“AND BREAD ITSELF IS GATHERED AS A FRUIT”: THE 18TH CENTURY BRITISH BREADFRUIT VOYAGES

A Thesis

by

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ABSTRACT

The first trans-Atlantic exchanges of flora and fauna occurred on Christopher Columbus' initial journey to the American continent in 1492 and initiated a process that Alfred Crosby has termed the "Columbian Exchange".[1] Though the movement of plants across the landscape – live, dried, as seeds, or otherwise – had begun long before, the centuries following Columbus' voyages witnessed an unprecedented reorganization of the natural world. Spearheaded by Europe's imperial and colonial powers – and enabled by the emergence of scientific societies and the institutionalization of knowledge in that same period – botanicals were sought out, shipped, and transplanted all over the globe. This thesis addresses the history of this transportation of live plants and other floral specimens aboard 18th century European sailing ships, using as a case study the British efforts to transplant the breadfruit tree (*Artocarpus altilis*) from its native South Pacific islands to the West Indies. From its first references in travellers' accounts such as those by William Dampier and George Forster, breadfruit was depicted as an almost miraculously versatile and nutritious foodstuff. Always looking for cost-reducing measures for its colonial plantations, the British empire equipped two expeditions, both captained by William Bligh, to bring breadfruit to the Atlantic sphere with the intention of making it a cheap staple for the diet of enslaved workers. The first expedition aboard *HMS Bounty* (1787-1790) failed due to a mutiny. The second, that of *HMS Providence* and *HMS Assistant* (1791-1793), loaded 2,126 breadfruit plants in Tahiti in the Pacific, and delivered its 690 surviving specimens to the botanic gardens of St. Vincent and Jamaica in the West Indies in the largest botanical transfer of its kind to have ever been attempted, and successfully carried out, at the time.

[1] Crosby, 1972.

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CHAPTER 1

Introduction

> Where all partake the earth without dispute,
> And bread itself is gathered as a fruit;
> Where none contest the fields, the woods, the streams: –
> The Goldless Age, where Gold disturbs no dreams.
>
> Lord Byron, The Island (1823)[2]

Plants and botany are rarely associated with ships and sailors. They stand on diametrically opposed spectrums of landscapes: the latter's whole existence is tied to the water, and the former's is, quite literally, rooted in the land. The transportation of plants aboard ships was never a well-recorded nor extensively studied endeavour, but its importance cannot be overestimated. The movement of flora began long before Columbus' voyages to the Americas in the 15th century, but grew exponentially from this time onward. Flora, as well as fauna, people, ideas, and diseases flowed between previously unconnected lands in what Alfred Crosby has called the Columbian exchange.[3] The tomatoes of Italian cuisine, the famous Irish potatoes, and the hot peppers of Szechuan Chinese cuisine all originated in the New World, but are so incorporated into people's understandings of dietary landscapes that their origins are now obscured.

The curious case of the transfer of the breadfruit tree (*Artocarpus altilis)* from its native environment in the islands of the South Pacific to the British colonies of the West Indies in the late 18th century was part of this wider network of ecological exchanges (Fig. 0.1). Cultivated by Pacific Islanders for more than 3,000 years, breadfruit was first encountered by European explorers in the early 16th century. Within a few centuries, it had become a privileged object of study and

[2] Byron 1823, 17.
[3] Crosby 1972.

Fig. 1.0 *The Breadfruit of Otahytey*. Illustration by George Tobin, 1792. Image courtesy of Mitchell Library, State Library of New South Wales, Australia.

the hope of a nation for staving off hunger in its colonies. The breadfruit voyages of 1787-1789 and 1791-1793, captained by William Bligh and sponsored by the British Crown under George III, are the focus of this thesis.

The first chapter addresses the plant itself, establishing its horticultural profile and the history of its study. Breadfruit's characteristics, properties, uses and origins are described, informing European interest in the plant. The second chapter focuses on the institutionalization of botanical knowledge, from its roots in Renaissance cultures of collecting that led to the emergence of scientific societies in the 17th century. The third chapter addresses the considerations of the transportation of plant specimens at sea, and the founding of colonial botanical gardens around the world. These first chapters set the stage for the latter two, providing the historical context of the late 18th century breadfruit voyages, their outcomes and their consequences. The first of these voyages (1787-1789) met an untimely end when the crew of *HMS Bounty* mutinied, leaving Captain Bligh and his loyal men to sail from Tahiti to Timor in an open boat with little provisions and less water. Bligh made it back to England alive and was once again tasked with leading a second breadfruit expedition after being cleared of blame for the mutiny (Fig. 0.2). The ships *HMS Providence* and *HMS Assistant* were assigned to Bligh for this voyage. The expedition ended in triumph, a fact often obscured by the grip *Bounty*'s mutiny holds on popular imagination.

My aim is to situate the British breadfruit voyages within an overarching framework of colonial botany. That is, the pursuit of botanical knowledge and the reorganization of the natural world in the service of empire, whether commercial, scientific, humanitarian, or political in nature. Legacies of colonialism linger on in much of our present-day lives, botany being no exception. The case study of breadfruit can help shed light on the creation of the structures of knowledge and the long-lasting impacts of plant transfers on landscapes and cultures that affect us to this day.

Fig. 1.1 *Portrait of Rear-Admiral William Bligh*. Alexander Huey, 1814. Watercolour on ivory. Image courtesy of the National Library of Australia.

CHAPTER 2

Artocarpus altilis: Horticultural Profile, Origins, and Uses of the Breadfruit Tree

> They [the people of Tahiti] think that because there are no breadfruit, cocoanuts nor plantations in England, that there cannot possibly be any food that is good there; and they say, that we come here on account of their sweet food, as they are pleased to call it.
>
> Rev. Charles Wilson, 1803[4]

Artocarpus altilis: A profile of the breadfruit tree

Breadfruit, *Artocarpus altilis*, belongs to the Moraceae family of approximately sixty species native to the Indian subcontinent, southeast Asia, and Australia, which includes the fig and the mulberry.[5] The genus *Artocarpus* consists of three species: *A. altilis*, the breadfruit proper; *A. camansi*, commonly referred to as either breadnut, chataigne or kamansi; and *A. mariannensis*, the Mariannas or seeded breadfruit (Fig. 2.0).

Fig. 2.0 *A. altilis, A. camansi* and *A. mariannensis.* Image courtesy of the National Tropical Botanical Garden, Kauai, Hawai'i.

[4] Wilson and Elder. 1803, 14.
[5] Zerega, Ragone and Motley. 2004, 760.

A. altilis is an evergreen, perennial tree which grows continuously and, under the right conditions, can gain more than one meter annually and reach heights of 25 meters. Though some types are shorter, dwarf cultivars have not yet been positively identified, and other factors may affect growth. From the tree's upright trunk, lateral branches rise in groups of two to seven, from which smaller branches also emerge. Breadfruit's lower main branches tend to be longer and grow perpendicular to the ground, giving the tree's canopy a predominantly pyramidal shape. Some cultivars are more dome-shaped or have compact or low, spreading canopies. Common Caribbean breadfruit varieties have seven to 15 leaves which measure up to 3 feet long emerging from the terminal ends of their branches; younger trees tend to not have as many.[6] Cultivars differ in the outline and degree of lobing of their leaves, but these generally have a dark green and glossy surface with a rough, pale green underside (Fig 2.1). With its significant size and the unique shape of its leaves, the breadfruit tree was valued not only for its nutritious fruit but also as an ornamental plant to adorn the gardens and estates of West Indian planters.

