

University of Rhode Island

DigitalCommons@URI

---

Senior Honors Projects

Honors Program at the University of Rhode  
Island

---

5-2016

## Environmental Impacts on the Success of Bermuda's Inhabitants

Alyssa V. Pietraszek

University of Rhode Island, avpietraszek@my.uri.edu

Follow this and additional works at: <https://digitalcommons.uri.edu/srhonorsprog>

---

### Recommended Citation

Pietraszek, Alyssa V., "Environmental Impacts on the Success of Bermuda's Inhabitants" (2016). *Senior Honors Projects*. Paper 493.

<https://digitalcommons.uri.edu/srhonorsprog/493><https://digitalcommons.uri.edu/srhonorsprog/493>

This Article is brought to you for free and open access by the Honors Program at the University of Rhode Island at DigitalCommons@URI. It has been accepted for inclusion in Senior Honors Projects by an authorized administrator of DigitalCommons@URI. For more information, please contact [digitalcommons@etal.uri.edu](mailto:digitalcommons@etal.uri.edu).

**Introduction.**

Since the discovery of the island in 1505, the lifestyle of the inhabitants of Bermuda has been influenced by the island's isolated geographic location and distinctive geological setting. This influence is visible in nearly every aspect of Bermudian society, from the adoption of small-scale adjustments, such as the collection of rainwater as a source of freshwater and the utilization of fishing wells, to large-scale modifications, such as the development of a maritime economy and the reliance on tourism and international finances. These accommodations are the direct consequences of Bermuda's environmental and geographic setting and are necessary for Bermudians to survive and prosper on the island.

**Geographic, Climatic, and Geological Setting.**

Bermuda is located in the North Atlantic Ocean at 32° 20' N, 64° 45' W, northwest of the Sargasso Sea and around 1000 kilometers southeast of Cape Hatteras, North Carolina (Vacher & Rowe, 1997). Although there are more than 150 islands and islets in the archipelago, the "island" of Bermuda is actually composed of eight small islands connected by causeways and bridges to form 55 km<sup>2</sup> of habitable land (Jones, 2015), located along the southeastern margin of the Bermuda Platform (Figure 1). An intricate ring-shaped fringing reef system surrounds a shallow (8-18 m deep) central lagoon near the island, causing some to consider Bermuda a pseudo-atoll when paired with the island's high hills and a wide reef-front terrace (Iliffe et al., 2011). Six narrow channels wind through the coral reef system leading to the islands, although only two of them, the North Channel and the South Channel, are of significant size (Ministry of Transport, 2011).

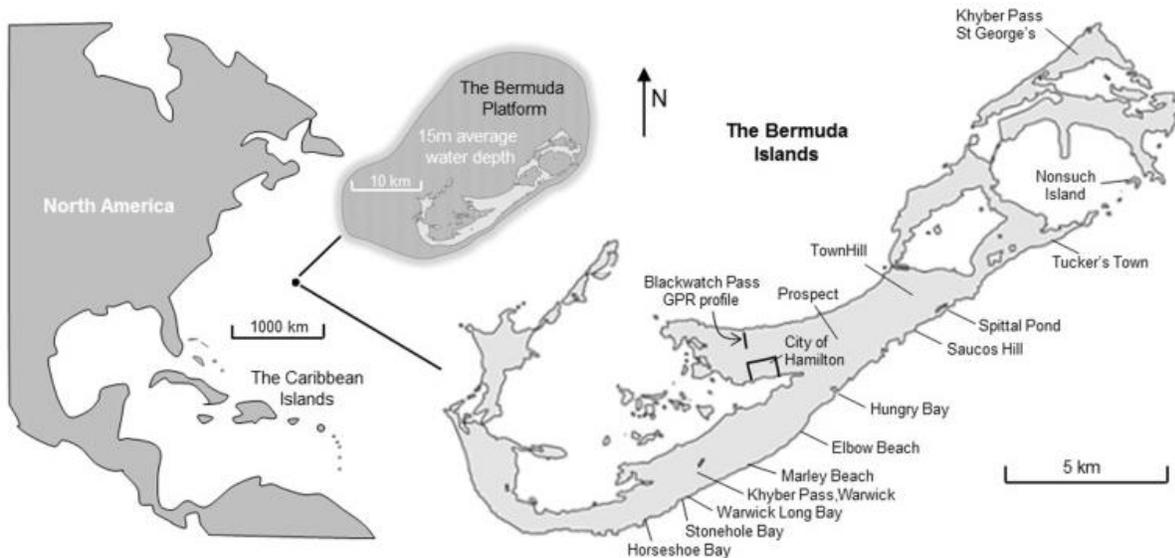


Figure 1. Map showing Bermuda's location in the Atlantic Ocean and on the Bermuda Platform (described below). (Source: Rowe & Bristow, 2015).

Due to influences from the western- and northern-lying Gulf Stream, which carries warm equatorial water up along the coast of North America, and the eastern Bermuda-Azores High, which deflects the fronts of westerly winds to the north of Bermuda during the summer, the island is characterized by a moderate, subtropical climate (Vacher & Rowe, 1997). However, Bermuda experiences slightly cooler temperatures during the winter when the Bermuda-Azores High travels southeast of the island, allowing storm systems to pass over it (Vacher & Rowe, 1997). Still this climate is warmer than those of other locations at the same latitude, accounting for the presence of coral reefs so far north of the equator (Iliffe, 2009). Bermuda's isolated geographic location and its position relative to these two influences also place it largely out of the way of hurricanes (Vacher & Rowe, 1997). Neither does the island experience a rainy or monsoon season. Instead the weather remains relatively constant, with rain falling throughout the year, increasing from January until March (Vacher & Rowe, 1997).

