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Socio-Politics of Smuttynose Island: A Look into the Glass Importation Industry of Early New England Fishing Sites

A Capstone Project Submitted in Partial Fulfillment of the Requirements
of the Renée Crown University Honors Program at Syracuse University

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and Renée Crown University Honors

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Honors Capstone Project in Anthropology

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Abstract

Smuttynose Island of the Isles of Shoals is a well preserved archaeological site that documents approximately 400 years of human activity. Four years of excavation has recovered a significant amount of material related to the intensely occupied, seasonally utilized fishing stations on Smuttynose. This project examined a concentrated sample of approximately 2,000 pieces of glass vessels related to two periods of fishing activity on Smuttynose Island (1640-1720 and 1760-1830). By determining the date and type of manufacture present in the concentration of fishing period glass and comparing the two specific time periods of the fishing industry, the project highlights how specific social and political influences affected the economic environment of the Shoals and the wider global trade networks which contributed to the importation of glass. This site's material culture creates a picture of the 17th century fishing industry in the Gulf of Maine.

In order to interpret the glass, the archaeological technique of stratigraphy will be used to date which pieces are relevant to the project. In addition to defining periods of occupation, the analysis of all the glass from the site was done in order to create a spatial analysis of where the glass was coming from (such as taverns, fishing docks, or personal houses). The analysis is also used to determine the use of glass in order to create a better picture of daily life during these two fishing periods.

The glass that is relevant to the fishing period will be tested under ultra-violet light as a way to determine the chemical composition of the glass as it identifies light emissions and color differences that are otherwise unrecognizable. Based on how glass was manufactured, both in technique and chemical composition, will assist in defining the country the glass was manufactured in, and thus, the trading relationship with that country. This project utilizes a range of primary and secondary sources to better define and explain the social context of material use on Smuttynose Island.

As many pieces of glass are undiagnostic fragments, it is possible that some information might be lost, but this is compensated for by a large sample of diagnostic glass. The glass fragments correspond to the intensive use of glass by the fishing community on Smuttynose Island. By looking at the manufacturing origin of glass, it will reveal information about the patterns of trade and interaction, and how they changed over time, as well as possible preferences related to the selection of the material consumed by the Isles of Shoals as a whole.

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Preface

I couldn't have imagined a better way to start off my summer than by going on my first archaeological dig. I had decided on a dig through Cornell University. It was located off the coast of Maine on a subset of islands about ten miles offshore (Figure 0.1). The isles, owned by the Star Island Corporation, are leased every summer by Cornell University and the University of New Hampshire starting in the 1970s. They host a research facility for marine life called the Shoals Marine Laboratory. In 2008, they decided to incorporate archaeology into this research facility. The islands' history is littered with myths and oral histories that were not necessarily true, but in excavating one of the nine islands that made up the Shoals, Smuttynose Island, the archaeologists were able to prove, and disprove, some of those legends and reinforce the historical significance of this site as one of the first fishing stations in America.

When I started digging, I had no idea of the vast history of these islands. I had picked this dig because it fit with my summer work schedule and sounded interesting. I didn't expect how influential the site was to America, Maine and New Hampshire, and to me. As I would find out in the next two years, this little cluster of islands would connect to other archaeological sites I worked on and become a topic of passion and interest for myself.

The Isles of Shoals were influential in the making of America as a nation as one of the strongest supplies of codfish in the Northeast American coast. In fact, Captain John Smith was one of the first to document a sighting of these islands and temporarily named them Smith's Isles. The name didn't stick for very

long, but the importance of their shelter for lost travelers and soon economic success that Smith saw, would.

My interest in doing a project, albeit on a much smaller scale, with the isles started on June 2nd. I was working on the south wall on unit 113R19 and discovered part of the base of an early 19th century pharmaceutical bottle, thought to be a whiskey flask at first glance (Figure 0.2). The color, a light orange tinted amber, stuck out amongst the rest of the dirty glass shards. I started finding other pieces that matched the base, including a fully intact hand-tooled finish and neck. Throughout level two and level three, we found about 85% of the bottle (Figure 0.3).

After dinner, we went into lab and my dig partners, Abby Mann and Jake Rogers, and I assembled the flask until every last piece that was in a level two or three bag from our unit was accounted for. I was so curious about this bottle and where it came from that I started asking questions about glass in general. What does a bottle tell you? How can the age of the bottle be an indicator of what was happening on the island? Where did it come from? What was it used for? How does this relate to the society that used these bottles? And as I started asking questions, an onsite project slowly formed. I compared window glass to bottle glass distributions in the unit I was working on. At the time, I didn't understand that this type of distribution analysis would play into the chronology of the site. I was interested to see what types of glass were present at Smuttynose Island and where they were in the soil.

When I returned to Massachusetts for the rest of the summer, I started researching what the Isles of Shoals meant in a historic context. I talked to historians, read books, and most importantly, talked to my two archaeological points of contact: my advisor, Dr. Armstrong, and the archaeologist in charge of the Smuttynose site, Dr. Hamilton. With their help, I soon started to narrow down an interest with the glass and international trade relationships among the Isles of Shoals.

With Dr. Hamilton's guidance, I decided to focus my research on the time period of the fishing station at Smuttynose Island as opposed to the 19th century hotel era glass (Figure 0.4). After reading about all of the legal insubordination from the Shoalers, I thought that looking at the artifacts, particularly the commonplace glass that was used in almost every aspect of daily life of fishermen, would be a great way to reflect the historic documentation and oral histories in the archaeological record. I also decided that comparing two time periods (independent fishermen versus a sole proprietor of the station) within the fishing station's existence would give a better depth to the social, political, and economic structure and its changes over time.

With a little research, I figured that the best method of differentiating which country the Shoalers were interacting with would be through where the glass was manufactured since each country had developed a specific technique of their glassmaking. I had no idea at the time what a huge undertaking that type of analysis would be. Not only is glass difficult to analyze, I had four years of preliminary analysis to do in addition to my project's specific analysis. I spent all

summer analyzing what type of glass pieces I had, collecting chronologies, and doing as much preliminary analysis as I could. When I started doing my research, I only had that one summer of fieldwork under my belt.

The following summer in 2011 when I was doing the preliminary analysis with the glass that Dr. Hamilton had sent to Syracuse University for me, I also participated in two Syracuse University archaeological field schools as a teaching assistant and returned to the Isles of Shoals to profile the site (Figure 0.5). These three field schools gave me a better understanding of how to look at glass and how it is manufactured in different parts of the world. Without these experiences, I would have had to rely explicitly on books and artifact catalogs in order to understand glass. Although my project is hard and provides challenges for a single undergraduate to research, I took necessary steps to understand archaeology and glass better for this project.

My project concept was seen as particularly difficult because there were four years of intensive excavation that had yet to be analyzed to the extent that I needed it to be in order to learn from the glass efficiently. Much of the Isles of Shoals' history comes from folklore, historical documents and town records, and historical accounts from individuals, but very little has been gathered and analyzed through the archaeological record until very recently. With the glass in particular, no one had really taken the time to intensively analyze what it was, so I had a lot of work ahead of me before I could even start looking at the particular time period of glass and manufacturing technique that was incorporated into my project concept.

I am very fortunate to have the knowledge of Dr. Armstrong and Dr. Hamilton to help lead me in my journey to learning more about the glass from Smuttynose Island. They offered knowledge on what certain pieces of fragments were and where to find catalogs and books that could help me discover more about these pieces. I was particularly lucky to have the Corning Museum of Glass close by and willing to help, especially as one of the leading glass libraries and a former American glassmaking site. Finding glass analysis techniques in books is very difficult because the books are scarce, but those that do exist, exist in the library of the Corning Museum of Glass. They also have a very knowledgeable staff that is willing and able to help with research through my email correspondence. Because of them, I was able to look at books that would otherwise be unavailable to me. While I was gaining as much knowledge as I could on glass, I had experts to ask questions to from the archaeological and glass-specific world.

As you can see, my sources for glass were very extensive, but I did find that it was very hard to learn the subject matter with my short time frame. While I started my research early and worked all summer to advance my project, I had a deadline earlier than that of the Honors Capstone Day. In July, I submitted my abstract to the Society of Historical Archaeology conference for January of 2012. As an undergraduate, it was an honor to be accepted to present my project among the professionals and budding archaeological graduate students. However, it meant that I needed to finish a majority of my project much quicker than anticipated. The conference was a great addition to my resources as I was able to

hear from experienced archaeologists interested in my methodology and gather alternative methods in furthering my research. As well, I had been asked by Dennis Robinson, a historian for Isles of Shoals, to interview about my research for a museum exhibit he was creating about the archaeological findings of the Shoals. I had the experience of glass while my other two graduate student peers, Megan Victor and Arthur Clausnitzer, had the experience of the ceramics and pipe stems and bowls.

Over the course of my last semester at Syracuse University, I found that my methodology and overall hypothesis/question needed rephrasing based on the resources that were available to me and time I had left to use those resources. I was able to continue with the same basis of my original question, but with a different method. That is one of the things I found most disconcerting about doing a project for such a long time. The ability to mold and be flexible with such a project is a hard thing to do. If I had to do this again, or advise any other Honors student, I would share that experience with them. What you start out with is not what you end up with. But, what you do end up with, you can be proud of.