Although found in subtropical areas close to the tropics of Cancer and Capricorn – in New Caledonia, for example – it occurs most frequently between the latitudes of 17°N and 17°S. Its ideal growing temperatures fall between 21 and 32 degrees Celsius. It can be cultivated at higher or lower temperatures, but the rate of its growth will decline, and temperatures outside of the ideal range can also affect fruit growth.[7] Accordingly, variations in microclimates within islands and landscapes can extend the period of fruit availability.

[6] Roberts-Nkrumah 2018, 11.
[7] Roberts-Nkrumah 2018, 12.

Fig. 2.1 Breadfruit leaves – variations in shape and lobing. Copyright Roberts-Nkrumah 2018, 30.

The breadfruit tree grows best under high rainfall conditions, from 1,500 to over 3,000 millimeters annually. Provided that rainfall is well distributed throughout the year, or if irrigation is available, it can be cultivated in areas where as little as 1,000 millimeters of annual rainfall occurs. The greatest populations of breadfruit trees occur in lowland areas where temperatures are higher, but some have been found to grow at altitudes of up to 1500 meters in Tanzania and Papua New Guinea. Coupled with high rainfall, the trees also require full sunlight as soon as they are established to encourage the development of a lower canopy, flowering and fruiting, and earlier fruit bearing. Persistent winds can stunt the growth of young trees, and strong winds – as the ones from Caribbean hurricanes – can damage older trees by breaking branches and stripping them of their leaves. Sheltered locations are thus preferable for the growing of breadfruit. Additionally,

though they will tolerate a wide range of soil types, breadfruit trees grow best in well-drained, moisture-retentive soils like sandy loams or clay loams.[8]

As *A. altilis* is a seedless species, it propagates vegetatively and asexually via suckers, new stems and root systems that form from the adventitious buds on the roots of the parent plant. The breadfruit tree's root system consists of several lateral roots that branch and produce an extensive network which stretches several meters horizontally. These lateral roots generally do not extend deeper than 0.6 meters below the soil surface, and often are just below the surface or even exposed.[9] Breadfruit's suckers frequently develop along these surface roots. To separate the new shoots from the parent plant, root pruning is done around the sucker within a foot-long radius. This pruning needs to be repeated over a period of several months to ensure the appropriate development of the new plant's root ball.[10] Suckers can be induced by wounding the roots of the parent plant, and it is also possible to multiply the plant with stem cuttings.[11] The seedless nature of the plant and its vegetative propagation were key components in the British breadfruit ventures: unlike other floral species whose seeds could be easily packaged and sent on voyage across oceans to distant colonies or royal gardens, in this case the plant itself needed to be acquired, and in sufficient quantities to assure enough specimens would survive the long arduous journey.

The fruit

The most widely sought part of the breadfruit tree is its fruit. The diversity of *A. altilis* cultivars is reflected not only in its canopy shape and leaf variations, but in its fruit as well. An

[8] Roberts-Nkrumah 2018, 13.
[9] Roberts-Nkrumah 2018, 11.
[10] Na Lima Kokua 1976, 3.
[11] Amusa, Kehinde and Ashaye 2002, 1.

exact number of breadfruit cultivars is not known; over 2,000 names have been collected from 22 Pacific islands, but the same cultivar may be referred to by different names on various islands, or by variations of the same name. These names refer to observable morphological traits, like leaf shape or fruit colour. Individual Pacific islands differ in their numbers of cultivars: over 200 have been reported in Temotu in the Solomon Islands, while Kiribati only has eight. Due to the nature of the plant and the history of its propagation, breadfruit germplasm diversity is greatest in the Pacific, with the most variation occurring in Melanesia and Micronesia.[12] Initially, Europeans only differentiated the seeded and seedless types, but soon came to define their own categories of cultivars. By 1828, Sir Joseph Dalton Hooker, British botanist, reiterated the five "main" cultivars based on fruit characteristics and quality previously described by Guilding in the second volume of *Curtis's Botanical Magazine*. These were:

1. Round and rough (muricated) fruit
2. Oval and rough, one of the most valuable
3. Oval and smooth, the second best
4. Round and smooth
5. Timor variety: small and very inferior[13]

This short list has been much expanded upon since with continued studies of breadfruit germplasms, but for our purposes it serves as a basic framework for categories of cultivars. Generally, the rind of the fruit is green in its unripe stage and turns greenish-brown or yellow as it matures. In its green stage, the fibrous pulp of the fruit surrounding the central core is white and starchy, and the flesh sweetens as it ripens and acquires a light cream to deep yellow colouring.[14]

[12] Roberts-Nkrumah 2018, 15.
[13]Hooker 1828; Guilding 1825.
[14] Miller, Bazore and Bartow 1965, 42.

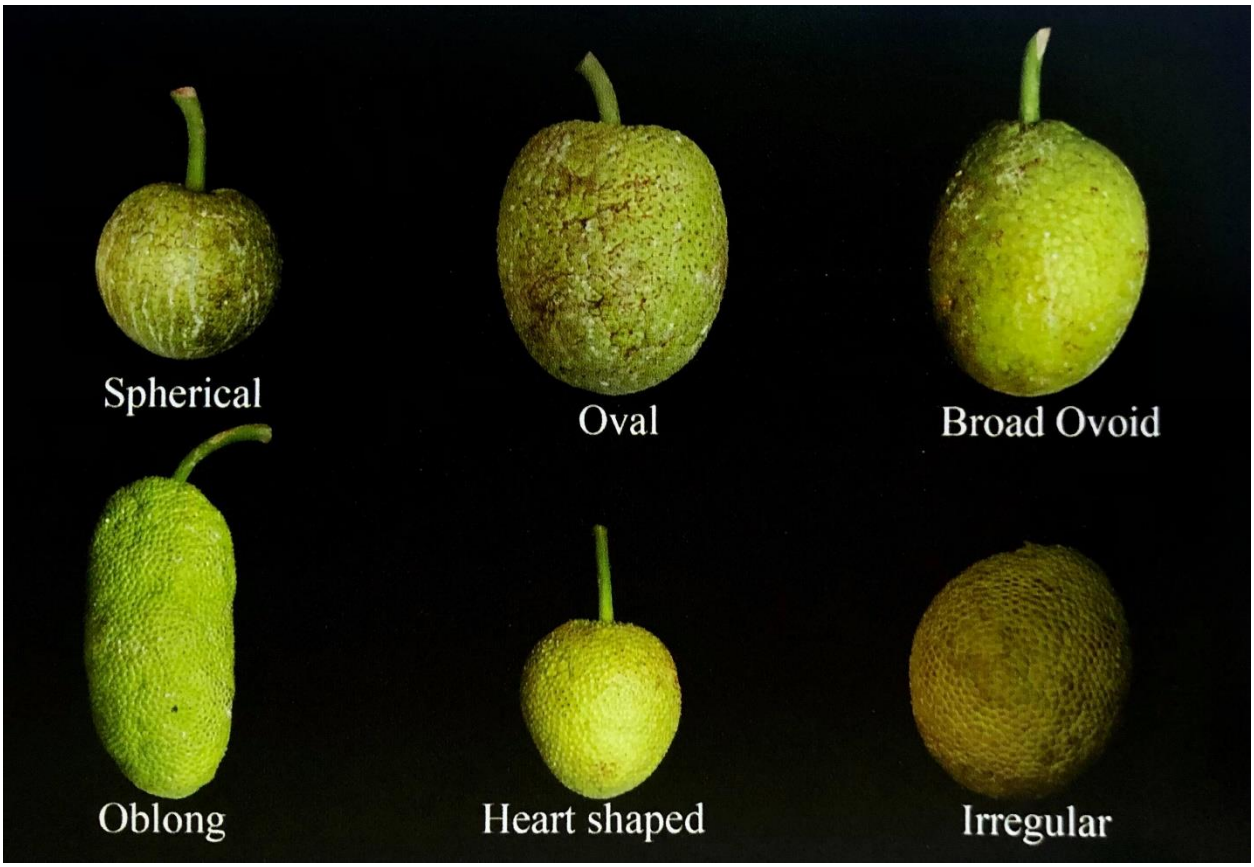

Fig. 2.2 Breadfruit fruits – variations in shape. Copyright Roberts-Nkrumah 2018, 32.