The geology of Bermuda is as distinct as its environment, consisting of carbonates atop of an eroded shield volcano (Vacher & Rowe, 1997). The island's formation began during the

mid-to-late Eocene through the early Oligocene (around 47-33 Ma) from volcanic activity. One hypothesis is that the volcanism resulted from tectonic plate reorganization associated with the collision of India and Eurasia (Vogt & Jung, 2007). This reorganization may have caused the subduction of lithosphere into the lower mantle and increased the stress applied to the interiors of some of the plates, making it possible for magma to rise along fractures and extrude onto the surface (Vogt & Jung, 2007). These generated basaltic pillow lavas and titanium- and iron-rich igneous dikes, forming the large shield volcano that constitutes the bedrock of Bermuda (e.g., its “Pedestal;” Vogt & Jung, 2007).

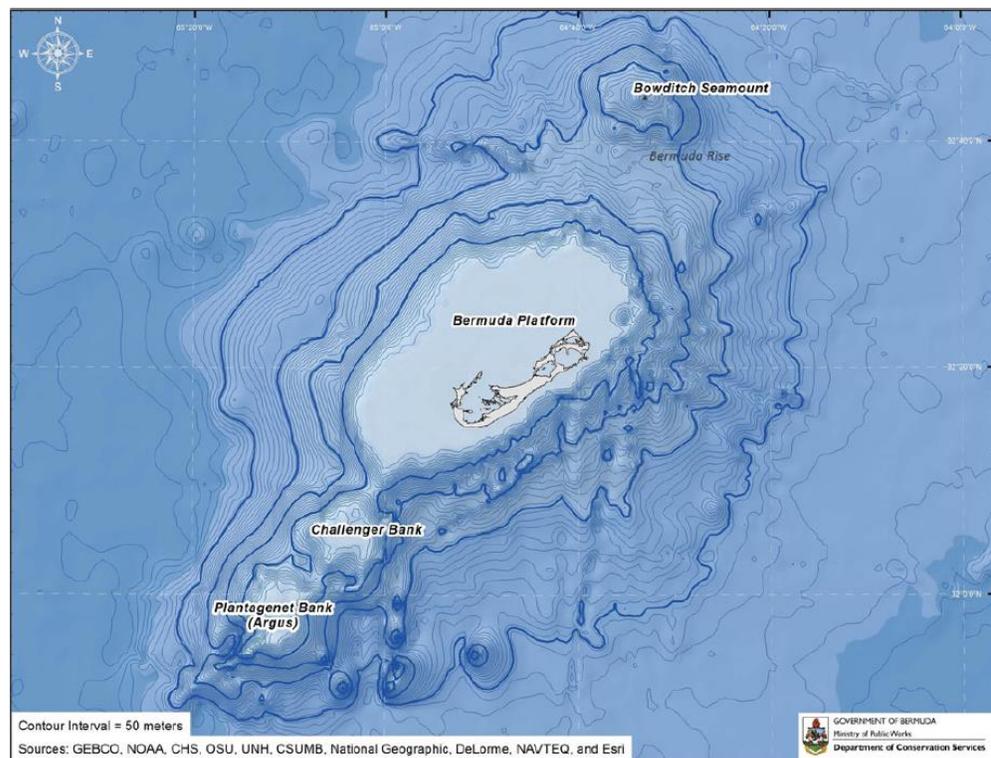
A second hypothesis suggests that hotspot volcanism explains the formation of the igneous bedrock (Vogt & Jung, 2007). According to this idea, a volcanic peak formed from an eruption to the west of the Mid-Atlantic Ridge around 110 Ma. It then traveled west at a rate of 2 cm per year over the next 60 to 80 million years as the seafloor spread, eventually passing over a hot spot above a mantle plume. The heat from this mantle plume caused the overlying rock to melt, leading to the formation and ascension of magma through the lithosphere to the surface, causing the volcano to erupt a second time, forming the Bermuda Pedestal. The tectonic plate on which the Bermuda Pedestal was situated then moved away from the hot spot as the Mid-Atlantic Ridge continued to spread, causing the volcano to go extinct by the early Oligocene (Vogt & Jung, 2007).

The second hypothesis has certain problems that make the other hypothesis more attractive. Normally, hot spot volcanoes result in a large heat-flux anomaly (more than 20 mW/m<sup>2</sup>), and thus undergo significant subsidence following the cessation of volcanic activity: around 400-500 m in the 30 million years. Associated with this, hot spot volcanism generally involves a chain of age-progressive seamounts like those of the Hawaiian islands (Vogt & Jung,

2007). By contrast, the Bermuda Pedestal has a relatively small heat-flux anomaly (8-10 mW/m<sup>2</sup>), has experienced little to no subsidence (less than 100-200 m in the last 25 million years), and lacks a chain of age-progressive seamounts. The hot-spot volcanism idea, therefore, appears to fit the data more poorly than the hypothesis of tectonic plate reorganization (Vogt & Jung, 2007).

The Bermuda Pedestal consists of four volcanic peaks, or seamounts: the Argus (or Plantagenet) Bank, the Challenger Bank, Bermuda (upon which the island is situated,) and the Bowditch

Seamount, positioned in a 100 km long line running southwest-to-northeast (Vogt & Jung, 2007; Figure 2). The tops of the Challenger and Plantagenet Banks are



*Figure 2. Image showing the locations and bathymetry of the four seamounts of the Bermuda Pedestal. (Source: Coates et al., 2013)*

located at depths of 42 m and 47 m below the the sea surface, whereas that of the Bowditch Seamount is located at a depth of 600-800 m (Coates et al., 2013). The largest of the four peaks is 665 km<sup>2</sup> Bermuda (Vogt & Jung, 2007), which is located between 50 m and 75 m below sea

level, with the shallowest part rising to a depth of around 15 m below the surface (Vacher & Rowe, 1997). These four seamounts are located at the summit of the Bermuda Rise, a 1,500 km long by 500-1,000 km wide oval swell of the ocean bottom, which rises 800 m above the surrounding sea floor and, like the seamounts of the Bermuda Pedestal, trends southwest-to-northeast (Vogt & Jung, 2007).