My research went from wanting to learn more a pharmaceutical bottle, once thought of as a flask, to understanding what the types and uses of bottles and where they came from reflected upon a society of changing political and economic values. I am proud of the research and the experiences that I have undergone because of this capstone project. It was an exhausting process full of obstacles and achievements. As well, I am forever indebted to those individuals who have helped me learn more about the Isles of Shoals, glass manufacturing,

and archaeology as an interdisciplinary science. Many people dread having to complete the capstone portion of the Honors program when they start, but even through the more difficult times, I am truly grateful that I stuck through it.

Within doing this project, I have come up with more questions about the glass that I did not anticipate. Because there is so little work done on the chemical structures of glass, there is not research about what other impurities, aside from lead, create some of the other colors I saw emit a light under ultra-violet radiation. I would like to continue research and find what these impurities are in order to understand how glass was being made.

Acknowledgements

There is absolutely no way I could have done this project on my own. Cornell University, the University of Southern Maine, and of course, Syracuse University were all huge influences in my research. Cornell University and its summer program that introduced me to the Shoals Isles and allowed me to return the following summer, the University of Southern Maine who provided the access to the glass and data from previous excavations, and Syracuse University, who gave me the ability to carry this project through. In respect to these universities, I found three organizations within them extremely helpful, as well. From Cornell, I thank the Shoals Marine Laboratory for their wonderful staff and support for marine-based education. From Syracuse University, I thank the Renee Crown Honors Department for the resources, motivation, support, and financial backing as a Crown Scholar in order to continue this project as well as the Anthropology Department at Syracuse University, which has supported me for the entirety of my four years at Syracuse University, offered the guidance and tools to create this project, and taught me so much more than I could ever have imagined.

On an individual level, there are members of the archaeological community whom I am indebted to for all their wisdom and help throughout this project. I, of course, have my parents, Karen and Ian Silverstein, to thank for encouraging my education in archaeology and all their support through my four years of college. I am also extremely grateful for the continued support of Alan Armstrong, who not only provided the support and motivation during

overwhelming times of research, but also aided in the preliminary glass analysis and editing , for which I am grateful for.

From the archaeological community, I would like to thank Dr. Douglas Armstrong and Dr. Nathan Hamilton. Without your incredible support, guidance, and teachings, I would be nowhere near as educated in archaeology. I couldn't have imagined learning under any other two archaeologists. As well, I would like to thank Dr. Christopher DeCorse who offered his expertise in glass and archaeology to help my project become polished and to the best of its potential. I would also like to thank Arthur Clausnitzer and Megan Victor for their continued support during the field schools and during my analysis as a point of reference and contact. It is with all of this support that this project has been completed. Each one of you has been an implemental part in the outcome.

1. INTRODUCTION

1.1 Research Questions

Glass from Smuttynose Island has held a fascination for me ever since my first trip to the island in 2010. I found a bottle that Dr. Hamilton looked at and defined as a flask dating to the 1840s. How did Dr. Hamilton know it was a flask? How could he date it so specifically? I wanted to know more, I was curious about what the details of a fragment of glass could say and what the glass being found in a certain place could tell you.

Coming back to Syracuse University, I found that the manufacturing of glass could tell you a lot more than just how it was made. It could tell you where it was made, which is indicative of the social, economic, and political aspects of the Isles of Shoals. I also saw that there may be a shift, represented by the glass, in those three categories based on the social structure of the Isles of Shoals because the fishing station went from a communal space of individual fishermen in 1640-1720 to an individual ownership of the entire fishing production in 1760-1830.

My goal is to examine the changing social relationships of the fishermen during these two different socially-structured fishing periods in terms of economics and international politics by way of glass. During these early time periods of North American settlement, the glass production industry was still in flux. There were many manufacturing techniques, both physically and chemically, that were specific to one country. Because the Isles of Shoals as an extension of

the English colonies was only supposed to be trading with England during these time periods, I will identify glass that has the potential to be made in England.

My main source of analysis is the ultra-violet testing of colorless glass. From the late 1600s and up until the mid-1800s, England was the only producers of potash-lead glass, which is indicated by a bright ice blue glow or purple glow under ultra-violet radiation. While this doesn't account for all the glass on the site, it is a large sample that can indicate trends within the glass.

By identifying the glass that is English and has the potential to be English, we can see the changing relationships that the Isles of Shoals had with England based on the time period.

In addition, understanding the manufacturing of how the glass was made and what it was later used for will create an image of daily life on the Isles of Shoals as well as an idea of the economic standing of the islands. Even though they set the market price of codfish, the historic records show a group of penurious people. Looking at the artifacts will help to understand where they stood economically as well as what they chose to spend their money on.

2. HISTORY

2.1 The History of the Isles of Shoals

The Isles of Shoals has a unique history. As a singular community, its uses include the habitation by pirates, lawbreakers, explorers, pioneers, and fishing communities. Aside from Gosport, the last settlement on Star Island, most historic sources on the Isles of Shoals refer to the nine islands as one. Among the rare descriptions of individual islands within the Isles of Shoals are documentation of Gosport, Cecilia Thaxter's writing, and unique documentation by Nathaniel Hawthorne. The islands that make up the Isles of Shoals are presently referred to as Star Island, Smuttynose Island, Appledore Island, Duck Island, Cedar Island, White Island, Malaga, Seavey's Island, and Lunging (or Londoner's) Island (Figure 2.1).

The Isles of Shoals were originally called Smith's Isles. While the first visitors of the Isles of Shoals remain a mystery, the first documented visitor is Captain John Smith in 1604. While he was there originally to explore for England, he ultimately recognized that the wealth of the Americas lay in the commodities: fish, fur, and forest. The safe haven he had found on the bare rocks in the Gulf of Maine were barren, but they were full of potential growth that represented America. Hence, Smith named the set of islands after himself (Lawson 18-20).

However, that name did not stick. While it has been referenced to in a handful of documents, the men who became residents of these barren rocks called the chain of islands something else: the Isles of Shoals. While there is no

documented reasoning as to why this is the name, it is believed that the name warns travelers to beware of the shores of the islands as they are rough and rocky and/or to reflect the abundant schools of fish that swim around the islands (Thaxter 1873: 5).

Shortly after Smith discovered the islands, England claimed them and put them under the control of the Council of New England. The Isles of Shoals were originally supposed to be a temporary fishing settlement owned by the Laconia Company. From the start, the Laconia Company encouraged the fishermen to build a permanent residency at the islands in order to be more profitable, instead of just the few months of fishing during late winter. It wasn't until 1640 that there was a permanent settlement of fishermen at Smuttynose Island. The profitability of this area is one that made it a crucial resource to Europe; that concept is why I am studying the Shoals, because it is valuable to all of Europe and all of Europe exploited it. The fish supplied by the the Isles of Shoals not only fed the colonies, it also fed European countries as this was the best codfish on the market. They set the market price globally. In addition to the codfish being a reliable resource in the Isles of Shoals, it was also financially advantageous to control the fishermen who were working the islands because of the profit from the fish (Bardwell 1989:1).

The Laconia Company, which was owned by Fernando Gorges and John Mason, ran the Isles of Shoals from England, which lead to their independent streak. Because the proprietors were far away, the fishermen were given free reign

to live as they saw fit. They didn't have to abide by a strict set of rules and were able to live without religion, laws, or taxes.

Gorges was given control of Appledore, Malaga, Smuttynose, and Duck while Mason had Star, White, Londoners, Cedar, and Seavey Islands. When the Laconia Company was broken up in 1635, the islands were deemed so profitable that neither Maine nor New Hampshire would give up their authority over the wealth generated by the Isles of Shoals, so the islands were split between the two states. After the breakup of the Laconia Company, New Hampshire assumed control over Mason's islands while Maine took control over Gorges' islands.

This split did not bode well for the Shoalers because they were taxed based on which island they were on. After having self-governed themselves for over a decade, the Shoalers refused to pay taxes and were often held in contempt as they defied the laws of the mainland. When Massachusetts annexed Maine, the Isles of Shoals petitioned for self-determination, and therefore exemption of the high taxes incurred by being a part of the Massachusetts Bay Colony. They defined themselves as the township of Appledore, which was established to include all of the islands in both Maine and New Hampshire. The petition was rejected twice before it was accepted on the third try in 1661. Even after all of that effort, in 1682 the township was dissolved after the Council of New Hampshire reported that the Isles of Shoals had no governing functionalism. After that, the islands returned to their original state ownerships and outlandish taxes that the residence could not afford and again, refused to pay (Randall 1997:xvi).

All of this upheaval of government is important to my thesis because it is reflected in the social and political structure of the community of the Shoals. While they may ignore the laws, there were laws in place that told them who they were and were not permitted to trade with. Watching how these restrictions and the changes in restrictions affected the international trading among fishermen, especially when comparing the two different time periods of political structures, will be important because it will represent the ideals of the society and how they viewed specific countries and their own governmental structures.

The Isles do not have an official date of establishment because the records of who claimed first inhabitation vary from different sources. However, we do know that in 1623, Christopher Levett was the first to document actual use of the Isles of Shoals as a place of profitable fishing. He wrote about the Isles of Shoals having shelter for about one hundred men, one-third of the fishing men at the islands, as well as the beginnings of shelters for the drying and curing of the dunfish (Figure 2.2). His elaborate detailing of the structures on the Isles of Shoals lends us a picture of what the beginnings of a permanent, year-round fishing station looked like (Harrington 1992:250).