Cultivars will vary in the size and shape of their fruit, which falls on a spectrum from round to oval (Fig. 2.2). The texture of the mature fruit is also variable. Its appearance of a network of polygons is a consequence of the tree's reproductive morphology. *A. altilis* is monoecious, meaning that is has both the male and female reproductive organs; another word perhaps more familiar is hermaphrodite. At maturity, both the male and female inflorescences are borne in the axils[15] of the leaves. The latter ones appear about three to four weeks after the former; the hundreds of small female flowers are fused together and attached to a single core. They then develop into fruitlets without pollination; in most seedless types, pollen production is very limited. The large,

[15] Axils are the angle between the upper side of the stem and a leaf, branch, or petiole.; the petiole is the stalk that attaches the leaf blade to the stem.

single fruit that is formed from the fusing of these fruitlets is called a syncarp. As a result of this process, the flesh of the breadfruit is solid except for the spongy texture surrounding its core, where the flowers are not fused. The fruit's surface texture of linked polygons reflects its composition from hundreds of individual female flowers; each polygon is the outer surface of one of these flowers, whose apex are at the center. Depending on the cultivar, these polygons can be flat or raised, and the texture can also change throughout the maturing process of the fruit. Though up to four fruits can arise from a single leaf axil, only one usually reaches maturity, the others falling before then. Generally, it takes at least fourteen weeks from the moment the fruit emerges until it matures.[16] However, certain cultivars vary in bearing periods and ripening time of the fruit.[17] The first fruiting average period of the crop is of four to six years, and every year a single breadfruit tree produces 150 to 200 kilograms of fresh fruit.[18]

The quantity of carbohydrates in breadfruit is comparable to that of the sweet potato and taro, and is higher than the white potato.[19] When fully ripe and all its starch has been converted to sugar, breadfruit is a fair source of ascorbic acid (vitamin C) and calcium.[20] Cultivars differ from good to fair in their abundance of phosphorous, which is crucial to the formation of bone and teeth and needed by the body to make protein for the growth, maintenance and repair of cells and tissues. Breadfruit is a poor source of iron and provitamin A, but a good source of thiamine (also called vitamin B1, important in the breaking down of carbohydrates from food into products needed by

[16] Roberts-Nkrumah 2018, 12.
[17] Na Lima Kokua 1976, 2.
[18] Gao et al. 2019, 1-2.
[19] Miller et al. 1965, 42.
[20] Na Lima Kokua 1976, 3.

the body), niacin (vitamin B3, also useful in the breaking down of food into energy), and riboflavin (vitamin B2, required by the body for cellular respiration).[21]

The fruit can be prepared and cooked in a wide variety of ways, at various stages of ripeness. Hawaiians are said to prefer theirs riper than Tahitians and Samoans, who use it in its unripe or starchy state.[22] Sydney Parkinson, the artist who accompanied the naturalist Sir Joseph Banks on Captain James Cook's first voyage to the South Seas aboard *H.M.S. Endeavour* from 1768 to 1771, provided the following description of the roasting of the fruit, and the preparation of the fermented paste it was made into:

> [Tahitians] generally pluck it before it is ripe, using a long stick with a fork at the end of it for this purpose; and before they roast it, scrape all the rind off with a shell; and then, when large, cut it in quarters; and, having prepared one of their ovens in the ground, with hot stones in it, they lay the fruit upon these, having previously put a layer of the leaves between, and then another layer over them, and, above that, more hot stones, covering up the whole close with earth, and, in two or three hours time, it is done; it then appears very inviting, more so than the finest loaf I ever saw; the inside is very white, and the outside a pale brown; it tastes very farineaceous, and is, perhaps, the most agreeable and best succedaneaum for bread ever yet know, and in many respects, exceeds it. When thus baked, it only keeps for three or four days, another contrivance being used for keeping it; they take the baked fruit, cut out all the cores, and, with a stone-mallet, mash it to a pulp with a wooden trough, or tray. This pulp they put in a hole that is dug in the ground and lined with leaves; this is close covered up, and left a proper time till it ferments and becomes sour, at which time they take it up, and make it into little loaves, which they wrap up in the leaves, and, in this state, it is baked, and called by them

[21] Miller et al. 1965, 43.
[22] Miller et al. 1965, 42.

> mahe, and will keep several months, being eaten when bread-fruit is out of season, and carried to sea with them; and of it they form several sorts of paste, such as pepe, popoee, &c. which are used by them at their meals.[23]

One of these pastes, Makey Poe Poe, was made of the fermented breadfruit and a substance called Meiya. It was mixed with coconut milk and then baked, tasting very sweet.[24] Breadfruit was a very versatile staple, and as much appreciated by the natives as it was by the sailors. George Anson, who found the fruit growing in the Mariana Islands in 1742 on an expedition to the South Seas, stated it was "constantly eaten by us during our stay upon the Island instead of bread, and so universally preferred to it, that no ship's bread was expended during that whole interval."[25] Three decades later in 1773, on Cook's second voyage to Tahiti, George Forster wrote that it was "a luxurious and most welcome substitute for worm-eaten biscuit."[26]

Other Uses

Beyond its fruit, the breadfruit tree has many other components for which applications have been found across time and space. When young, its leaves are surrounded by a keeled, conical leaf sheath that subsequently falls off. In Hawaii, these sheaths were dried and used in the manufacturing of utensils and bowls as a fine quality abrasive for their final polishing.[27] When damaged, all parts of the plant exude a white milky sap that has been used in its liquid form as both a glue and a caulking agent. Children have been known to let the sap solidify and use it in the same way as the modern chewing gum. A most unique usage of this sap in Hawaii has been as

[23] Parkinson,1773, 45-6.
[24] Parkinson 1773, 17.
[25] Anson 1748, 417.
[26] Forster 1776, 264.
[27] Na Lima Kokua 1976, 3.

birdlime: it would be smeared on the branches of trees rare and desirable birds were known to frequent, where they would land and get stuck. This allowed their feathers to be harvested to make leis and cloaks.[28] Featherwork knowledge was brought to Hawaii by early Polynesian settlers, and the Hawaiian level of craft came to be the most elaborate in the Pacific. The leis and capes of Hawaiian culture required thousands upon thousands of feathers for their manufacture – one cloak alone could necessitate more than sixty thousand feathers. Many of these were taken from endemic birds such as the ‘i’iwi an ‘apapane honeycreepers, sought for their brilliant red feathers. These birds, plentiful at the time, were killed and eaten when caught. Many species once prized for their feathers are now extinct or severely endangered in Hawai’i as a result of unsustainable harvesting practices, a consequence of one of the breadfruit tree’s applications beyond its use as a nutritious fruit. It is unclear whether breadfruit tree sap was used in a similar manner on other Polynesian islands to catch birds for feather harvesting.