The volcanic bedrock of Bermuda is buried below a 15 to 100 m thick limestone cap of alternating beds of limestone, *terra rossa* paleosols, and calcarenite protosols, recording sea-level fluctuations during Quaternary glacial and interglacial periods over the course of the last million years (Figure 3; Iliffe, 2009). During interglacial periods when sea levels were higher, Bermuda was flooded and coral reefs were abundant, resulting in the production of carbonate sands composed of pellets, shell fragments, and dasycladacean algae in shallow water (Iliffe et al., 2011). As sea level fell, these sands were reworked into dunes and held in place by vegetation until they were cemented by acidic rain-dissolved carbonates, forming porous limestone (Iliffe et al., 2011).

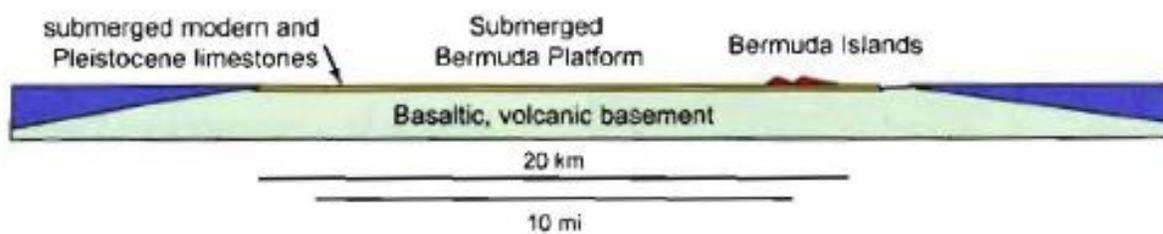


Figure 3. Cross section of Bermuda showing the volcanic basement and limestone cap. (Source: Iliffe, 2009)

During glacial periods, with sea levels that were around 100 m lower than those of the present, Bermuda was exposed subaerially, resulting in the weathering of the limestone cap and the deposition of nutrient and clay-rich fine-grained sediments blown across the Atlantic from the Sahara Desert (Iliffe et al., 2011). Over time this sediment accumulated, eventually altering

to form *terra rossa* paleosols (Ilfte et al., 2011). During sea-level transitions, when Bermuda was partially flooded and carbonate sands were produced, calcarenite protosols, or accretionary protosols, developed from organic waste and eolian sediment that had been captured by vegetation (Carew & Mylroie, 1995).

The carbonates and interbedded *terra rossa* paleosols and calcarenite protosols that compose Bermuda's limestone cap constitute five marginal-marine sub-environments (Vacher & Rowe, 1997) distributed among six formations (Hearty, 2002). The five sub-environments consist of a suite of two coastal-terrestrial sub-environments (eolian and calcarenite protosols) and three coastal-marine sub-environments (erosional-coastline, depositional-coastline, and protected-coastline; Vacher & Rowe, 1997). Together, these sub-environments are indicative of six to nine glacial-interglacial cycles and associated transgressive and regressive deposits representing the last million years (Ilfte, 2009). The six formations include, in stratigraphic order, the early Pleistocene Walsingham Formation, the middle Pleistocene Lower Town Hill and Upper Town Hill Formations, and the late-middle to late Pleistocene Belmont, Rocky Bay, and Southampton Formations (Hearty, 2002) (Figures 4 and 5).

The basal Walsingham Formation consists of terrestrial eolianites and protosols while the eolianites, protosols and interbedded coastal-marine deposits of the overlying Lower and Upper Town Hill Formations (Hearty & Olson, 2011) have been interpreted to represent transgressive and regressive sequences during glacial and interglacial periods (Hearty, 2002). Similar trends are visible in the coastal-marine deposits of the Belmont Formation, grading upwards to small eolianites, with calcarenite protosols separating the two. Several transgressive and regressive

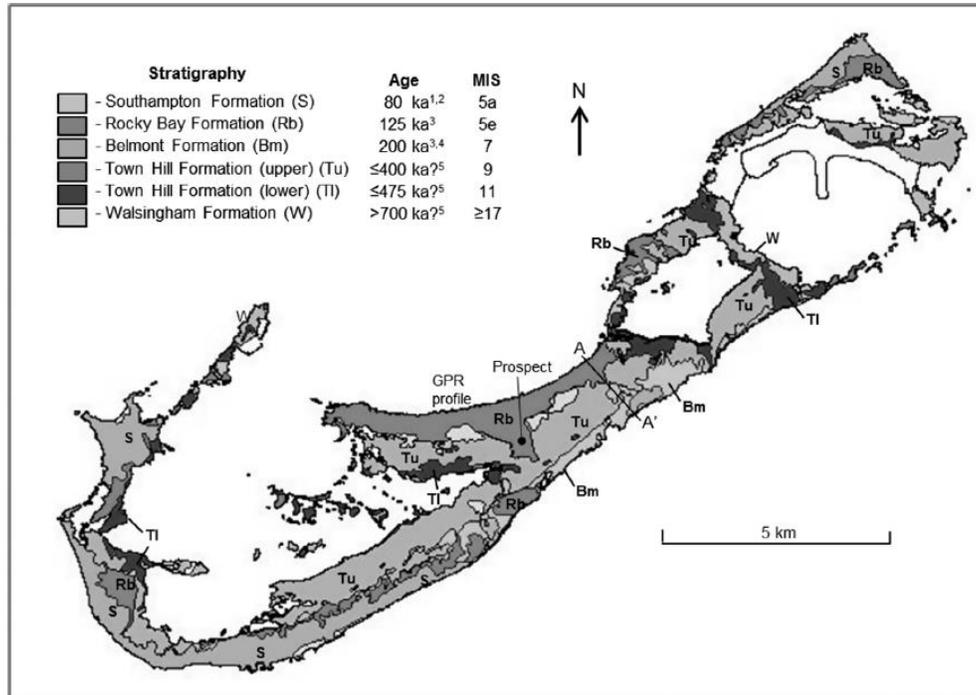


Figure 4. Geological map of Bermuda showing the six limestone formations. (Source: Rowe & Bristow, 2015)