In 1628, concrete evidence of a permanent residency resides in the form of a bill under the name of Thomas Morton, a prisoner being exported back to Europe for selling firearms to a Native American. His name appears on the bill, along with Miles Standish, his escorting officer, and the two tavern owners, Mr. Jeffrey and Mr. Burslem, who meet them on their way out of the New World. When they arrived, not only was there a shelter for them to stop at, there is an

established tavern, which provides evidence of a thriving and settled community (Bardwell 1989:20). Therefore, we start our exploration of the glass with the established independently operating fishing station in the mid-1600s, once there is enough evidence to show a thriving community of fishermen at the Isles of Shoals.

According to historical records, the original societal structure of the fishing settlement at Shoals was to follow ordinary seasonal procedure. Fishing took place during the months of January-March when the fish were most abundant in the Atlantic Ocean. These high risk/high cost fishing stations could be closed at the discretion of the proprietor, Gorges and Mason in this case. Within the first season, Gorges and Mason saw the opportunity to grow and encouraged their men to stay year-round and become a permanent settlement based on its profitability. Because they would stay all year, there was the ability to construct and mend equipment, buildings, and ships in the offseason. In addition, this would shift the high risk/high cost nature of fishing stations to a low risk/low cost self-sufficient structure.

In the original structure of a seasonal fishing station, all Shoalers were to be men. They were contracted for a year, after which they could renew their contract. They were to live communally with the other fishermen in several temporary collective shelters on the islands. These types of fishing societies were created for communal living in every aspect of life. From the sharing of common living space to the sharing of the portion of profits allotted by the proprietors, the

community was created with the idea that economics and social structure were mutually inclusive.

When the Laconia Company was disbanded in 1635, the economic and social inclusivity changed. Because there was no corporal control over how the place was run, the fishermen created their own independent society (Harrington 1992:253). These men came here for profit. They didn't care for religious freedom or self-determination. They wanted to trade. America presented the opportunity with its resources of fishing, fur, and lumber (Drake 1875:181).

Residents of the Isles of Shoals were reliant on fishing as the islands were otherwise "bleak, bare, and barren." It was literally a rock in the middle of the ocean. They had to import all their basic needs, which makes this a great case analysis for glass as a representation for international relationships. Glass, as will be explained later, was used for everything. It was their lighting source, medicine, and especially to this society, alcoholic drinking agent (Lawson 2007:27).

2.2 Smuttynose 1640-1710

This first period of fishing was a period of communal living, much as the original structure intended it to be. As the shift towards a temporary fishing settlement to a permanent settlement arose, the islands became increasingly populated, with their peak estimated at 600 people between the nine islands (Drake 1875:165). This required community centers and more buildings and materials to be placed onto these working islands.

Among the buildings that was pushed upon the fisherman was a religious building. The Shoalers were ambivalent to the religious pushes of Europe. They enjoyed the practicalities that the ministers brought with them and followed certain rituals, such as not fishing on Sunday and praying, but the religious institution was not of much importance to them. More often than not, ministers stayed for a very long time and married into the community. They were a liaison for the Shoalers rather than a disciplinarian for Europe as intended. Much like the legal system, the Isles of Shoals adopted their own version to inhibit their ability to fish (Lawson 2007:43-58).

However, the Shoalers did not come to America for freedom of religion. Although they appreciated having the few uncorrupt ministers around to teach in the community and often deal with the legal issues, they were here to fish and to make a profit (Harrington 1992:255-258). Unfortunately, while under the Laconia Company, the profits were shared with the proprietors Mason and Gorges and the fisherman barely incurred profits. When they were a self-governed township and even after the Council of New Hampshire disbanded the Appledore Township, the Isles of Shoals were profitable in the sense that the cod were so copious and so well developed in the Gulf of Maine that the Isles of Shoals was setting the market price for codfish. Even so, the fishermen of the Isles of Shoals were never wealthy. They never enjoyed very many luxuries and preferred the tavern to fine dining, as shown in their taste of plain ceramic as opposed to fine porcelain (Victor 2010). It wasn't until the revolution that the Isles of Shoals became destitute and the codfish became scarce.

Because the New World was still being colonized, there was a push from Europe to exploit the land, which required sending missions there. Many countries would send their explorers, but because of the uncharted coast of the New World, many got lost. After all, Smith did find the Isles of Shoals by luck and was never able to find them again. Because they were six miles out into the ocean, travelers would often come across the Isles of Shoals first. When the ocean and weather was rough at it often is during the winter months, the Isles of Shoals provided a safe haven. With the Shoalers lack of loyalty towards any one country, they welcomed visitors from all over the world, including pirates. There are even some legends that say Blackbeard hid treasure on Smuttynose Island. Whatever truth there may be to the legends, the islanders did in fact welcome strangers to their island, which leads to the international relationship, reflected within the much used artifacts of glass (Thaxter 1873:35).

2.3 Smuttynose 1760-1830

During the second time period, Samuel Haley was the sole proprietor of Smuttynose Island. He also owns Appledore, but the fishery and its activities still remain on Smuttynose. Because it is a single ownership as opposed to the independent fishermen from the first time period when the Isles of Shoals was first being established, I am curious to see any similarities and differences reflected in the material culture through this change in political structure.

Before the American Revolution, Haley brought prosperity to Smuttynose Island. He created a self-sustaining island where there was a windmill, salt-works,

rope-walk, bake house, brewery, distillery, and blacksmith and cooper shops (Figure 2.3). The end of the fishing period is marked by Haley's hotel on Smuttynose, accompanied by the hotels on Star and Appledore Islands (Figure 2.4). In his lifetime, this time period I am studying, he would see that prosperity fall apart because of the after-effects of the American Revolution (Drake 1875:183).

Something to keep in mind is that during this time, both the Americans and Britain want the Shoalers to be removed from the Isles of Shoals. They are on the brink of war, and as we know from their previous illegal behaviors, the Shoalers have no allegiance to any one state or country. Therefore, they could house fugitives from both sides, provide fish for either, or other such atrocities during a war. This plays into the decline of the fishery, aside from the dwindling numbers of cod.

As mentioned, the communal buildings have progressed since the first time period. In tandem, the individual familial structures have changed as well. Haley has a central home to himself and his extended family. The fishermen under his contracts now live in communalized dwellings, but not as one large one like they had before. It is much more permanent of a residency, mimicking the townships of the mainland. Now that there are more established residences on each of the islands and an established form of communal activity, such as their own self-governance systems, the Shoalers are less likely to island-hop as they had before in order to avoid taxes from Massachusetts. When they are told to leave the Isles of Shoals and take up residency on the mainland during the

American Revolution, some Shoalers refuse. Some float their houses. Some leave (Robinson).

The Shoalers are told that they must leave the islands because they are so far from the mainland that if England decides to attack them, it would be very hard for America to protect them. In addition, neither the Americans nor British trust the Shoalers to play fairly on one side as they have been illegally smuggling fish to different European countries throughout the past century (Harrington 1992:258). This, of course, leads to a severe population decrease among the Isles of Shoals.

The few families who refused to leave during the war and came back after the war was over numbered around twenty on Smuttynose and ninety-two on Star (the Gosport Township). The economic structure had fallen apart with the decrease in codfish and the lack of people working on the island. In an unfortunate cycle of events, the township had lost its sense of being by the 1820s . What laws that the Shoalers had abided by, such as age and marriage, were cast away. It was a destitute land, almost as barren as it had been when discovered until Haley sold his island to the Leighton family in 1839 (Drake 1875:165). However, the legacy that Haley left behind with his honorable work ethic and strong devotion to the Isles of Shoals is brought to light in Celia Thaxter's memoirs of the Isles of Shoals (Figure 2.5). Although her father, time, and weather destroy the buildings, what we find covered by layers of soil will tell us of how he truly ran the Isles of Shoals (Thaxter 1873:35-37).

2.4 Excavation and Modern History of Smuttynose Island

Historical research has dominated the Isles of Shoals much more than archaeological research presently. It is the historical records and the work of historians that have led me to my hypothesis as well as created a picture of how the inhabitants of the Isles of Shoals functioned on a daily basis. Through glass found on Dr. Nathan Hamilton's excavation from 2008-2011, I will try to reconstruct and prove another facet of information to these conjectures.

Haley sold Smuttynose Island and Appledore Island in 1839 to Thomas Leighton (Figure 2.6). Eventually the Isles of Shoals all became privately owned. The Star Island Corporation, an organization created by members of the Universalist Unitarian Church and Congregation churches, owns the majority of the Isles of Shoals. During the summer, they lease Appledore Island to Cornell University and the University of New Hampshire for their summer research program, the Shoals Marine Laboratory (Robinson).

For the past four summers, the Shoals Marine Laboratory has hosted an excavation on Smuttynose Island led by Dr. Nathan Hamilton of the University of Southern Maine. Dr. Hamilton used the otoliths (inner ear bone) of codfish and the timeline of the introduction of invasive species of the gastropods found within his excavation units to help create a stronger chronology of the material culture found on the island as a representation of what was happening in the Isles of Shoals. In addition to his personal research with excavation, he has granted several students access to the artifacts in order to study a specific topic related to the artifacts as he focuses on the faunal and malacological remains and what they

shows about the Shoals communities. Megan Victor, a PhD candidate at the College of William and Mary, has studied the ceramics of Smuttynose in comparison to Pemaquid, a nearby fishing station and Arthur Clausnitzer, a PhD student at Memorial University of Newfoundland, has studied the pipe stems and bores (Victor 2010).