The breadfruit tree also has medicinal properties. Its latex has been used to treat several skin diseases, and its young flower buds used to alleviate the symptoms of thrush disease (a fungal infection caused by the overgrowth of *Candida albicans*) in children’s mouths.[29] Additionally, its wood is light and easy to work, but its quality varies considerably. With trunks that can reach a diameter of two feet, the wood of the breadfruit tree has been used to build furniture, surfboards, and various parts of canoes including gunwales, bows and pieces of the stern. It is unclear if the wood of the breadfruit tree was ever specifically sought by Europeans in the Pacific when their ships needed repairs.

[28] Na Lima Kokua 1976, 3.
[29] Na Lima Kokua 1976, 3.

From the inner bark of young branches, tapa cloth could be made, though it was hard and brittle, and not preferred.[30] *A. altilis* also serves an environmental purpose where it is planted: its significant size provides shade to the landscape, its canopy reduces the impact of rainfall on the soil thus slowing erosion, and its leaf litter contributes to the creation of mulch that keeps the ground moist in dry periods.[31]

Origins

Over centuries, the breadfruit tree has been distributed around the islands of the Pacific and beyond, but the identity and origins of its wild progenitor remain enigmatic. Possible areas of origin for the genetic predecessors of *A. altilis* include Polynesia, Pacific and tropical Asia, the Mayan archipelago, and the region encompassing New Guinea, the Philippines, and the Moluccas.[32] Since the seedless breadfruit is sterile and propagates via suckers, it depends on human intervention for dispersal.[33] As such, breadfruit data has been compared to theories of human dispersion and colonization in Oceania. Indeed, the prominence of seedless cultivars increases as one moves eastward from Melanesia into Polynesia. Seeded cultivars are more common in the West, while nearly all eastern cultivars are seedless triploids with identical zymotypes.[34] Zymotypes are varieties distinguished by physiological and/or metabolic properties, defined by the results of tests determining the ability of one or more organisms to ferment each of a range of carbohydrates.[35]

[30] Na Lima Kokua 1976, 3.
[31] Roberts-Nkrumah 2018, 8.
[32] Zerega, Ragone and Motley. 2004, 760.
[33] The breadfruit's loss of fertility is due to two factors; triploidy (2n = 3x = ~84), or hybridization leading to sterile diploids (2n = 2x = 56) (Zerega et al. 2004, 760).
[34] Zerega et al. 2004, 760.
[35] Singleton and Sainsbury 2006

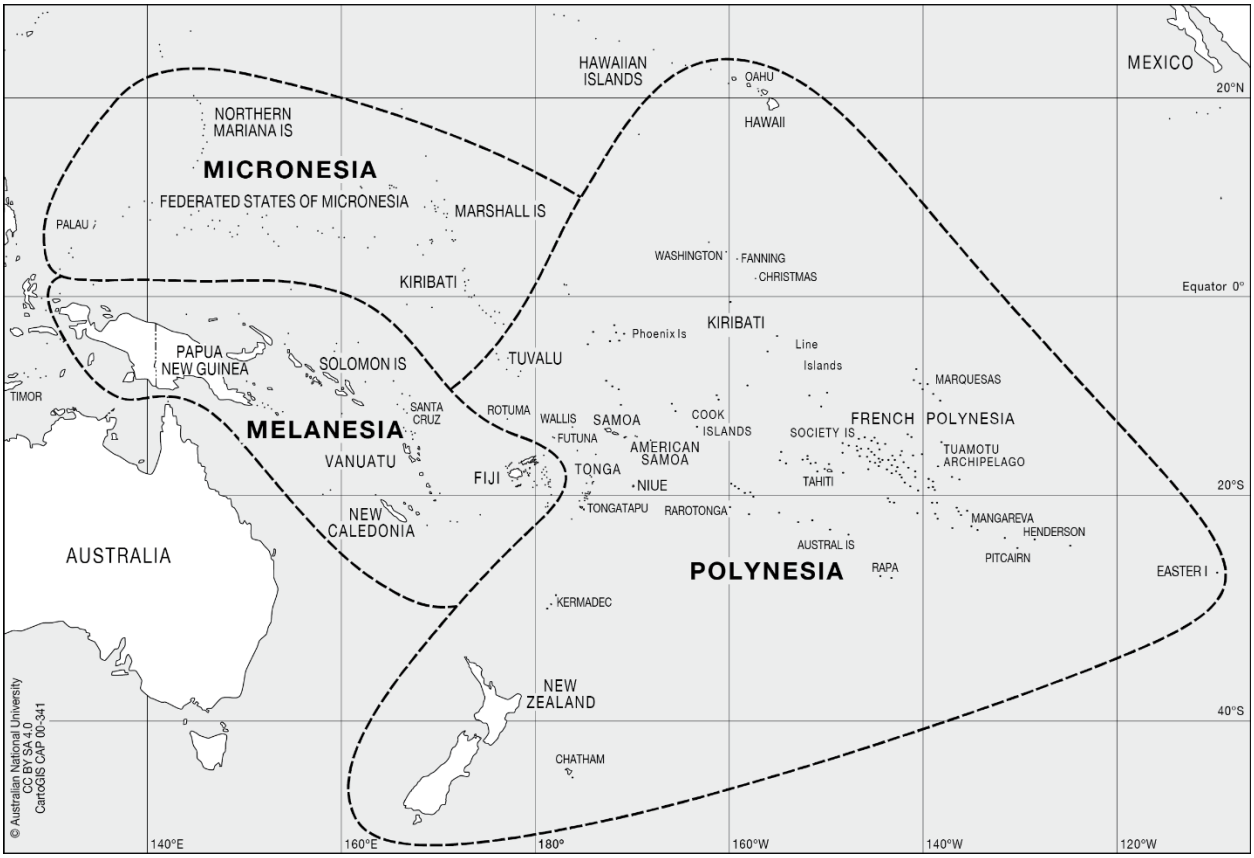

Fig. 2.3 Micronesia, Melanesia and Polynesia. Map courtesy of CartoGIS Services, College of Asia and the Pacific, The Australian National University.

By using multivariate analyses and DNA fingerprinting through the identification of species-specific AFLP markers (Amplified Fragment Length Polymorphisms), Zerega and colleagues tested the relationship between breadfruit (*A. altilis*) and its closest relatives (*A. camansi* and *A. mariannensis*) to trace the human-mediated dispersal of the breadfruit tree through Oceania. They took fresh leaf samples from thirty *A. camansi*, twenty-four *A. mariannensis*, and one-hundred-and-eighty-tree *A. altilis* specimens from Melanesia, Micronesia, and Polynesia.[36] Their analysis determined at least two origins of the breadfruit and has indicated that most Melanesian and Polynesian cultivars have arisen over generations of vegetative propagation and

[36] Zerega et al. 2004, 761.

selection from *A. camansi*, the seeded breadfruit. This finding complements the well-accepted theory of a West-to-East human migration of the Lapita people through Melanesia into Polynesia (Fig. 2.3).[37] Most Micronesian cultivars, on the other hand, are the result of a hybridization process between *A. camansi*-derived breadfruit and *A. mariannensis*.