events are also evident in interbedded eolianites, protosols, and extensive marine deposits in the Devonshire Member, the protosol of the Harrington Member of the Rocky Bay Formation, and the eolianite- and protosol-bearing Hungry Bay Formation (Hearty & Olson, 2011). The eolianite beds and protosols with isolated marine deposits of the Southampton Formation represent an interglacial period (Hearty & Olson, 2011). The Southampton Formation is capped by a layer of nutrient-rich *terra rossa* soil composed of carbonate waste from the dissolution of the limestone cap, eroded particles of the volcanic bedrock, clay-rich sediment from Africa, and loess from the lower Mississippi River Valley (Muhs et al., 2012).

With the exception of the boundaries between the basaltic basement and the Walsingham Formation and the Southampton Formation and modern soil layer, *terra rossa* paleosols form the boundaries between the different formations, representing several glacial periods (Hearty & Vacher, 1994). These deposits formed subaerially as sea level fell relative to Bermuda's

coastline. This stratigraphic sequence is arranged in a lateral accretionary pattern, where younger strata are deposited laterally on top of older strata (Figure 5; Vacher & Rowe, 1997). In this manner successive “beach-dune complexes” are produced, with older formations located on the advancing interior of the island and younger ones accumulating along external shorelines (Vacher & Rowe, 1997).

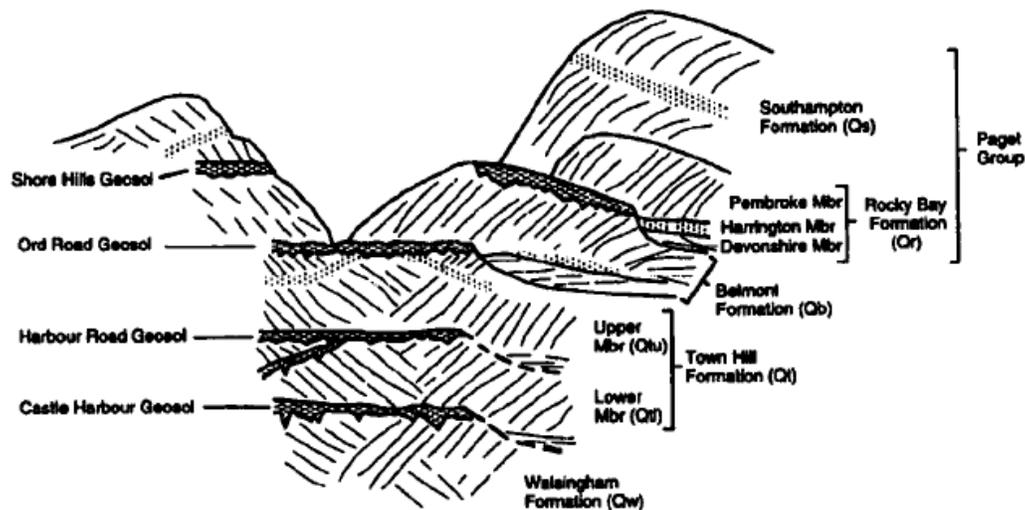


Figure 5. Diagram of Bermuda's stratigraphic sequence. (Source: Vacher & Rowe, 1997)

Although no surficial freshwater rivers, streams, or lakes can form on the porous limestone (Coates et al., 2013), this distinctive geologic sequence makes it possible for freshwater lenses, which float on top of more dense salt water, to develop at the top of the saturated zone (Vacher & Rowe, 1997). These lenses form just below the water table, which cuts across the different formations, distributing the fresh groundwater (Figure 6; Vacher & Rowe, 1997). Four main freshwater lenses, the Central Lens in the Main Island, the St. Georges Lens in the western portion of Bermuda, and the Port Royal and Somerset Lenses in the eastern portion,

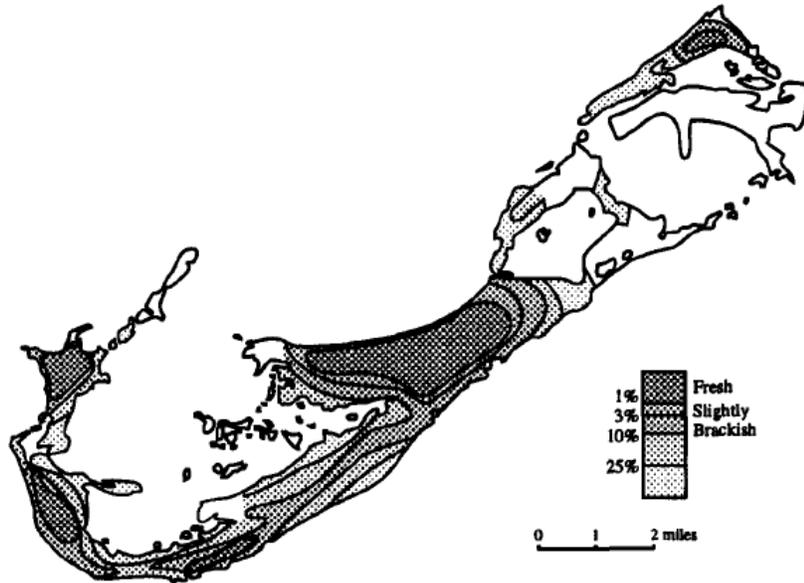


Figure 6. Map showing the distribution of freshwater on Bermuda. (Source: Vacher & Rowe, 1997)

are present across two hydrostratigraphic units, the Langton Aquifer and the Brighton Aquifer (Figure 7; Vacher & Rowe, 1997). Although the Brighton Aquifer, which is located in the porous Town Hill Formation, frequently contains brackish water at the water table, the Langton Aquifer, present in of the Southampton, Rocky Bay, and Belmont Formations, contains mostly freshwater