Dr. Hamilton used Smuttynose Island as his core of research whereas his predecessor, Dr. Faith Harrington, focused on Malaga and Appledore as a case study for New England fisheries in the 17th century. Dr. Harrington looked at the earliest fishing settlement on the Isles of Shoals and how the structure of that society was set up and changed over time based on the access to fish. Both excavations help create the picture of a society, connected by proximity and desire to fish.

3. HYPOTHESIS

3.1 Expectations

Based on the historic accounts, such as town records and journal accounts, despite the restrictions placed on the islands by the British enforcement, the Isles of Shoals still traded with countries they were not allowed to. They were often visited by weary travelers as the Shoals was a safe haven from weather and provided the travelers with an abundance of fish as food.

In both periods of the fishing station, there is evidence of France, Spain, and the West Indies visiting the Isles of Shoals for their fish (Lawson 2007:36). In addition to the trading, both Spain and France were in competition for land in the New World while England, who did have the control of the land, tried to keep strict restrictions on North America. England wanted the sole rights to raw material and products from North America (Randall 1997:19).

In order to see the influence that England really had over Isles of Shoals trading, I have chemically analyzed the glass artifacts. There are indications based on manufacturing technologies and the elements present in the glass that can signify whether glass came from England or not. How much English glass there is in each period and how that amount changes from 1640-1720 to 1760-1830 will indicate what type of control England truly had.

In Megan Victor's *Fishing For a Link: A Comparative Ceramic Analysis of Smuttynose Island, Isles of Shoals, and Pemaquid Maine*, she found that while Smuttynose was a wealthier fishing station than that of its comparison, Pemaquid, there was still more English ceramic wares found at the site than any other

ceramic ware. They had the ability to purchase ceramics of a higher quality and more luxurious status from other countries, such as Germany and the Mediterranean, however, it was not reflected in the material record excavated thus far on Smuttynose (Victor 49). Comparing the results of my analysis with glass to her analysis with ceramics will help solve questions her thesis left unanswered.

For the time period of 1640-1720, there are stories of Western European countries, such as Holland, Zealand, that visited the Isles of Shoals. Often these ships were independently owned and many times, countries, such as Spain, would be pirate ships that were not endorsed by the government (Jenness 13). Although there has yet to be archaeological research to support these oral stories, we do know for certainty that there were independent ships, such as pirates, visiting the Isles of Shoals (Figure 3.1). As well, there was thought to be a trading base on Lunging Island, even though it has yet to be found from the original surveys done by Dr. Harrington (Bardwell 1989:15-17).

In the second fishing station period of 1760-1830, England was losing control over North America as their colonies in addition to the already loosely controlled Isles of Shoals. This shift in power is reflected through three wars: the American Revolution, the Napoleonic Wars, and the War of 1812. With each war, England lost more control over the Isles of Shoals. With the wars not based in North America, England's focus became protecting the homeland and thus their energies were not fixated onto the colonies. This expedited the Isles of Shoals' independence as a free-trading economy during this time frame as there was less control from England during these wars (Jenness 106-109, Robinson).

With the American Revolution, there is a gap in time for the archaeological record because neither the colonies nor England could trust where the Isles of Shoals loyalty lie. Therefore, they were moved to the mainland. This time is negligible in the record, but the effects of that war, the freedom of trade it gave to the Shoalers, will be a unique insight to obtain (Drake 1875:165-166).

It is worth noting that in the second period of fishing, there was a social shift that may have affected the trade relationships. Women were allowed to live on the island with their men whereas this was not encouraged during the Laconia Company and traditionally continued throughout the fishing station during the first period of fishing. With women there, men were not encouraged to leave the island as much and thus there is a possibility that this may have motivated more of their trades to be done within closer boundaries. One adaptation may have been trading with the mainland and the mainland trading with the European nations for the goods (Randall 1997:51).

Whatever the reason for trade relationships shifting, I believe that the archaeological record will reflect the shifts. The more British glass there is, the more control England has over the Isles of Shoals. Compared and combined with the ceramic analysis done by Megan Victor, this will lead to an overall contextual view of what the Shoalers were doing with the fish they produced and who they were interacting with.

3.2 Expected Methodology

Because the Isles of Shoals were in trading contact with these countries, I expect that there should be material remnants found within the archaeological record of glass because glass was so prominent in their everyday lives. These fishermen and traders were in constant contact with glass, whether it was from the bottles they drank to the medicine they took to cure the community from the epidemics of consumption that took the Isles of Shoals people.

Having looked at documentations of trading partners, approved and prohibited, I have identified unique manufacturing techniques that identify specific time periods in explicit countries based on the metals included into the process of glass making. While the process of glassmaking and these material differences will be explained later in Methodology, a shorthand figure defining these methods can be found in Figure 3.3.

While I am constrained by time and resources in identifying all the elements of each piece of glass, I am able to identify the glass based on the criteria for English-made glass. Originally, I had wanted to use X-Ray Fluorescence to identify the iron levels of glass and ultra-violet light sources to identify lead traces within glass. This, along with an analysis of the color and manufacturing technique (mold type, process, etc.) would help to identify the origin of country. Figure 3.3 displays the chemical analysis techniques that are possible to use within this context and question even though I will only be using the ultra-violet light source to identify lead traces (Figure 3.1).

English glass (Figure 3.2), known as potash-lead glass, was first developed in 1676 by George Ravenscroft. The glass was clear, heavy, and contained traces of lead, although sometimes it will show up as slightly tinted clear glass. England was able to maintain this manufacturing technique to itself for over a century until new techniques, such as soda-lime glass from North America in 1860 replaced the traditional potash-lead glass. Under a short-wave ultra-violet light source, the potash-lead glass will be indicated by an ice-blue or ice-purple coloring. Density can indicate how much lead is present in the glass, however, this is not as prominent characteristic as an indicator of potash-lead glass as the fluorescence is (Jones and Sullivan 1989:10-14).

In order to evaluate the English influences on trade within the Isles of Shoals, I will be comparing how much glass is made in England as opposed to not made in England. This will indicate how much influence England has over the Isles of Shoals as well as show the shift from the independent fishing period to the single ownership period. By looking into the percentages of where the glass was coming from and comparing this influence to the ceramic analysis done by Megan Victor, we can create a clearer picture of the international trade relations of the Isles of Shoals as well as what activities were being done in certain areas of Smuttynose Island..

It is important to note that not all historical accounts are one-hundred percent accurate and looking at the archaeological record in addition to historic documentation can provide a more accurate and stronger interpretation of what these men and women were faced with in their daily lives.

Figure 3.3: Types of Glass Chemistry

Type of glass	Manufacturing Technique	Chemical Analysis	Extra Information
Soda-Lime	Marine Plants, Mediterranean (Spain and Venice)	Identified by the flux: soda (salt used in process as of 1787): Mass spectrometer	Blue/green due to impurities or clear (cristallo) in coloring, easily decorated because it sets quickly, used for bottles, window, table, and lighting glass
Potash-Lime	Iron, Germany	X-Ray Fluorescence	Used until the 19 th century, green from iron or clear with iron (also known as cristallo sytle), common for drinking and window glass
Potash-Lead	Lead, England	Ultra-violet light fluorescence	Is present within both periods, clear, usually blown glass, used for tableware, medicinal vials, stemware, and Venetian-style glass
Lime	Iron	X-Ray Fluorescence	Developed by Leighton in 1860 for pressed tableware and bottles, could be made with potash or soda as flux. Anything in this category is too modern

4. METHODOLOGY

4.1 History of Glassmaking

Glass can occur naturally in one of two ways. One way was by lightning striking sand and melting it into long, thin tubes of glass called fulgurites. The second way was for volcanoes erupting to melt rocks and sand into glass called obsidian. These natural processes were extreme heat melting sand (silica), the main ingredient in glass (“How is Glass Made?”). Manmade glass copies these natural processes by using extreme heat to produce a malleable silica structure (Figure 4.1).

The manufacturing of glass vessels started around 1500 B.C. in Egypt and the Mesopotamia. This early refinement of glassmaking and the success within the glass industry created a solid foundation of glassmaking in the Mediterranean. This area dominated the production of manmade glass, creating the standards for glassmaking and leading the progression of more efficient techniques.

The beginnings of glassmaking were very slow and costly. It wasn't until around 30 B.C. when glassmaking tools were properly established, such as the blowpipe in the Mediterranean area and proper capturing of heat with furnaces to melt the sand, which made glassmaking an easier process (Figure 4.2). Glass was an object of high status as a decorative item because it was so difficult to obtain. As the industry grew, the uses of glass became varied and entered into a more diverse market of applicability. It wasn't until the 15th century that glass started being produced outside of the Mediterranean countries (Martin 2001).

Once glass was produced outside of the Mediterranean market, other European markets were quick to catch on. Germany and Bohemia were strong supporters of the potash-lime glass, England was the developer of potash-lead

glass, and soda-lime glass was used by the Mediterranean. Because the glass industry was in such a new phase of technologies and was constantly transforming how the processes were done physically and chemically, the glass is able to correlate with certain time periods, whereas this might not be possible on every site. By defining the main chemical techniques in conjunction with the dating context in addition to the manufacturing techniques as seen in Figure 4.3, I can determine where the glass originated from because they were so distinct during this early period of glassmaking.