The seeded breadfruit, possibly originating from New Guinea, could have had its seeds transported as far east as the Solomon Islands by pre-Lapita, non-Austronesian speaking peoples.[38] The Lapita cultural complex is characterized by a pottery type with incised decoration. Their small permanent villages provide a record of the rapid eastward movement of islanders by boat from New Guinea to Samoa in western Polynesia between 1600 and 1000 BCE, according to radiocarbon dating. The Lapita are generally accepted to be the ancestors of Polynesians. They had a known dependence on vegetatively propagated crops, with bananas, taro, yams, and sugarcane making up a significant portion of their cultivated foodstuffs. Breadfruit's shift from a seeded to a vegetatively propagated, seedless crop, would thus not have been unwelcome by the Lapita people, and would not have complicated its transportation across the islands of the Pacific. The gene pool of possible breadfruit cultivars would have been further reduced by these transportations, with the proportion of seeded specimens diminishing greatly in favor of few-seeded, and eventually seedless cultivars arising and persisting.[39] This evolution of breadfruit from seeded to seedless transformed it into a starch-rich food and elevated its status to a staple crop in Polynesia. The breadfruit tree was brought as far as Hawai'i from Tahiti before the European incursion in the Pacific, but it never achieved the same status of staple there as it did elsewhere in Polynesia, with taro remaining the primary source of carbohydrates. *Ulu*, the Hawaiian name for

[37] Zerega et al. 2004, 764.
[38] Zerega et al. 2004, 764.
[39] Zerega et al. 2004, 764.

breadfruit – corresponding to the Tahitian *uru* – was nevertheless still common in sheltered and coastal areas and has seen a resurgence in the past few years as conservation efforts have taken place.[40] The modern-day revival of breadfruit as both a possible crop to fight food insecurity and an underutilized species deserving of more limelight, in Hawai'i and globally, will be addressed in detail in this thesis' conclusion.

The west to east migration of the breadfruit into Polynesia is further supported by isozyme studies.[41] Zerega and colleagues analyzed the zymotypic diversity of breadfruit cultivars, and found it to decrease eastwards, in accordance with the theory of increasing clonal propagation and the narrowing of the available gene pool with each transportation of the breadfruit further afield.[42] In summary, the origins of breadfruit can be traced to at least two species (*A. camansi* and *A. mariannensis*), and two events; introgressive hybridization in Micronesia, and human selection and vegetative propagation in Melanesia and Polynesia.[43]

First European Accounts of the Breadfruit

The first Europeans to come across the breadfruit tree would have been Portuguese and Dutch voyagers in the early 16th century, on the islands of Indonesia and Malaysia. However, no notice of the plant was given in their written accounts, instead they gave precedence to the spices that were the objective of these early voyages. The oldest written description of breadfruit is found in the Portuguese pilot Pedro Fernandes de Queirós' account, dated to 1595, of his voyage in Mendaña's fleet in search of the famed *Terra Australis* or the "Great South Land."[44] The plant was

[40] Miller et al. 1965, 42.
[41] Isozymes are enzymes that differ in amino acid sequence but catalyze the same chemical reaction.
[42] Zerega et al. 2004, 764.
[43] Introgressive hybridization is a term used in genetics to describe the movement of a gene from one species into the gene pool of another; this happens when mating between two different species produces fertile hybrids.
[44] 1) de Queirós' name is also anglicized as *Ferdinand de Quiros.* 2) *Terra Australis* was a hypothetical continent posited in Antiquity which first appeared on maps in the 15th and 16th centuries. The existence of this continent was

sighted when the ships came across the islands they named the Marquesas: de Queirós wrote that this fruit, pineapple sized and sweet, was so useful – having only a bit of shell left as waste – that there was "no superior fruit."[45] From this description, it can be assumed that the variety of breadfruit he observed was the seedless one.

Another account was published in 1697 in England in which breadfruit was described as a substitute to bread, and it is to this account we owe the name of breadfruit. Buried in the hundreds of pages of English explorer William Dampier's (1651-1715) account of his first circumnavigation of the world, this description of breadfruit was written during his 1686 stay in Guam, where his ship anchored on the 21st of May.[46]

> The Breadfruit (as we call it) grows on a large Tree, as big and high as our largest Apple-Trees. It has a spreading Head full of Branches, and dark Leaves. The Fruit grows on the Boughs like Apples; it is as big as a Penny-loaf, when Wheat is at five Shillings the Bushel. It is of a round shape and hath a thick tough rind. When the Fruit is ripe, it is yellow and soft; and the taste is sweet and pleasant. The Natives of this Island use it for Bread: they gather it when full grown, while it is green and hard; then they bake it in an Oven, which scorcheth the rind and makes it black: but they scrape off the outside black crust, and there remains a tender thin crust, and the inside is soft, tender and white, like the crumb of a Penny Loaf. There is neither Seed nor Stone in the inside, but all is of a pure substance like Bread: it must be eaten new, for if it is kept above 24 hours, it becomes dry, and eats harsh and choaky; but 'tis very pleasant before it is too stale. This Fruit lasts in season 8 Months in the Year; during which time the Natives eat no other sort of food

not based on any direct evidence, but on the argument that continental land in the Northern Hemisphere should be balanced by a similar expanse in the Southern Hemisphere. Antarctica was not to be sighted until 1820 by the Russian expedition led by Fabian Gottlieb von Bellingshausen and Mikhail Lazarev in the hypothetical area of *Terra Australis*; its extent, composed of both Australia and Antarctica, was determined to be much less than that of the land mass in the Northern Hemisphere.

[45] Newell 2010, 144.

[46] Dampier 1702, 296-7.

> of Bread-kind. I did never see this fruit anywhere but here. The Natives told us, that there is plenty of this Fruit growing on the rest of the Ladrone Islands; and I did never hear of it anywhere else.

Both early descriptions list the virtues of this strange tropical fruit. It had less panache than some other of its exotic peers – like mangoes, papayas, or even the coconut – but it was instantly recognized as a hearty, reliable source of food. Subsequent accounts were given by the many French, Dutch, English and other explorers travelling to the South Seas. By the time of the second voyage of Captain Cook (1728-1779) to Tahiti (1772-1775)– or Otaheitee – breadfruit had become a staple of sailors' diets when sojourning on Pacific islands. George Forster wrote in his account of this voyage, as Cook's ship anchored in Tahiti in August of 1773 that "the breadfruit and yams proved a luxurious and most welcome substitute for worm-eaten biscuit."[47]

The common name "breadfruit" was universally accepted in Europe, with the French *arbre à pain*, the Spanish *arból de pan*, the German *brotfruchtbaum*, and the Dutch *broodvrucht* all translating to "bread fruit" or "bread tree." However, breadfruit's scientific name was debated for decades before botanists agreed not only on the species name, but on its genus as well. In 1773, breadfruit was the first species of the genus of which a description was published under a Linnean binomial.[48] Sydney Parkinson accompanied Sir Joseph Banks and Dr. Daniel Solander as an artist on Cook's first voyage to the South Seas (1768-1771), but he unfortunately died on the way back from Batavia. Parkinson wrote his observations in a manuscript later published by his brother Stanfield under the title "A Voyage to the South Seas in His Majesty's Ship, The Endeavour."

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[47] Forster 1776, 264.

[48] The Linnaean binomial is a form of biological rank-based classification (taxonomy) developed by Carl Linnaeus in his *Systema Naturae* (1735) and subsequent works. It wasn't until 1753 that his book which would have the greatest accelerating effect on the science of plant systematics was published, *Species Plantarum*. This work presented a list of all the plant species then known to Europe, identified by the number and arrangement of the plants' male and female sexual organs. The binomial system was quickly adopted by the scientific community at the time, but was still a relatively new concept in Cook's voyages of exploration where breadfruit was first described in this manner.