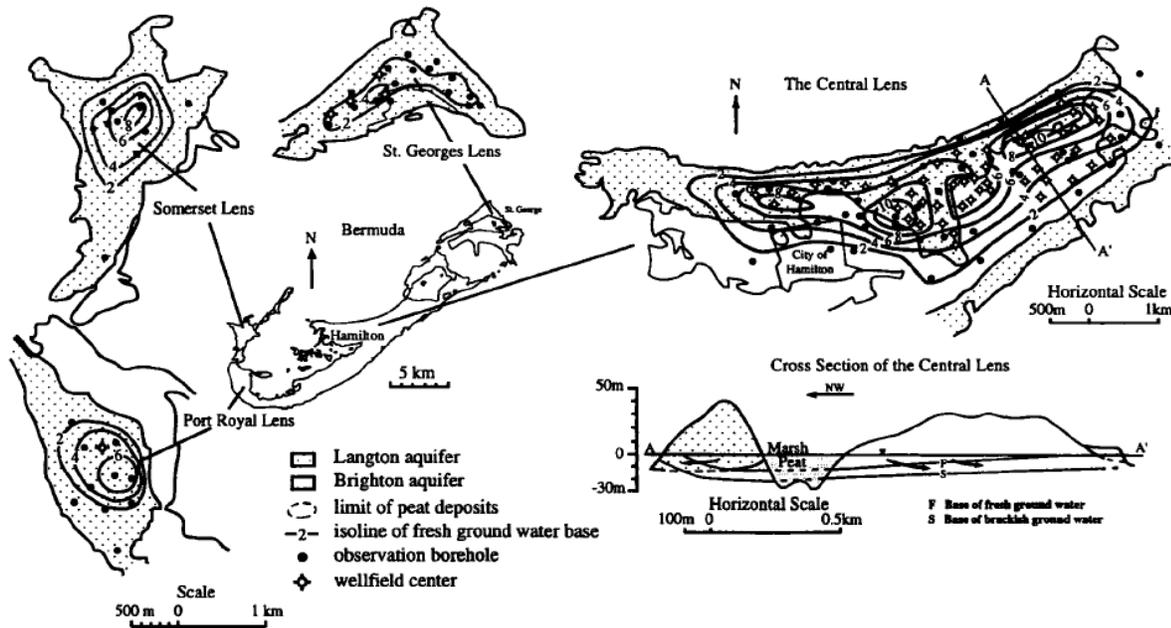


Figure 7. Diagram showing the locations of the Langton Aquifer, the Brighton Aquifer, and Bermuda's four main freshwater lenses. (Source: Vacher & Rowe, 1997)

due to the lower permeability of the formations (Vacher & Rowe, 1997). This lower permeability helps to confine recharge-derived fresh groundwater, specifically from rainfall, and to lessen the amount of freshwater and saltwater mixing due to tides and sea level variations (Vacher & Rowe, 1997). A third hydrostratigraphic unit is present in the Walsingham Formation, but is filled mainly with salty groundwater due to the high porosity of the basal limestone (Vacher & Rowe, 1997).

### **Historical Record.**

The recorded history of Bermuda dates back to 1505 when the island was first discovered by Spanish navigator Juan de Bermúdez (Jarvis, 2012). However, the island's potential as a location for a self-sufficient and prosperous colony was not recognized until the passengers from the Virginia Company flagship the *Sea Venture*, which was wrecked on the island in 1609, noted the island's central location and plentiful natural resources (Jarvis, 2012). The first settlers arrived from England in 1612, but were unable to generate a substantial profit from the island's abundant resources, having been required instead to focus on the development of infrastructure on the island (Jarvis, 2012). This disappointment led to the Virginia Company selling their interest in Bermuda three years later to the joint-stock venture the Somers Isles Company, in whose possession it remained until the company's dissolution in 1684 (Jarvis, 2012). After this time Bermuda became a British Crown Colony and to this day remains a self-governing British overseas territory (Smithsonian.com, 2007).

Bermuda's economy and involvement in foreign affairs have evolved greatly over the course of the last few centuries. The island economy has evolved from agricultural, based on the production of tobacco, to maritime, dependent on shipbuilding and intercolonial trade, to tourist-

and international finance-based (Smithsonian.com, 2007). A parallel evolution is visible in Bermuda's increasing role in international affairs; in the nineteenth century, it was involved in the trade of Confederate goods blockaded by the Union during the American Civil War; in the early part of the twentieth century it played a key role in rum-running during Prohibition. During and since World War II, it has been a base for intelligence operations and a refueling stop (Smithsonian.com, 2007). These changes are representative of Bermuda's increasing distance from British rule and the importance of international relations to the island's economy.

Bermuda's physical isolation assured that the island remained largely undiscovered until the sixteenth century. Even after Bermuda was located, its isolation and dangerous reefs prevented sailors from approaching the island (Jarvis, 2012). Instead, Bermuda was used as a marker for sailors who knew that they had to travel east along 32° latitude until they spotted the island and then had to sail northeast in order to return to the Iberian Peninsula from the Americas (Jarvis, 2012). This, however, proved to be difficult during the Little Ice Age (1350 to 1800) when the ocean was 1-2° C cooler; decreased temperatures resulted in a stronger and less predictable Gulf Stream flow and northeasterly winds, creating harsher storms around the island (Jarvis, 2012). This led to shipwrecks on the reefs surrounding Bermuda, earning the island the title of the Isle of Devils (Jarvis, 2012).