The type of glassmaking during the time of the fishing station is glass blowing, which was a slow process of blowing into an iron pipe with the melted ingredients at the end in order to shape the glass. Any glass production that was semi-automated (Figure 4.4) or included molding, as the majority the mold production techniques were created around the mid-19th century, were too modern for my research questions (Figure 4.5). Figure 4.3 defines not only the chemical components of the glass as a way of dating glass, but also the observable production techniques in addition to other methodologies of creating a dating context.

The second period of the fishing industry will provide an interesting outlook to American production on a socially incorporative scale because this is the period when America started manufacturing its own goods at a larger scale. Glass was first produced at a sustained and successful level in 1739 by Caspar Wistar. With the Napoleonic Wars and the War of 1812, it was necessary for America to form their own domestic glass producers, in addition to industrial

manufacturing of all goods. Within the first half of the 19th century, there were at least 90 glass producers, whereas just a century ago, there were only a few failed projects of foreign glassmakers coming to America to produce glass (Martin 2001).

The ingredients used to make glass are sand, soda ash, and lime, which are melted into a workable state that can be shaped. As seen in Figure 3.3, there are four main types of glass chemical structures, although they have been manipulated over time to create certain colors and designs. For example, although soda-lime glass produces a blue-green tinted glass, it can be used to create a colorless glass. It can also be used to create the amber color of modern liquor bottles with the addition of carbon, sulfur, and iron (“Glass Bottles” 2009).

Glass has two parts to it chemically, the flux and the stabilizer. Potash and soda are the two types of fluxes and lime, calcium oxide, and lead, lead oxide, are the two types of stabilizers. The general glass types are soda-lime, potash-lime, potash-lead, and lime glass. Potash, potassium oxide, is found within the creation of ash by the burning of bracken fern or other woodland plants. Soda, sodium oxide, is made of the ashes from the burning of marine plants such as kelp and seaweed. Because of the photosynthetic characterizes of these marine plants, the glass, untreated, would have either a blue or green tint. Certain areas only had access to certain fluxes and thus focused on techniques with specific types of glass. For example, both Germany and England only used potash as a flux because soda was not available to them, whereas in the Mediterranean areas, soda was abundant and they chose to use this lightweight flux instead.

In general, the flux is the majority of the glass and is the foundation for the chemical makeup of the glass. There is one exception in lime glass. There is usually soda within lime glass as the flux, but in this case, the difference is that there is equal, if not more, lime than the flux, which can be either soda or potash, within the chemical makeup of the glass. The flux is an alkali and the stabilizer is a non-alkali. When put together, they balance out and the non-alkali helps to balance out the natural impurities. Without enough stabilizer, the glass produced could result in crizzling, a condition of glass that causes lack of transparency and ruins the integrity of the glass. Although the types of glass available during the periods I am researching are straightforward, the only way to be certain of what a fragment of glass actually is to do chemical analysis of the glass.

Lime glass was generally used for bottles because the iron oxide and lime in it made it extremely hard. Potash-lead glass was used to make smaller bottles, tableware or finer stem and glassware, and lamp/lighting glass because of its finer colorless attributes. Potash-lime glass was used for drinking glasses and window glass due to the iron presence creating a green tint and a heavier glass. In 1680, a colorless potash-lime glass was created, which kept it around longer as a low quality, colorless glass that had the potential to be engraved, which were qualities that were held at high esteem at the time. Soda-lime glass, still used today in colorless bottles, was light and easily decorated, allowing it to be used just about anything: table glass, bottles, window glass, and lamp/lighting glass.

Potash-lime glass was replaced by soda-lime glass because it did not set as quickly, which was a difficulty with the new coal-burning furnaces in the 19th

century. Potash-lead glass was replaced by Leighton's new soda-lime glass, which was also colorless, but not the same as cristallo, in the 1860s because of its high quality and light weight (Jones and Sullivan 1989:13).

Figure 4.3: Glass-Techniques Timeline

15 th Century B.C.	Egypt and Mesopotamia discover the art of glass production, the only glass available before this was obsidian and fulgurites. It is extremely hard to come by and reserved for the high-class in society.
30 B.C.	The blowpipe is invented in the Roman Empire (the Mediterranean). This creates an easier way of creating glass and makes it more accessible to the masses (Figure 4.2).
1500 A.D.	Northern European countries are starting to produce glass. Up until now, Venetian glassmaking has been the predominant type of glass. They used soda as the flux, which was created by burning marine plants. This gave the glass a blue-green tint (3.9). Cristallo, colorless glass, was made by special techniques but still contained the marine plants.
1570 A.D.	The actual date for pattern molding is not established, but it is understood to be created in the Mediterranean at least by 1570. It is adopted by William Stiegle in America in 1765-1774. It requires glass-blowing as the technique (3.10).
1608 A.D.	Jamestown, the English colony set up by the London Company, tried to set up the first glass factory in America by importing foreign glassmakers. It failed in this attempt and the later attempt in 1622.
1676 A.D.	Potash-Lead glass is created in England by George Ravenscroft and kept a secret technique until the mid-19 th century.
1680 A.D.	In Bohemia and Western Europe, soda was not readily available and so they used potash as the flux, which usually created a forest-green glass. By 1680, they created a colorless glass, which was later replaced with potash-lead glass.
1730 A.D.	While not exact, it is understood that English green 'wine' bottles were produced by dip molding in 1730 (Figure 4.6).
1739 A.D.	Caspar Wistar established the first successful American glass factory in New Jersey. Up until now, all glass was imported from Europe. It closed in 1782.
1750 A.D.	Two-piece molding is established in Europe. America does not adopt this method until 1810 (Figure 4.7).
1760 A.D.	Enameling on English glass is introduced.
1771 A.D.	Swedish chemist invents acid etching onto glass (Figure 4.13).
1784 A.D.	John Frederick Amelung came from Germany with other glassmakers to pursue his own self-sufficient factory, the New Bremen Glassmanufactory. It lasted until 1795.
1787 A.D.	Nicholas LeBlanc (France) develops a chemical process that uses salt to create soda as a flux rather than plants as the flux-base. This becomes

	the preferred flux for all bottles, window, and lamp glass in Europe.
1821 A.D.	Henry Ricketts patents a three part mold known as the Ricketts-type mold.
1825 A.D.	Pressed glass (Figure 4.11 and Figure 4.12) (by the United States and expands to Britain in 1840) and Cut/cased glass (by France) become predominant glassmaking techniques. Cut glass replaces crown glass for windows (Figure 4.8).
1848 A.D.	James Hartley develops the first plate glass, as cast plate glass, which replaces cut glass for windows.
1850 A.D.	Multi-mold body with separate base, which replaces the dip mold, Ricketts-type mold, and two-piece mold. America and England were strong producers of this mold. It was later introduced into a mechanized process in 1920.
1864 A.D.	William Leighton's soda-lime composition of clear glass replaces the potash-lead glass as the leader in colorless glass.
1865 A.D.	Turn-paste molded bottles were being exported from France. America started creating these types of seamless-molded bottles in 1870-1880.
1874 A.D.	Crimping, a decoration technique, is introduced (Figure 4.14).
1875 A.D.	Corning Glass Works is incorporated.
1881 A.D.	The first semi-automatic machine to manufacture glass was made in America by Philip Arbogast in 1881. England created their own machines in 1886 and France in 1897 (Figure 4.15).
1889 A.D.	Westmoreland Glass Company, based in Ohio, was a strong provider of milk glass until 1985 (Figure 4.21).
1880 A.D.	Natural gases became incorporated into the glassmaking process whereas only coal had been used for a heat source as of 1880.
1903 A.D.	Michael J. Owens invented a machine that made glass bottles. This sped up the production process. Using a blowpipe, a glassmaker could make 216 bottles. In that same time, a man using Owen's machine could make 300,000 bottles (Figure 4.16).
1930 A.D.	Depression Era: glass from this period is translucent and colored (Figure 4.17).

*This timeline was created using a collaboration of sources located in Sources Cited and Consulted.

4.2 Why Glass?

Glass is a significant artifact. Within the preliminary analysis of glass artifacts from the excavations of 2008-2010, I examined a total of 7257 pieces of glass. From that, I looked at 5368 under ultra-violet light. Aside from the general uses of glass as a product, it was in great abundance at this particular site, providing evidence of its prominence within the society.

In relation to this specific society, some of the common uses of glass are as a container for alcohol and medicine, both of which are important to this particular society. The most common types of glass found on this site were from bottles, window glass, and glassware (Figure 4.18). There were very few samples of lighting glass and no closure glass, which is glass used to seal the contents of a bottle. By looking at where these types of glass are found in relation to what types of structures have been mapped onto the island during specific time periods, we can learn more about what structures and spaces were used for by the fishermen and how this changed over the two fishing periods.

The charts in Appendix A.1 represent the entire occupational history of the site as excavated thus far and are used to show that glass is a significant artifact in the site for examining the daily interactions of the inhabitants. Many of the pieces of glass pertain to the hotel and Leighton family era based on where some of the units were located (Figure 2.4). About 33% of the glass pertains to the fishing station periods.