Fig. 2.4 *Sitodium altile* by Sydney Parkinson, in *A Voyage to the South Seas in His Majesty's Ship, The Endeavour* (1773).

Under the name *Sitodium altile*, Sydney Parkinson wrote the following botanical description of breadfruit (Fig. 2.4).[49]

> This tree grows to between thirty and forty feet high, has large palmated leaves, of a deep grass-green on the upper side, but paler on the under; and bears male and female flowers, which come out single at the bottom or joint of each leaf. The male flower fades and drops off; the female, or cluster of females, swell and yield the fruit, which often weighs three or four pounds, and is as big as a person's head when full grown. It is of a green colour; the rind is divided into a number of polygonal sections; the general shape a little longer than round, and white on the inside, with a pretty large core. The fruit, as well as the whole plant, is full of a white clammy juice, which issues plentifully from any part that is cut…

A few years later, in 1776, another account of the fruit was published, this time under the name *Artocarpus communis* by Johann Reinhold Forster and his son George, botanists on Cook's second voyage around the world (1772-1775).[50] This new genus name was derived from the Greek words *artos*, bread, and *karpos*, fruit. In the same year, the Swede Carl Pehr Thunberg published his account of the breadfruit under the name *Radermachia incisa*.[51] After much back-and-forth and further appellations, the genus name *Artocarpus* was accepted over *Sitodium*, and Parkinson's species *altile* became *altilis*, taking precedence over the Forsters' *communis*.[52]

The European, but mostly British, fascination with breadfruit would come to blossom into what can only be called an obsession, culminating in two British crown-sanctioned voyages specifically fitted for its transplant from Tahiti to the West Indies. These ventures were made possible by the developments in the transportation of specimens at sea in the wake of a renewed

[49] Parkinson 1773, 45-6; Jarret 1959, 116-7.
[50] Forster and Forster 1776, 101-2.
[51] Thunberg 1776.
[52] Jarret 1959, 155-6.

interest in cultures of collecting coupled with scientific enquiry brought about by the Enlightenment. The history of the transport of specimens at sea, and the advances specific to the care of living plants aboard ships, are the subject of the following chapter.

CHAPTER 3

The Institutionalization of the Study of Plants

> In the Choice of these Things, neglect not any, tho' the most ordinary and trivial; the Commonest Peble or Flint, Cockle or Oyster-Shell, Grass, Moss, Fern, or Thistle, will be as useful and as proper to be gathered and sent, as any of the rarest production of the Country.
>
> John Woodward, 1696.[53]

Cultures of Collecting and the Emergence of Scientific Societies

Cultures of collecting in the modern era can be traced back to the Renaissance, when sociopolitical, economic, and cultural changes resulted in the invention of the self as an owner, with the accumulation of goods and property as an ideal to achieve.[54] A renewed interest in, and veneration of, Roman and Greek antiquity as the source of civilization fueled the aristocratic coming-of-age Grand Tour from the mid-16th to the mid-19th century, coupled with the search for sculptures and artefacts for display in the homes of the upper classes. The same financial and social capital required to collect statuary applied to the collection of exotic plants. Though initially lacking the same cachet, the collecting of plant specimens required its participants to possess a global network of correspondents, sufficient leisure, a gentlemanly education in the sciences and botany and, from the second half of the 18th century onwards, a knowledge of Linnaean taxonomy.[55] Knowledge of nature was gathered during the Middle Ages in herbals and bestiaries, but over the course of the 16th and 17th centuries major changes affected the conceptual framework that structured European approaches to the study of nature. A turn away from medieval

[53] Woodward 1973 (1696), 10.
[54] Swann 2010, 5.
[55] Tobin 2005, 83.

universities, where patronage played a significant role, as part of the Scientific Revolution led to the institutionalization of science, with the formulation of natural history as a discipline of its own.[56]

Instrumental to the restructuring of science was the emergence of scientific societies and academies in Europe, starting with the foundation of the British Royal Society of London in 1660 and the French *Académie des Sciences* (Academy of Sciences) by King Louis XIV in 1666. Though important institutions in the 17th century scientific landscape, the Royal Society and the *Académie des Sciences* before 1700 were a far cry from the giants they would become once their formative years were left behind.[57] Over the course of the 18th century, about 70 official scientific societies of the same model cropped up over the European continent.[58] Admission into these societies hinged less on one's educational experience than on contributions made to scientific fields.[59] Unlike the earlier medieval and later 19th century university models, societies and academies were not pedagogical institutions. They did not give out degrees, and they did not directly contribute to the transmission of knowledge to younger generations of students.[60] As it concerns the professionalization of botany and horticulture, and more specifically the breadfruit voyages, it is on *scientific* societies that we will keep our focus. However, these were but a subset of learned societies; societies of language, philosophy, fine arts, history, archaeology, literature and more represented the main form of institutionalization of culture from the late 17th century to the mid-19th century and represent a wider shift in the production and dissemination of ideas.

[56] Swann 2010, 56.
[57] McClellan III 1985, 41.
[58] McClellan III 1985, 1.
[59] McClellan III 1985, 12.
[60] McClellan III 1985, 12.

Scientific societies and academies were defined by shared characteristics beyond their general concern with science. These were official institutions, either public or private, legally chartered by a civil authority, whether a king, a governor, or a town. Written rules governed their activities, their meetings were held on a fixed schedule, and they had appointed officers and elected fellows. They usually possessed quarters with facilities such as libraries and botanical gardens. Resources allowing, they published memoirs and transactions, and ran prize competitions. Such competitions ranged from the solving of mathematical problems to the successful introduction of new plant specimens to Europe or the colonies. Despite an array of common characteristics, diversity was still present among these societies, in degree if not in kind. A fair number of high-powered and well-endowed societies existed in almost every major city from London to Saint Petersburg, and across the Atlantic in cities such as Philadelphia and New York. Additionally, small provincial organizations further dotted the landscape of 18th century Europe. [61]

Structures of Knowledge

With the centralization of resources allowed by learned societies, knowledge came to be acquired on a never-before seen scale as ideas were transmitted faster and farther than in any previous period. It is in this context that a divide was established in the 18th century between so-called "observers" and "classifiers" of the natural world. Heading the "observers" was Georges-Louis Leclerc, Compte de Buffon (1707-1788), a French naturalist and mathematician. Buffon's ideological standings were made apparent through his seminal work *Histoire Naturelle*, a forty-four-volume natural history descriptive encyclopedia published between 1749 and 1804. He

[61] McClellan III 1985, 1-3.

believed that "any clear divisions drawn in nature were merely impositions of the human mind."[62] Buffon's counterpart, epitomizing classification, was the Swede botanist Carl Linnaeus (1707-1778). Linnaeus developed the binomial system of nomenclature of genus and species, providing the first widely accepted system of classification for natural historians. The simplicity of the system laid out in his *Systema Naturae* (1735), where he established the fructification organs of plants as the basis for their classification, allowed it to be adopted by large segments of the population. By ignoring analyses of anatomy and physiology and limiting his botanical study to the identification and naming of plants, any amateur could fashion themselves a botanist, and many indeed did.[63] The study of plants and the collecting of exotic specimens became a phenomenon that not only produced knowledge of nature, but actively contributed to its global reconfiguration.[64]

