (2010) looked to assess the market potential for local seafood in Rhode Island and offer a marketing framework. The survey findings showed that of the 200 respondents, 63.50% prefer to purchase seafood at independent seafood markets. Conventional supermarkets received the next largest response (45.5%). This indicates consumer preference to support local business and presumably seafood, a trend that seems to only be growing.

Section 540. Management for Economic Concerns

1. The Winter Harvest Schedule (for the commercial wild harvest industry) is determined annually between DEM, the RI Marine Fisheries Council (Council) and its Shellfish Advisory Panel (SAP) process. The schedule is set no later than November each year and identifies specific dates and times for a select number of designated Management Areas to be opened for harvest throughout the year (See Section 430). The SAP consists of Council-appointed representatives from the commercial and recreational shellfish sectors in the state, including dealers and other interested parties.
 - a. While there are no formally established guidelines, the process by which DEM determines the winter harvest schedule each year is performed with industry input. This agency-industry interaction has become a common and effective process for metering the flow of quahogs to the

market to keep prices steady for fishermen, while at the same time meeting DEM objectives of sustaining and monitoring the shellfish resource.

- b. DEM will initially set an appropriate extraction level for shellfish in those designated areas, using a total number of hours that cannot be exceeded for harvesting during the open periods. The common practice, which has become an informal policy with DEM and the SAP, is as long as the maximum extraction hours are not exceeded, DEM will typically adopt the industry recommendation for a harvest schedule (i.e. days of the week/times of day areas are open to harvest).
- c. There is a clear recognition by DEM that if the harvest levels are not metered effectively, derby fishery will result, which would only serve to saturate the market and result in drastic consequences to shellfishermen and associated businesses that rely on the resource year round. In addition, increased catch limits are permitted for harvest under certain circumstances, such as during the holiday season, to allow shellfishermen to supply enough product to meet higher consumer demands. These allowances are offered by DEM at the industries discretion in order to maintain sustainable harvest levels while simultaneously giving substantial opportunity for fishermen to maintain viable businesses.

Section 550. Research

1. As mentioned above, there is a need to better understand the economic contributions all shellfish activities have to the state. Some research has been conducted and other efforts are underway. Below is a list of some of these efforts – This is not intended to be a comprehensive list, but rather a highlight of the most relevant and timely efforts.
 - a. Efforts at the URI Resource Economics Department in 2013/14 focused on better understanding demand and market interactions between various wild harvest shellfish products. The research was funded by the URI Coastal Institute and sought to also understand the price of shellfish (mostly quahogs) to the quantity landed, and also the relationship between the price of quahogs and substitute products (three market categories for quahogs, scallops and whelks).
 - b. Preliminary results from the work suggest that different products have different sensitivities in terms of price variation to landed volume of that product. For example, a one percent increase in landings of one product will result in a less than one percent drop in the price of that same product. In addition, all the shellfish products were found to be substitutes for each other (i.e. increased landings of little neck clams will equate to less demand from shellfish dealers for cherrystone clams). The example used in the study to demonstrate the price -to -landing sensitivity uses a hypothetical volume of 100 counts of clams fetching a price of \$0.15 per count from the dealer. For cherrystones, the landing volume would need to increase up to 139 clams (+39%) for the price to drop by one cent. For littlenecks, however, the landing volume needs only to increase to 109 counts (+8.6%) for the price to drop one cent.
 - c. The work did not, however, include oysters and mussels, products that play a heavy role in the RI shellfish market. The researchers also had data collection challenges from other states, including states which play a significant role in the larger shellfish market. (See Appendix 6.2 for the Final Report on this work).
 - d. TNC is involved in several projects in Rhode Island, all of which will increase our understanding of the values associated with restoration of shellfish. One such effort is a partnership between the EPA and TNC focusing on Ninigret Pond, estimating denitrification rates of restored oyster reefs. A second study, also in Ninigret Pond, is a NOAA-TNC partnership to evaluate the bolstered production of fish and invertebrates from the designated TNC restoration sites. This work coordinates with EPA and their efforts to evaluate oyster reef productivity, including efforts to decipher the degree of landscape effects on fish production in the pond. These landscape effects include placement of restored reefs near sea grass beds vs. other areas that may be more isolated benthic habitats (Pers. Comm., DeAngelis 2014).

- e. Ongoing research by Grabowski and others is looking to better understand the economic value of various ecosystem services, like oyster reef restoration. Grabowski states that quantifying various services provided to the ecosystem through restoration can aid in creating more effective management strategies. Though focused primarily on Virginia and Maryland, the researchers were able to assign approximate values to the various ecosystem services provided by oyster reefs, including habitat status, values of finfish and crustaceans, water quality improvement, carbon burial, shoreline protection, habitat services, and landscape processes. Interestingly, the non-oyster harvest service was estimated to provide a maximum of \$99,421 per hectare per year and shoreline protection offered \$85,998 per hectare per year (in 2011 dollars) (Grabowski, 2012). These estimates do not include commercial harvest benefits or recreational benefits derived from the reefs, likely a significant contribution to the overall value. There are no specific estimates for Rhode Island reefs, however this work does imply there is considerable benefit to these restored areas.

Section 560. Recommendations

1. This chapter is intended to describe what is currently known about shellfish and the Rhode Island economy. It was known there are significant gaps in terms of research and numbers, so the chapter was intended to identify these gaps. A Technical Advisory Team was not formed for this chapter thus no recommendations were discussed or vetted through public review.

Section 570. References (Chapter 5)

DeAngelis, Bryan. Email communication, May 2014

Grabowski, J.H., Brambaugh, R.D., Conrad, R.F., Keeler, A.G., Opaluch, J.J., Peterson, C.H., Piehler, M.F., Powers, S.P., and Smyth, A.R. 2012. Economic Valuation of Ecosystem Services Provided by Oyster Reefs. *BioScience*, October 2012, Vol.62 No.10. Pg.900-909.

A Practitioners Guide to the Design and Monitoring of Shellfish Resotration Projects, The Nature Conservancy.

Rhode Island Commercial Fishing and Seafood Industries – The Development of an Industry Rprofile, October 2012. Prepared by the Cornell Cooperative Extension Marine Program.

Fisheries of the United States, 2010. National Marine Fisheries Service, Office of Science and Technology, August 2011. Avail. at http://www.st.nmfs.noaa.gov/st1/fus/fus10/FUS_2010.pdf

Hodges, A., Mulkey, D., Philippakos, E., and Adams, C. 2002. “Economic Impact of Florida’s Commercial Fisheries and Aquaculture Industries.” University of Florida, Cooperative Extension Service, Institute of Food and Agricultural Sciences. Avail. at <http://nsgl.gso.uri.edu/flsgp/flsgpg01011.pdf>