Based on how prominent bottle glass is compared to the other categories of glass, I have separated out what types of bottle glass have been found. Pharmaceutical glass dominates the other categories of bottle glass (Figure 3.19). Conversely, by accounting for the weight versus count distribution, many of the pieces are small fragments and thus not as diagnostic or reliable as some of the larger pieces that have less fragments. Their small, thin nature fits best within the pharmaceutical category, however there is the possibility that these smaller bottles

still held alcohol or other substances aside from medicines because this type of categorization is analyzed based on shape as well as function.

The international trade relationships are reflected in glass because glass was highly demanded for everyday items. We can see the places of activities through the spatial analysis of the glass and the importance of glass to the Shoals based on category. There was a strong belief in the consumption of alcohol on the Shoals (Jenness 1873:89, 156).

Within the second period of the fishing station, there was a high demand for crown-manufactured window glass, which shows permanent lodgings on the Isles of Shoals as well as glass used for alcohol and medicine storage. This type of glass container was the most used glass at the site. Glassware and lighting glass did not become popular until the late 19th century, which is reflected in the small amount of glassware found at the site (Figure 4.14). The glass artifacts held significance in the daily lives of fishermen during the 17th, 18th, and 19th centuries and thus, has a meaningful value for archaeological analysis and interpretation.

4.3 Glass Analysis: Dating Context

During these specific periods in history, glass was going through certain manufacturing and market-demand changes that help to date the glass pieces. Glass production was at a pivotal point in which techniques are recognizable to a country and to a time period up until a certain point. By identifying what time

period the glass from each layer of a unit belonged to, I am now able to compare the techniques of manufacturing and the chemical composition used to make this glass in order to identify the country of origin. A complete timetable of the applicable techniques of glassmaking can be found in Appendix A.4.

When approaching the concept of dating the glass, I used the context of previous analyses of ceramic-based artifacts in addition to what the glass was telling me as an individual artifact. There are two new technologies developed that mark the end of the fishing station period. Both pressed glass and crown glass are created at the very culmination of the fishing period and thus, can be a marker to eliminate specific samples of glass.

Pressed glass was a new technology to make decorative glass and domestic glass available for the masses at a much more economical rate (Figure 4.11). It changed the atmosphere of glassmaking in that glass became a disposable item whereas before, it was harder to come by. This technique replaced that of cut glass, a more involved and hand-tooled technique. Imperfections in the glass are the easiest way of identifying certain types of hand-tooled manufacturing. Pressed glass is created using a mold onto heated and malleable glass and can be identified by the seams of the mold or in how the glass decoration is set compared to the inside of the glass.

The second manufacturing technique is crown glass process, which stopped being produced in 1825 when it was replaced by the cylinder process. Both cylinder and crown glass processes are ways of making window glass. With the higher demands for window glass, the cylinder process was created in order to

find a more efficient and cost effective way of producing this glass. Crown glass is made by starting out with a lump of glass and blowing it out, reheating several times, and transferring to another tool once the glass is completely blown out. Then, the glass is spun and the centrifugal forces flatten it out (Figure 4.8). This is why some pieces of glass will have a bull's-eye pattern and some pieces, while window, are not perfectly flat (Morphet 1999). Cylinder glass, a slightly more efficient method of glass, replaces crown glass in 1825 because it produces more glass in the time it took to make a small panel of crown glass. It is still a hand-blown method of glassmaking, but there is cutting involved that keeps the glass flat and clean of the imperfections that crown glass had. Plate glass later replaced the cylinder process in 1850 and is the polished, flat glass used for larger items such as windows and mirrors (Morphet).

There are other techniques, such as identifying seams on glass, because they are consistent with either molded glass or machine-made glass, that provide the dating context of 'modern' (Figure 4.5). Embossed glass, which is raised writing onto the outside surface of the glass vessel, is also an indicator of glass that was made after this time period (Figure 4.12). Preliminary diagnosis of the glass allowed me to separate glass with these types of characteristics out of my smaller, relevant glass sample (Appendix A.6).

Another factor that created a solid structure of dating analysis that was consistent with the fishing periods was the coloring and types of the glass. During these specific periods of history, there were only certain types and colors of glass

available based on what types of elements were being used with glassmaking at that time and what glass was needed for (Figure 4.20).

The types of glass hold another meaning aside from the dating context, which I will explain later in my analysis of spatial context. Because glass at this time period was not efficiently made, it was an expensive commodity for certain types of glassware. Seeing the use for the glass artifacts as well as where they were found in relation to the organizational structure of Smuttynose Island will lead to a great overall picture of daily activities and social standing.

As for the dating context, both lighting glass and glassware only became a popularized and more available commodity during the later time period. There is a much smaller amount of this glass, and virtually no closure glass, which is used as a bottle stopper. Not only is this a tool for dating context, it also provides an idea of the economic status of the Shoalers. While they had a lucrative market, they were not buying fancy glassware as the norm. This aligns with the image that historical documents and the Megan Victor's thesis have provided in that the inhabitants of Smuttynose Island were not of high economic status.

Glass can come in almost any color, however, that was not always the case. The major manufacturing companies of glass during the fishing periods were Western Europe, mainly Bohemia (Germany), England, the Mediterranean (Spain and Italy), and the English colonies in North America which later comprise part of the United States of America. At these times, there were only certain resources and techniques available to these countries and normally, one would try not to disclose their methods as to remain the top producer in a certain style of

glassmaking. Because color is created by using other natural elements or impurities within the silica, we have the opportunity to understand what type of process it underwent chemically to a degree.

Color was an indicator of dating context. Glass that was produced after 1851 can be defined by several colors within my sample of class: purple, blue, green, and brown. Of course, it takes a practiced eye and an understanding of the piece of glass itself that can mark it as modern. Bright green glass with very few, if any, impurities, and brown/slightly amber glass are from modern, machine made beer bottles. Both of these colorings are opaque. Translucent colored glass, which I only found amethyst purple of, is glass made during the depression era. The blue glass, which is a dark, vibrant was not produced during the fishing period time, either. All vibrant blue pieces had markings of machines, as well (Figure 4.20) (Armstrong 2011).

Certain impurities, such as those that created a desired color, were seen as a positive influence among the glass whereas other impurities, like air bubbles, were marksmanship of a bad glassmaker and were not desirable (Figure 4.22). Clear glass, for example, was very hard to make, and thus the British glass with lead impurities to create that type of colored glass, was seen as high quality.

4.4 What Glass Can Tell Us

This site and time period makes it possible to do an analysis based on glass manufacturing place of origin whereas this may not be a possible analysis technique for all sites. I first separated the glass into the time periods of 1640-1720, 1721-1759, 1760-1830, and post-1831. Having the glass separated into time

periods would allow me to look at those specific species in context to what manufacturing methods were being applied during that period.

In order to derive context through time, I used a three step process. The first method of deriving context was the application of previous work done with ceramics and pipe stems. Megan Victor, a graduate student at the College of William and Mary, calculated the mean ceramic date for each level within units from the 2010 excavation (Appendix A.2) while Arthur Clausnitzer, a graduate student from Memorial University of Newfoundland, dated selected units from the 2009-2011 excavation with pipe bores (Appendix A.3). These charts were able to give me a stratigraphic basis to coincide with the stratigraphic work I have completed for the 2011 excavation (Figure 4.23).

A law of the archaeological record is superposition. This principle states that sedimentary layers are deposited in a time sequence, and thus, materials found within deeper layers will be older than layers above them. However, archaeologists must be careful in fully following this stratigraphic principle because there is always room for disturbances such as intrusions, which is when younger layers deposit within older layers in small pockets (Scupin and DeCorse 2008:41-44).

With this in mind, I created my own set of stipulations about glass dating based on the history of glassmaking to incorporate within the stratigraphic context provided to me. As mentioned, there were certain manufacturing techniques that were only available to certain countries during certain time periods. Therefore, I was able to include glass made with those specific techniques into certain time

periods. For the post-1831 time period, I excluded levels that had pressed or cut glass as those techniques were created in 1825, plate (flat modern window glass), By following the timeline I've created in Figure 4.3, I was able to create these stipulations

Some pieces that were imperative to my dating system outside of just how they were manufactured can be found in Figures 4.24, 4.25, and 4.26. Figure 4.24 is the base of a stemware piece that is folded over. Not only is this piece indicative of a time period based on the style of decoration, it was fragmented all over the site. In addition, it is also one of the few pieces of potash-lead glass that has patina (the white stripe). Patina is the decomposition of glass from moisture, which creates a flakey, colorful appearance. While it can be found on most glass, it is very difficult to form on leaded glass because of the chemical composition of lead (Armstrong). This leads to Figure 4.25, which is a scale of patina. I've analyzed all the glass from Smuttynose on a scale from 0-2. Glass that is rated 1.0 or higher cannot contain lead, which is 36.9% of the glass in total (this includes both colored and clear glass). In Figure 3.26, there is leaded paint and leaded glass. Much of the paint during these periods was leaded, but these two pieces were helpful in creating a dating context based on the type of paint decoration.