Plant collection and trade was not done uniformly across Europe: British naturalists mostly followed trade routes and relied on commercial networks and personal relationships to collect specimens on private ventures, the French operated under the authority of the government on voyages financed by the king and his ministers, and in Holland voyages were enabled by trading companies.[65] Voyaging unofficially across the seas meant that specimens collected by English naturalists were entrusted in the care of passengers or amenable captains on Britain-bound ships and ran a greater risk of failing to meet their destination. From the time of Louis XIV in the Old Regime, the French empire was institutionalized into a bureaucratic and centralized organization which J. McLellan III and F. Regourd have called the "colonial machine."[66] The collection of plant

[62] Miller 1996 (I), 3.
[63]Tobin 1996, 274.
[64] Schiebinger and Swan 2005, 8.
[65] Parsons and Murphy 2012, 505; Schiebinger 2004, 24, 35.
[66] McClellan III and Regourd 2011.Old Regime France (*Ancien Régime*) refers to the period of history from the late Middle Ages (c. 15th century) until the French Revolution of 1789 which led to the overthrow of the monarchy. It is under the reign of Louis XIV, the Sun King, that the Old Regime reached an absolutist form of government.

specimens in France was accordingly done for imperial, rather than mercantile, interests and was carried out on board the ships of the Royal Navy and the *Compagnie des Indes* (Company of the Indies).

From its very inception, botanical matters were an essential component of the French colonizing process. The French first sought territories for the commercial production of plants such as tobacco, indigo, sugar cane, and coffee, but later expanded this production to other botanical resources including ginseng from Canada, rhubarb and mulberry trees from China, and more. The intent behind this diversification of production was to avoid reliance on one or two commodities, which left the colonies vulnerable if a glut on the world's markets drove prices down.[67] Despite these differences in procurement networks between the French and English colonial empires, the knowledge produced by their respective scientific societies circulated freely and their collecting practices, which will be discussed in the next chapter, were somewhat uniform.[68]

F. Stafleu distinguishes two main categories of people engaged in the production of floral knowledge: "botanistes de cabinet" and "botanistes-voyageurs."[69] The *botanistes de cabinet*, armchair botanists, of the likes of Carl Linnaeus, who tended the fine gardens of imperial institutions, entertained networks of correspondence, and classified and synthesized the specimens shipped to them from across the seven seas. These botanists never left Europe, instead relying on colonial networks to acquire and trade plant materials. By the end of his career, Linnaeus "sat at the center of a vast scientific empire where, in the comfort of his home and gardens in Uppsala, he received specimens and news of new discoveries from some 570 Swedish and foreign

[67] McClellan III & Regourd 2011.
[68] Parsons & Murphy 2012: 505.
[69] Stafleu 1971, 145.

correspondents."[70] The second group, *botanistes voyageurs*, were travelling botanists. These were the individuals who ventured into the forests and mountains of faraway lands in the search for new botanicals, in the name of science, in the name of empire, or for personal gain and possible fame.[71] A prominent figure in British colonial botany, one who also played a major role in Captain Bligh's breadfruit voyages, was Sir Joseph Banks (1743 – 1820). Banks accompanied Captain James Cook (1728-1779) on his first circumnavigation of the world in 1768 to 1771 as an amateur naturalist, where he was charged by the admiralty to oversee the collection and classification of new plant life on the expedition.[72] He showed his devotion to the mission by slipping ashore in Brazil under the cover of darkness, and against the Brazilian governor's directives, to collect plants.[73] Banks was appointed director of the Royal Gardens at Kew in 1772, a role he kept until his death in 1820. Under his administration, the gardens became the center for management of the British botanical empire, growing its collection by more than seven thousand new species.[74] Banks could not have achieved such growth to the garden's collections without his network of collectors. At least 126 botanists, physicians, apothecaries, naval and merchant officers, navigators, and explorers working overseas acted as procurers of plant specimens in one form or another in his unofficial employ. Most of the specimens were gathered in India, southeast Asia, and the West Indies, with the Middle East and North America as the least represented regions.[75] Joseph Banks' French counterpart was André Thouin (1747-1824), the administrator and accountant for the *Jardin du Roi*. In his youth, Thouin's education was sponsored by none other than the Comte de Buffon. When Thouin's

[70] Schiebinger 2004, 57.
[71] Schiebinger 2004, 23, 57.
[72] Tobin 2005, 3.
[73] Tobin 1996, 266.
[74] Tobin 1996, 266.
[75] Mackay 1996, 39-45.

network of correspondence reached its largest extent in 1786, it comprised more than 400 individuals.[76]

Another category of botanical knowledge producers at the time, outlined by L. Schiebinger, was the voyaging botanical assistant. As they rarely published their personal findings, botanical assistants have received less recognition for their work – as illustrators, guides, and general support staff – than the naturalists.[77] These were generally lower-class individuals working for upper-class botanists, tasked with the massive undertaking of cataloguing nature. In a 1696 pamphlet of voyaging instructions for the collecting, labelling, and recording of specimens, John Woodward stated "[this] may be done by the hands of servants; and that too at their spare and leisure times."[78] In this manner, the production or acquisition of botanical knowledge was not limited to the minds of wealthy European men. Citizens of foreign countries, and even women were thus included in this process. Jeanne Baret, the first woman to circumnavigate the globe, did so while serving as a valet to Philibert Commerson, the physician and royal naturalist on Louis Antoine de Bougainville's voyage (1766-1769), though she had to hide her identity as a woman to do so.[79] However, the contributions of botanical assistants, especially those of indigenous people and women, were rarely – if ever – properly acknowledged.[80]

Europeans agreed that Indigenous and African peoples had a special connection with nature that they themselves lacked and, thus, possessed a certain kind of expertise, but it was believed that indigenous contributions were simply observations and know-how lacking theoretical or rational principles. Therefore, European naturalists could claim to be the true discoverers of this

[76] Spary 2000, 50.
[77] Schiebinger 2004, 24.
[78] Woodward 1973 (1696), 12-3.
[79] Schiebinger 2004, 46-48.
[80] Schiebinger & Swan 2005, 11.

knowledge, as they were the ones translating it into logical information that could then be diffused to their compatriots back in Europe.[81] When crediting indigenous groups, European naturalists tended to acknowledge the community as a whole rather than individuals in order to deny any singular person these knowledge claims.[82] In one instance, the contributions of an enslaved African named Kwasímukámba of Tjedú (also known as Kwasi) were acknowledged by Linnaeus when the botanist named a plant after him. Kwasi was born in Guinea around 1690 and was enslaved and brought to Surinam in 1700 (Fig. 3.0). There he discovered a root whose properties restored appetite and strengthened the stomach: this discovery was reported to Linnaeus by a Swedish immigrant living in Dutch Surinam and the plant was named *Quassi amara* in Kwasi's honor. The plant became a major pharmacological export, and Kwasi later obtained his freedom from slavery.[83] Though important, this case is exceptional: the contributions of non-European peoples to the study of botany were largely omitted from the historical record.

The Dramatic 18th-Century Expansion of Botanical Knowledge

Natural history, and particularly botany and horticultural studies, underwent an extensive expansion between the start of the 18th century and its end as illustrated by the rate of publications in these fields (Fig. 3.1). Assembled by Roger Emerson from Blanche Henrey's bibliography of 18th century British botanical and horticultural publications, the table shows a sharp increase in the latter half of the century, repeatedly attaining new peaks from the 1770s onwards.[84] The rising public interest in botany is also apparent in the number of new species introduced to Britain over

[81] Schiebinger & Swan 2005, 11.
[82] Murphy 2011, 35.
[83] Parrish 2006.
[84] From Emerson 1982, 84: "This table has been compiled from a sampling of the bibliography edited by Blanche Henrey, *British Botanical and Horticultural Literature before 1800*, vol.3. All entries dated under the letters A-D, M and S were included except those referring to magazines and serials. Conjectured dates have been treated as certain."