It was only after the *Sea Venture* ran aground on a reef and its passengers remained on Bermuda for ten months that Bermuda's negative reputation changed drastically (Jarvis, 2012). During their stay on the island the castaways noted the numerous bays and forests on the island, containing everything from fish, lobsters, and turtles to mangroves, palms, cedar trees, Cahow birds, and even Spanish hogs from previous shipwrecks. These plentiful natural resources, the island's fertile soil, and the close proximity of the ocean enabled the castaways to survive on the

island. These features also made it possible for them to construct two boats from local cedar and the remains of the *Sea Venture*, permitting all but three men who stayed behind to lay claim to the island, to continue to Virginia (Jarvis, 2012). Despite having been wrecked on the island's expansive reef, the passengers of the *Sea Venture* were the first to recognize the habitability of Bermuda and its potential as a self-sufficient colony.

### **Island Setting, and its Impact in Bermudian Life.**

The experience and accounts of the passengers of the *Sea Venture* prompted the migration of the first settlers to colonize the island. It is during this time and shortly afterwards that the adaptations become apparent that allowed the establishment of a successful society on the island. To the earliest settlers' advantage, the fertile *terra rossa* soil, subtropical climate, and a stock of seeds from the *Sea Venture* made it possible to easily cultivate a variety of crops. For this reason Bermuda was able to sustain a successful agricultural economy for a good part of the seventeenth century as well as for a period of time from the late nineteenth century into the twentieth century (Jarvis, 2012).

The high fertility of Bermuda's soil can be attributed to the island's geographic location and geologic make-up. The island's central location between Africa and the Americas makes it possible for aeolian sediment from the two to accumulate on Bermuda along with weathered particles of the island's volcanic bedrock and limestone cap (Muhs et al., 2012). Additionally, as crops are cultivated and then decompose organic matter is added to the soil, further increasing its nutrient and mineral compositions and fertility (Muhs et al., 2012). Thus, during the early seventeenth century tobacco was the staple crop of Bermuda (Jarvis, 2012). Until 1625, when the tobacco market declined and Bermudian planters realized that tobacco cultivation greatly

decreased soil fertility, Bermudian planters cultivated more tobacco than planters in nearby Virginia (Jarvis, 2012). During this time Bermudian farmers also grew potatoes, corn, wheat, and sugarcane, which helped to sustain the economy and provide for the island's inhabitants (Jarvis, 2012). However, after 1684 Bermuda's economy focused largely on maritime activities instead, only turning back to agriculture for a period after the American Civil War until Prohibition (Smithsonian.com, 2007). During this time Bermudians cultivated celery, potatoes, tomatoes, and onions, for which they are still well known today (Smithsonian.com, 2007).

Along with crop production, Bermudians have heavily relied on the ocean and the surrounding reefs as sources of food. Like many maritime communities, fishing has been a regular activity since the island was first settled (Jarvis, 2012). Frequently caught fish include yellow-fin and black-fin tunas, wahoo, blue and white marlins, mahi mahi dolphin fish, groupers, rockfish, and snappers (Davidson, 2016). Historically these fish were commonly caught in Antillean arrowhead fish traps, or pots (Slack-Smith, 2001). These Z- or S-shaped wire or woven bamboo traps (Burnett-Herkes et al., 1989) were between 180 cm and 230 cm long and 60 cm high (Slack-Smith, 2001) and were frequently used to catch tropical reef fish as well as spiny lobster (Burnett-Herkes et al., 1989)

(Figure 8). The traps would be placed on the sea floor where fish and lobsters would enter them and be unable to escape due to the traps' shape and wire mesh (Davidson, 2016). The trap would then be pulled by hand in order to retrieve the fish inside (Davidson,

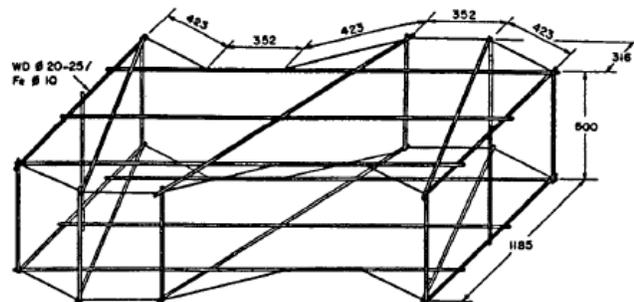


Figure 8. Diagram of an Antillean arrowhead fish trap. (Source: Slack-Smith, 2001)

2016). Improvements in the wire mesh of these traps increased their efficiency overtime until the traps were banned in the twentieth century following the introduction of motorized boats and sharp declines in fish stocks as larger numbers of fish were caught in the traps (Davidson, 2016).

Shore fishing or reef fishing on boats using nets and spears and less frequently a hook and line, spearfishing, and lobster diving were also common practices (Davidson, 2016). However, the use of Antillean arrowhead fish traps was more common because they could be easily and cheaply constructed out of local materials and would continue to fish for extended periods of time without having to be carefully monitored (Davidson, 2016). Once fish were caught they were placed in fish wells, or fish ponds, near the shore which would trap and hold fish, making them easily accessible for later consumption or sale (Davidson, 2016). Fish wells, which continue to be used today, provided Bermudians with both a source of food when the weather was too bad to fish and leverage that could be used to manipulate the fish market (Davidson, 2016).

The presence of marine mammals, in particular whales, also impacted Bermudian life and the island's economy. When the castaways of the *Sea Venture* first arrived on Bermuda they noticed a piece of ambergris washed up on the beach (Romero, 2007). In the following years several other pieces of ambergris were also discovered on the island (Romero, 2007). These rare discoveries lead to many people believing that natural ambergris was abundant on Bermuda, causing some to move to the island with the hopes of profiting greatly from the substance (Romero, 2007). As a result, both whaling and the search for ambergris were important in Bermuda during the seventeenth century (Romero, 2007).