In addition to these specific pieces of glass, there was also an overarching theme in the finishes of glass that identify the use of the glass and possibly when it was made (Figure 4.33). Finishes with screw caps, such as Figure 4.15 are modern machine made. However, finishes and bases, specifically ones with pontil scars, are quite indicative of how they were made. Like the impurities of air

bubbles and disfiguration of a bottle, finishes that are not perfected such as the added glass strap or disfigured lip, tell more about the type of person using the bottle. Bottle finishes such as Figure 4.27 are lower quality because they were made poorly, but give us a keen insight into the Shoalers' lives. Similarly to finishes, pontil scars are indicative of how the bottle was made because it had to have been made by a blow-stick to create the scarring whether it was glass or metal. Figure 4.28 shows several types of pontil scars found on Smuttynose, each pertaining to a specific glass manufacturing technique. Some even show a mold seam, which indicates several types of manufacturing methods were at work to create the bottle.

With these stipulations, I was able to date 74% of the glass found on Smuttynose Island. There was 26%, or 1886 pieces of glass, that I was unable to identify with absolute certainty of a given time period. However, these undiagnostic pieces are negligible based on the amount of representation of glass from the site. While Appendix A.4 shows how I analyzed the total 7257 pieces of glass, which play into the spatial distributions and daily activities, Appendix A.5 shows the distribution of those pieces by time period and which pieces contain lead and other impurities (as observed under ultra-violet radiation). After being provoked by historical documentation and other previous research, the combination of these two analysis techniques have led me to my final conclusions.

4.5 Ultra Violet Radiation Methodology

Because only the English had access to the potash-lead technique for making clear glass at these time periods, we know that any clear glass with lead is indicative of England whereas glass with plants or iron have specific indications of non-English manufacturing. England and Germany were countries that only had access to potash for a stabilizer, and therefore, they needed to find a flux that would create a clear glass with this stabilizer. To accomplish this, they used lead. England didn't gain access to soda until the very end of the 18th century, which would later replace the potash-lead glass at the end of the 19th century. If the time periods did not line up with the shift in glass manufacturing technologies, this project would not have been possible to complete in the manner it has been done in.

Based on the objective of my project, which was to observe the trend in historical documentation that the Isles of Shoals disobeyed English law and traded with other countries through the observable manufacturing techniques of glass, I decided to use ultra violet light testing. Because the English only had potash available to them during the majority of the two fishing periods, the only technique they had developed, and would not share with any other countries until the end of the 19th century, was that by using lead as a flux, glass could be made clear. This difference between a piece of glass with the lead impurity as opposed to other impurities is undistinguishable under normal circumstances (Figure 4.29).

Short range ultra-violet light, and in my analysis I used wavelengths at 2500 angstrom units, will make glass with impurities, such as lead, glow (Jones and Sullivan 1989:13). Even though there is natural lead within some glass, that

lead takes up less than 0.01% of the lead and will not be strong enough to create an observable glow. Glass, like the English potash-lead glass, contains 5-10% lead and will glow either an ice blue or a soft, but visible, purple (Figure 4.30) (Jones and Sullivan 1989:13).

This analysis also yielded other observable impurities in the form of orange, white, green, and dull (undistinguishable) colors (Figure 4.31). These impurities have not yet been analyzed and distinguished as specific impurities within the glass and if given more time, I would be interested to know what they were. Throughout the site, there was a distinguishable pattern of certain colors aside from the blue and purple from the lead. Mass spectrometry, which is a scientific method that destroys the artifact but analyzes what it was composed of, would be the most efficient method of understanding the high concentrations of elements that are creating these orange, white, and green glows. The green glow is not to be confused with the bright fluorescence of what is known as “Vaseline glass,” which had been created in the late 19th and early 20th centuries (Figure 4.32).

Even though this analysis method results in positive outcomes, the test is not perfect. Any glass that has a 1.5+ rating on the patina scale could not be used, and therefore, some clear glass was lost within having too much patina to identify color. This would affect the numbers of how much possible glass could have been tested (although none would yield positive for lead because they succumbed too easily to the decomposition of patina. As well, this test is only indicative of potash-lead glass and does not include colored glass (although tinted glass still

falls under the clear category). This indicates that there is the potential for colored English glass to appear on Smuttynose, but as potash-lead was the most prominent glass made in England during this time, it is still an indicator for overall economic status (based on the quality and decoration/type of manufacturing of the glass). Because these discrepancies are across the board and not just specific to one time period, they are negligible enough to make this a valid technique.

5. INTERPRETATION OF ANALYSIS

5.1: Spatial and Social Analysis

One of the factors that I wanted to study aside from the patterns of trade that were reflected in the manufacturing of glass was the social aspects that the glass reflected. This goes beyond the pattern of trading and to the core of daily life within the Isles of Shoals by reflecting places of daily activities, what those activities were, and what materials the inhabitants of the Isles of Shoals were consuming in terms of glass in order to perform those daily activities.

Based on the historical documentation of where structures stood, we excavated in certain areas of the southern shore on Smuttynose Island that we thought would produce artifacts from the fishing period. The glass from the northern end of the excavations corresponded to the mid-19th century with finer glassware for the hotel. The glass that was found on the southern side is geared towards the bottles which correspond to the tavern and fishing docks being located near those units.

Both areas consisted of different types of glass, both glassware and bottles. However, the details in the pieces of glass and how it was used is more indicative of what the fishermen were doing with these material objects and who owned them. I had hoped to use Surfer, a topology illustration tool, to show distribution maps of the different types of glass and where they were found in relation to the building structures that used to be on the Isles of Shoals, where the English potash-lead glass was found, and separate these pieces (type and lead)

into the four time periods I had devised. I was able to do this on Surfer and created incomplete maps to show these distributions. However, the database I created was not fully compatible with the way Surfer understands excel data and thus some of my information was lost while transferring from one program to the next. This is an issue I would like to continue to work with over the summer so that these distribution charts can be included with any further research, but the concepts that the incomplete charts are still able to be understood.

Part of understanding what Surfer was conceptualizing was the correspondence of the separation of space within the different building structures and time periods being reflective of what activities were being done in different sections of Smuttynose Island and who was participating in those activities. The finer glassware was reserved for hotel visitors and was of a higher status. There are pieces of both decorated and plain glassware unassociated with the hotel, providing the insight that the Isles of Shoals inhabitants did obtain finer materials, but chose to indulge their money in other activities.

Similarly to the ceramics, these more expensive pieces of glass were available as the more expensive pieces of ceramics were, but they do not show up in the archaeological record in abundance either because they were not present on the island in multitude or they were removed when the Shoalers left during the American Revolution period. The material record on an isolated island that trades on a global scale is about choice. What we do know is that glassware represents a

little over 2% of the glass at the site, much less than the bottles at 71% (Appendix A.1) and that there is a separation of where these pieces are found.

Within glassware, there is a difference between cheaply made and expensive pieces. The simple, undecorated glassware (Figure 4.18) is more common on the Isles of Shoals than decorated pieces, but both do exist on the islands. How the glass is made is indicative of its availability to the economic status of the inhabitants of the Isles of Shoals, as well. Even the bottles have a differentiation among economic status. For example, how well or poorly it was made is an indicator of its price. Many fragments of the bottles show poor craftsmanship and thus, higher availability to the islanders. Figure 4.27 shows examples of glass that would be considered lower quality based on how they were made.

According to patterns within the archaeological record for both glass and the ceramic analysis, while the money made of fish was lucrative, most of what the Shoalers did receive back from the fish (as much of it was siphoned off by outside entities such as the Laconia Company) was used on other expenses than decorative glassware, such as alcoholic consumption. There are many historic accounts that mention the incredible amounts of alcohol consumption on the island and the vast amount of bottles found in relation to where the tavern and docks were, which is where the majority of the drinking would occur, provide evidence to these accounts.

The distribution of the two specific types of glass, bottle and glassware, are shown in relation to the communal spaces created by the fishing period and hotel era. The separation of these spaces is indicative of what types of activities were being done in what area. While bottle glass was literally found everywhere on the site, the southern shore corresponds to an area of drinking bottles, which shows a communal area of social leisure within the tavern as well as a place of work by the dock. In both spaces, there is a camaraderie found within the consumption of alcohol incorporated into the fishing lifestyle. Inland is the hotel era space where this is a place of business and social structure, as seen by the smaller amounts of bottles and relative abundance of decorated glassware. The only point in which there is more glassware found than bottle is at this northern end of the excavation unit.

Understanding the places of daily activities in a community such as the Isles of Shoals is important because of the communal buildings and living spaces, specifically in the earlier fishing period. In addition to the spatial analysis, it is imperative to understand what the individual pieces mean. The comparison between a scruffily blown and hand tooled bottle versus what a high-end decorated and painted piece of glassware meant to the community can reveal much about their living styles, preferences, and access to materials.

5.2: Lead Analysis

The indication of glass made with lead correlates to two different concepts: one, the British trading relationship with the Isles of Shoals, and two, the amount of clear, or colorless, glass at the site in comparison to other colors.

One of the few datable indicators that could be narrowed specifically to England manufacturing of glass during the majority of the fishing period was the presence of lead in colorless glass. Lead was only found in colorless glass and thus, only colorless glass was able to be tested with accurate results. An important note to keep in mind is that this experiment only examines for lead impurities on colorless glass and can thus only accurately correlate to English-made colorless glass. Bottles, which were also made in other colors aside from clear or tinted, were also produced by England, but these manufacturing techniques are not datable and confined in the way that lead is on colorless glass.