Although ambergris was ultimately not found to be abundant on the island, whales were prominent offshore, causing Bermudians to turn to whaling as the oil was used in lamps, to tan

leather, and to manufacture candles and soap at the time (Romero, 2007). Although initial attempts at shore whaling during the early seventeenth century were not successful due to the settlers' inexperience, the practice not only came to be successful, but was regulated by the Somers Isles Company during the 1660s (Romero, 2007). The Company imposed regulations and taxes on the whaling industry, causing a rise in illegal whaling around the island (Romero, 2007). Once the Somers Isles Company was dissolved in 1684 and many of the regulations surrounding whaling were lifted the practice became more prominent (Romero, 2007). However, until the late eighteenth century when Bermudians were introduced to more efficient techniques, such as cutting blubber with spades to avoid waste, Bermudians hunted whales for survival rather than significant financial gain (Romero, 2007).

As the story of Bermuda's abundant resources and opportunities became widely known, Bermuda's population increased rapidly over the course of the seventeenth century (Jarvis, 2012). As a result the island's infrastructure had to be built to accommodate a large number of people within limited island space. This accommodation necessitated the construction of smaller buildings and roads as well as forts at the entrances of the two main deepwater channels that were both in close proximity to each other and built using the resources that were locally available (Jarvis, 2012).

Most of the earliest homes that were constructed were small timber-framed houses or post-and-beam structures with two or three rooms; occasionally a basement was quarried out of the underlying limestone (Jarvis, 2012). These homes were anchored by cedar posts and had either palmetto thatch or cedar shingle roofs due to the abundance and price of native cedar (Jarvis, 2012). However, after ship construction using Bermudian cedar timbers became popular, houses were built using quarried limestone blocks that were cemented together by mortar and

surface whitewash produced by firing in lime kilns (Jarvis, 2012). In many cases cellars were quarried, and the limestone blocks then laid out to form stone walls (Jarvis, 2012). These stone houses resembled the earlier timber-framed homes until the early eighteenth century when the construction of more elaborate two and three story townhouses and mansions began (Jarvis, 2012).

These later homes were also constructed with more durable, steep-sloped roofs made up of thinly cut limestone tiles, which would collect rainwater and direct it through several gutters and pipes into underground storage tanks (Jarvis, 2012; Figure 9). Until the twentieth century these storage tanks were cedar cisterns or rum puncheons, or were constructed by drilling holes in rock and then using mortar to make it water tight (Waller, 1982). These tanks were typically located in the backs of buildings, either above

ground or partially buried, and could be pumped by hand or by bucket. Eventually pumps that could transfer the water from the collection tanks to indoor storage tanks were constructed. This compensated for the absence of surface freshwater and the limited supply in the underlying aquifers (Waller, 1982, Jarvis, 2012). Currently underground storage tanks, electric pumps, and pneumatic tanks are still used to store and transport water indoors as rainwater continues to be Bermuda's main source of freshwater (Waller, 1982).



Figure 9. Picture showing the sloped limestone roofs. (Source: [http://afterorangecounty.com/wp-content/uploads/2015/08/DSC\\_0812-496x496.jpg](http://afterorangecounty.com/wp-content/uploads/2015/08/DSC_0812-496x496.jpg))

Beginning in the middle of the seventeenth century after the collapse of the tobacco market, Bermudians began using their distinctive location, natural resources, and connections to colonies along the eastern coast of North America and in the Caribbean to build a maritime-focused economy (Jarvis, 2012). With the initial foreign disinterest in Bermuda after the collapse of the tobacco market came more independence for its inhabitants, which they used to increase ship production and build intercolonial trade (Jarvis, 2012).

The first Bermudian deep-sea vessels were sloops constructed from the island's local Bermuda cedar in the early 1650s, relieving Bermudians of their dependence on outside shipping and enabling them to regularly trade with other colonies (Jarvis, 2012). The local cedar used to construct these sloops was an excellent shipbuilding timber because it was relatively light, strong, and highly resistant to marine organisms, making the vessels both durable and fast (Jarvis, 2012). As a result, Bermudians were able to use the increased demand for their Bermudan sloops to further establish their role in the maritime world as Bermuda transitioned to a British Crown Colony (Jarvis, 2012). Until the middle of the eighteenth century Bermuda continued to increase shipbuilding and intercolonial trade, eventually developing close ties with the nearby colonies with whom they traded salt from Turks Island for food (Jarvis, 2012).

During the time of the American Revolution, when Bermuda remained loyal to Britain and trade with the Americas was cutoff, the island's economy and role in the world shifted. Instead of being an important trade partner due to its unique location and highly regarded shipbuilding industry, Bermuda became an invaluable location for a Royal Navy base after Great Britain lost its other continental naval bases in the Americas (Smithsonian.com, 2007). The island was used to protect British trade routes and to attack American shipping up through the War of 1812 (Smithsonian.com, 2007). The island's economy collapsed due to the substantially

decreased trade with the United States, causing Bermudians to resort to privateering and to rely on Great Britain (Smithsonian.com, 2007). This dependence led to the increased presence of the Crown on the island and further shaped Bermuda's economy, focusing it more on defense and agriculture (Smithsonian.com, 2007).