Another interesting note, which can be found in Appendix A.6 is that ultra-violet radiation exposure is not just limited to light emissions from lead. There are also three other impurities that are signified by light emission, one that glows orange, one that glows a dull green, and one that glows dull, almost like a white. These emissions have not yet been tested to correspond to a specific chemical impurity within glass, but the possible future use of mass spectrometer testing could lead to the conclusion of what impurities are causing this emission.

Being able to identify colorless glass, outside of its connection to lead analysis, is an example of preference and economic viability of the Isles of

Shoals. As represented in Figure 4.3, there were very few techniques to create colorless glass during the majority of the fishing period on the Isles of Shoals. Colorless glass was an expensive commodity as most was tinted from natural impurities within the glassmaking materials. For purposes of this experiment, colorless glass includes tinted, but still clear, glass as some of this glass still contained lead from England manufacturing.

The amount of colorless glass found at the site that was determined to correspond to a particular time period within the fishing industry as compared to the total pieces of glass that correspond to the time period can be found in the blue columns in Figure 5.1. The amount of glass that was able to be dated was only 76% of what I analyzed, but because the sample size is so large, this is still a comparable sample. Aside from 1720-1760, the blue columns increase, which corresponds to the idea that colorless glass was becoming cheaper to produce with new manufacturing technologies and thus more readily available for people at lower incomes such as the inhabitants of the Isles of Shoals. The exception to this trend is from the period of 1720-1760; however, this is negligible as the sample size is very small, only 10% of what the other three sample sizes are. The overall trend of colorless glass is one that reflects the ability to afford high expense items and the increase in popularity and affordability as colorless glass became easier to manufacture.

The reason that this experiment is indicative of British manufactured glass was that lead was only being used in England at this time to create colorless glass.

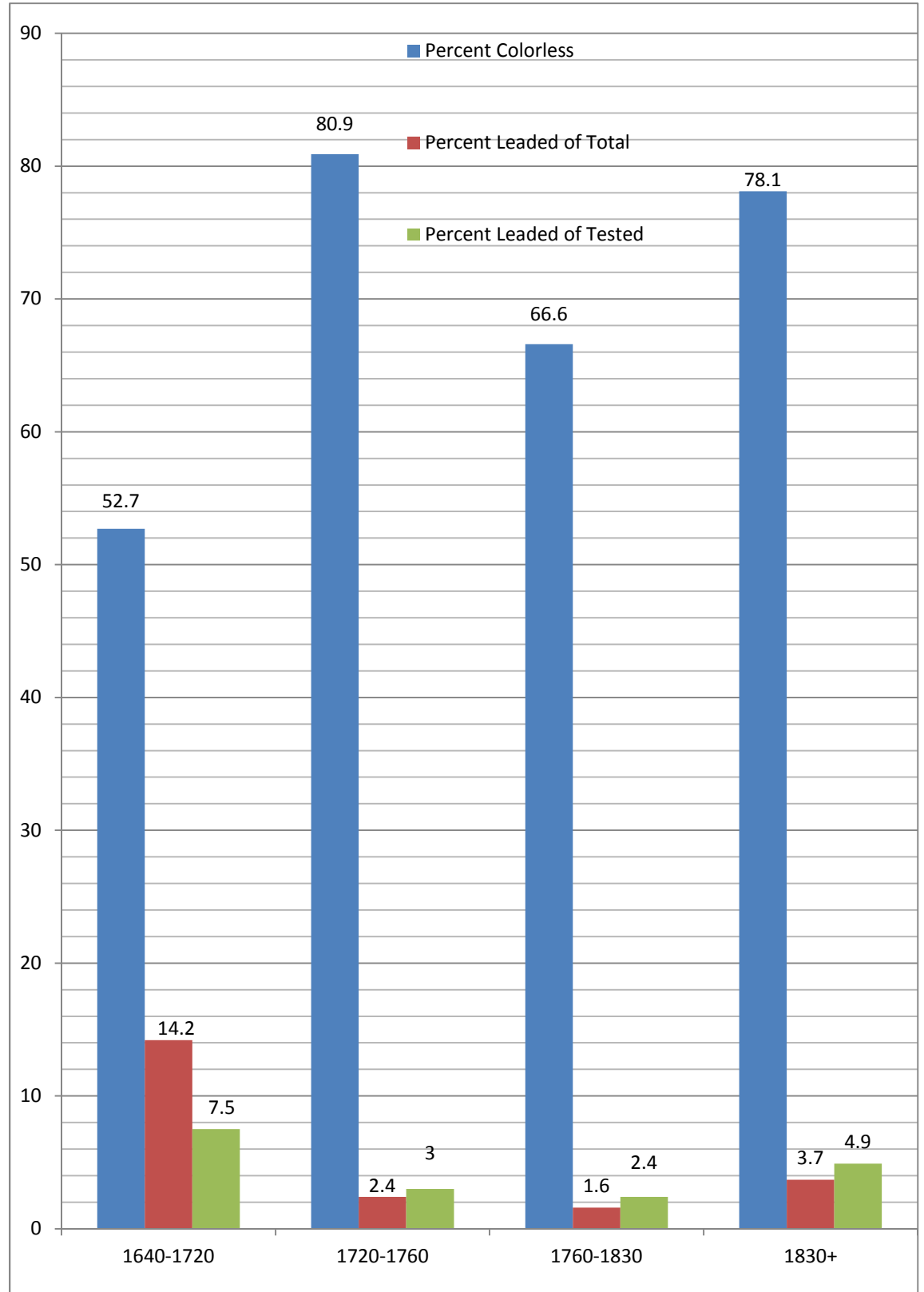
These numbers only reflect the amount of potential British pieces in reference to colorless glass and do not contain colored glass. Because of the large samples being worked with, they are comparable as a representative of the site as they account for 46% of the total glass found at the site.

In Figure 5.2, the red columns represent the amount of leaded glass out of the total pieces that were dated and the green column signifies the amount of leaded glass out of the total that were tested for lead (or colorless within that time period). Both columns follow the same trend in that the highest amount of lead was found in the first fishing period, where England had the most control over the trade relationships and it steadily decreases during the fishing periods. This correlation indicates, by the extremely low percentages and their cumulative decline throughout the Isles of Shoals' fishing periods, that the English did not originally have a very much control over trade relations and it decreased as the fishing station became individually owned by Halley in the second fishing period from 1760-1830.

There is a slight increase during the glass dated after 1830. This is possibly caused by reuse of glass from the earlier periods as the Isles of Shoals was in an economic decline during the end of the fishing periods and became a residential area where glass was not being imported as frequently. At this point in time, the lead reflected within glass is not as indicative of interactions with England as in the earlier periods, in which the small percentage of leaded glass and its decline is highly significant of a rogue colony.

This decline between the two different fishing periods is also inclusive of the fact that a single owner, Halley, opted to create a system with less controls on trading than the previous settlement, in which independent fishermen were working communally under the control of the English nation.

Figure 5.2: Ultra-Violet Radiation on Colorless Glass



6. SUMMARY OF FINDINGS

Within the context of what was happening during 1640-1830 in the Isles of Shoals, the analysis of glass and its chemical composition creates a picture that England did not have as much control over the Isles of Shoals' trading relationships as they claimed.

As fishing in the Isles of Shoals was such a lucrative business such as the fishing industry on the Isles of Shoals, it is interesting to see that the economic gains were not reflected in the material record. Both the ceramics from Victor's thesis and the glass from this analysis paint a picture of the archaeological materials mostly being of low end, cheap production.

Colorless glass, which was hard to produce and more expensive than colored impurities within glass became more abundant on the Isles of Shoals as the technologies advanced and the clear glass became more available and cheaper. However, the amount of lead in glass decreased from when the Isles of Shoals was first settled. Based on the amount of clear glass that contained lead, the most lead was found in the first period when England was still under control of the fishing station because it was in control of the colonies that supervised the islands. As the fishing station progressed into a single ownership, the Isles of Shoals had less trading contact with England, which is reflected from the very large drop in leaded colorless glass.

The lead increase during the 1830+ period is possible because it is at that point in time that England finally shares the potash-lead technique with other

glassmakers because it becomes an outdated technique with the increased interest in using soda-lime. The English colorless glass becomes very cheap and accessible to the Isles of Shoals.

In addition to the lead analysis of the Smuttynose Island glass, the activities used with this glass were, in majority, used for the consumption of alcohol. Appendix A.1 defines the types of glass and what it was used for. The chart shows that 71% of the glass analyzed was bottle glass. Bottle glass has a variety of different uses, usually medicinal or liquor storage.

With the analysis of the glass done, the glass was defined by probable shape, which within the bottle category does not always correlate to the use of the glass. Even though most of the shapes resembled pharmaceutical bottles, the bottles were used for alcohol consumption in some circumstances based on their shape.

A new question in the basis of answering my original question on what was the true trading relationship between England and the Isles of Shoals that has arisen due to the ultra-violet light radiation is the question of what other impurities are being shown by ultra-violet light emission. Under the ultra-violet radiation, many pieces of glass emitted strong waves of orange, green, and white glows. Not as bright as the ice blue and purple of the lead, these glows are clear and deliberate. Understanding what those impurities may be could lead to a new understanding of what was happening with the Isles of Shoals and glass technologies on a global scale. This could be done, at the expense of the

destruction of some of the archaeological materials, through mass spectrometry in which the elements and their amounts present in the glass can be identified.

Documenting the impurities and how much is needed to create a strong presence of the impurities would have the potential to answer this new question.