The importance and effects of Bermuda's geographical setting on Bermudian society were also apparent during the second half of the nineteenth and the twentieth centuries. During this time Bermuda's role changed drastically from an important location for smuggling Confederate goods blockaded by the Union during the American Civil War and for rum running during Prohibition, to a popular vacation destination (Smithsonian.com, 2007). This shift resulted from improvements in tourist access to the island; initially, large passenger steamships traveled between New York and Bermuda, then, later, flights to Bermuda became available as well (Smithsonian.com, 2007). These advances lead to the development of a sizable tourist industry as Americans, Britons, and Canadians started to vacation to Bermuda for the island's pristine beaches (Smithsonian.com, 2007). This industry continued to expand until World War II, when Bermuda served important strategic, military purposes (Smithsonian.com, 2007). In 1941 the United States leased parts of the island for military use, for 99 years (Smithsonian.com, 2007).

After the war Bermuda's role began to evolve again with the removal of troops from the island in 1952 and several political conferences between world leaders occurring on the island since then (Smithsonian.com, 2007). In 1968 Bermuda received a new constitution, that allowed the island to be internally self-governing while remaining a British overseas territory (Smithsonian.com, 2007). Since then Bermuda has continued to rely heavily on tourism and international enterprises that grew out of the earlier maritime trade (Smithsonian.com, 2007).

**Conclusion.**

The influence that Bermuda's unique setting has had on the evolution of Bermudian society is apparent in the adaptations that have been made over the course of the last five centuries. To reside and thrive on the small, secluded island Bermudians have had to adjust to unfamiliar practices and ways of life to accommodate the resources that are available to them. While some aspects of Bermuda's environment and geology, such as fertile soil, an abundant supply of fish, and limestone and local woods which can be used as building materials, have been advantageous to its inhabitants, compensation has been required for others, like the absence of freshwater and limited land availability. These adaptations affirm the presence of a relationship between human settlement and the natural environment.

## References Cited:

- Burnett-Herkes, J., Luckhurst, B., and Ward, J., 1989, Management of Antillean trap fisheries: Bermuda's experience: *Proceedings of the Gulf and Caribbean Fisheries Institute*, v. 39, p. 5-11.
- Carew, J.L. and Mylroie, J.E., 1995, Depositional model and stratigraphy for the Quaternary geology of the Bahama Islands *in* Curran, H.A. and White, Brian, *Terrestrial and Shallow Marine Geology of the Bahamas and Bermuda*, Geological Society of America Special Paper 300, p. 5-32.
- Coates, K.A., Fourqurean, J.W., Kenworthy, W.J., Logan, A., Manuel, S.A., and Smith, S.R., 2013, Introduction to Bermuda: Geology, Oceanography and Climate *in* Sheppard, C.R.C., *Coral Reefs of the United Kingdom Overseas Territories*, *Coral Reefs of the World* 4, p. 115-133.
- Davidson, Alex, 2016, Bermuda fisheries information: Bermuda Fisheries Department, e-mail.
- Hearty, P.J. and Vacher, H.L., 1994, Quaternary stratigraphy of Bermuda: A high resolution pre-Sangamonian rock record: *Quaternary Science Reviews*, vol. 13, p. 685-697.
- Hearty, P.J., 2002, Revision of the late Pleistocene stratigraphy of Bermuda: *Sedimentary Geology*, v. 153, p. 1-21.
- Hearty, P.J. and Olson, S.L., 2011, Preservation of trace fossils and molds of terrestrial biota by intense storms in mid-last interglacial (MIS 5c) dunes on Bermuda, with a model for development of hydrological conduits: *Palaios*, v. 26, p. 394-405.
- Ilfie, T.M., 2009, Bermuda *in* Palmer, A.N. and Palmer, M.V., *Caves and karst of the USA*: National Speleological Society, p. 353-357.
- Ilfie, T.M., Kvitek, R., Blasco, S., Blasco, K., and Covill, R., 2011, Search for Bermuda's deep water caves: *Hydrobiologia*, v. 677, p. 157-168.
- Jarvis, M.J., 2012, *In the Eye of All Trade: Bermuda, Bermudians, and the Maritime Atlantic World, 1680-1783*: The University of North Carolina Press, 704.
- Jones, R., 2015, *Moon Bermuda*, 4th ed.: Avalon Travel Publishing, 368 p.
- Ministry of Transport, 2011, Study of Bermuda's shipping channels to accommodate larger cruise ships: Bermuda Government, public presentation, 49 p.
- Muhs, D.R., Budahn, J.R., Prospero, J.M., Skipp, G., and Herwitz, S.R., 2012, Soil Genesis on the Island of Bermuda in the Quaternary: The Importance of African Dust Transport and Deposition: USGS Staff - Published Research, Paper 738, 37 p.

Romero, A., 2007, 'More private gain than public good': Whale and Ambergris Exploitation: Bermuda Journal of Archaeology and Maritime History, v. 17, p. 5-27.

Rowe, M.P. and Bristow, C.S., 2015, Landward-advancing Quaternary eolianites of Bermuda: Aeolian Research 19, p. 235-249.

Slack-Smith, R.J., 2001, Fishing with traps and pots: Food and Agriculture Organization of the United Nations, public presentation, 65 p.

Smithsonian.com, 2007, Bermuda - History and Heritage: Smithsonian.com, url:  
<http://www.smithsonianmag.com/travel/bermuda-history-and-heritage-14340790/?no-ist>

Vacher, H.L. and Rowe, M.P., 1997, Geology and Hydrogeology of Bermuda *in* Vacher, H.L. and Quinn, T., Geology and Hydrogeology of Carbonate Islands. Developments in Sedimentology, v. 54, p. 35-90.

Vogt, P.R. and Jung, W., 2007, Origin of the Bermuda volcanoes and Bermuda Rise: history, observations, models, and puzzles *in* Foulger, G. and Jurdy, D., Plates, Plumes, and Planetary Processes, Geological Society of America Special Paper 430, p. 553-592.

Waller, D.H., 1982, Rain Water as a Water Supply Source in Bermuda: 1st International Conference on Rain Water Cistern Systems, p. 184.