Fig. 3.0 *The Celebrated Graman Quacy*, 1796. Courtesy of the William Blake Archive.

the course of the same century: it is estimated that between 1715 and 1760, about 1,952 new plants were introduced, while the reign of George III from 1760 to 1820 saw no less than 6,056 novel botanicals make their way into English gardens.[85] In 1804, an illustrated guide to new and rare plants was published in Britain. Sir James Edward Smith's *Exotic Botany* aimed to introduce to the "curious cultivator" plants "worthy of his acquisition" from all around the world.[86] With detailed descriptions of the plants, it was meant to teach interested parties who had correspondents abroad what to look for, as existing publications focused on plants native to the British Isles or on foreign specimens that had already made their way into English gardens. This book of new or rare plants was compiled from stores collected by the author himself, as well as access to Aylmer Bourke Lambert's collection of New Holland sketches with original specimens in herbariums, Captain Thomas Harwicke's collection of botanical drawings from his travels to India, and from the specimens for which Sir Joseph Banks had no other publication plans.[87] Interestingly, though presenting the reader with a wealth of botanical diversity, *Exotic Botany* did not include care instructions beyond the plants' short descriptions, and most of the plants listed were propagated by seeds, which were much easier to ship around the world than living plants.

[85] Stuart 1979, 73-4.
[86] Smith 1804.
[87] Smith 1804, VI – VII.

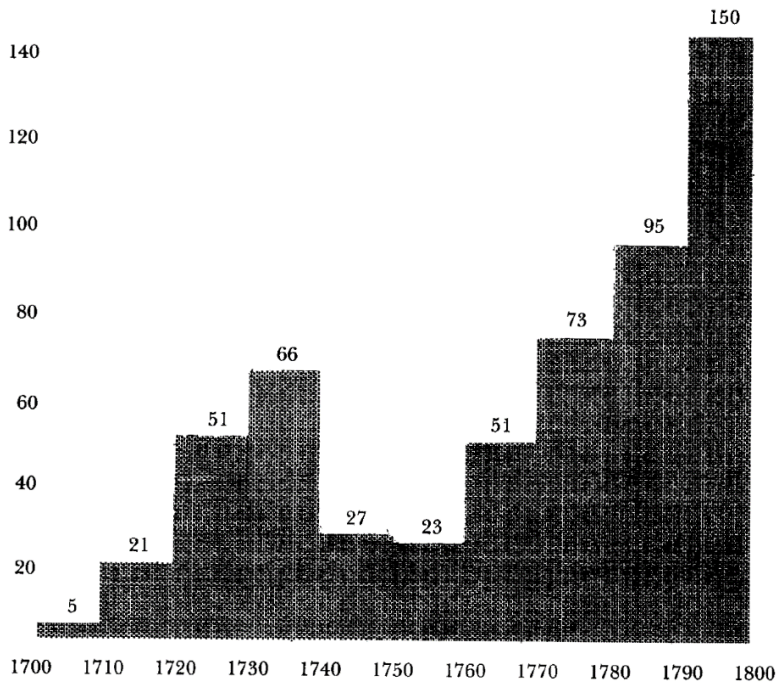

Fig. 3.1 *The Rate of Publication on Botanical, Horticultural, and Related Subjects,* in the 18th Century. Taken from Emerson 1982, 84.

This dramatic increase in plant imports, botanical publications, and general horticultural interest over the course of the 18th century can be explained in part by the introduction, quick adoption, and growing dominance of Linnean taxonomy in learned European circles. From its inception, the field of natural history had lacked a widely accepted classification system. It was regarded by some as lacking scientific rigor, as it was devoid of theory and generalizations. Horticulture was thus a "discipline" whose advancement of science was conducted only by the accumulation of yet more specimens and more data. Indeed, this sentiment can be seen in popular depictions of Joseph Banks and his assistant Daniel Solander, who having just returned from sailing around the world on Captain Cook's first voyage in 1771, were labelled "macaronis" by London caricaturists Mary and Matthew Darly 1772 (Fig. 3.2). The term macaroni had recently emerged with the travels of young men of means to Italy on the Grand Tour; where they were introduced to macaroni pasta, to which they took a liking. To refer to something as "macaroni"

initially signalled it as fashionable, and these aristocratic, travelled men even self-appointed themselves the "Macaroni Club." By the mid-18th century, the term had taken a pejorative turn, used to deplore inappropriate bourgeois excesses in dress and character – the macaroni became a precursor to the 19th century dandy.

Fig. 3.2 Joseph Banks as "The Fly Catching Macaroni" (left) and Daniel Solander as "The Simpling Macaroni" (right). 1772. Both images courtesy of the Trustees of the British Museum.

The Fly-Catching Macaroni (Banks) and The Simpling Macaroni (Solander) in Figure 2.2 exhibit characteristic attributes of macaroni fashion in the form of both men's bagwigs, and the sword at Banks' hip coupled with the plume tucked in his hat. There is no evidence that this fashion was adorned by the men off the pages of the Darlys' prints, or that their behavior resembled that

of macaronis. Indeed, Rauser argues that the intent behind the illustrations was less to ridicule the men than for the imagery to hint at their identity. Already scientists of renown, Banks and Solander were marked in these portrayals by unique attributes of their identity: Banks' straddling of the poles demonstrating his global ventures, and Solander holding up a plant specimen indicating his role as a naturalist. Rauser thus suggests that the manner of the men's depictions was more intended for the benefit of learned readers to feel like cultural insiders, rather than simply accusing Banks and Solander of being macaronis in the full sense of the term.[88] Nevertheless, the word "macaroni" surfaced again in reference to Banks in the faction-fighting within the Royal Society a decade later in 1783 and 1784, with his opponents describing the feud as "a struggle of the men of science against the Macaronis of the Society."[89] Though the Royal Society's longest sitting president, Banks' appointment to this position was not unanimously acclaimed. His chief opponent was Samuel Horsley, editor of Isaac Newton's works. Regarding Banks' seat as head of the Society, and by extension the fields of natural history and botany, Horsley spared no disagreeable words. He wrote: "science herself had never been more signally insulted, than by the elevation of a mere *amateur* to occupy the chair once filled by Newton."[90] In this context, the fast and widespread adoption of Linnaeus' classification system makes perfect sense, as it gave a sense of legitimacy to the discipline.[91]

The Imperialist Nature of Plant Collecting

Why did European empires collect and transport plants, seeds and bulbs across the world's oceans, regardless of the difficulties of doing so? The scale on which they operated from the 15th

[88] Rauser 2004, 112.
[89] Gascoigne 1994, 62.
[90] Gascoigne 1994: 62.
[91] Gascoigne 1994, 66.

century onwards may have been grander than ever before, but ecological transfers had taken place long before the Columbian Exchange. As far back as the 15th century B.C. in Egypt's XVIIIth Dynasty, Hatshepsut brought incense trees from Punt to Egypt. The Phoenicians, Etruscans, Greeks and Romans subsequently introduced and diffused trees, often fruit trees, of Chinese, Persian and Armenian origin like the peach, apricot, and almond tree across Europe.[92] In an influential 1974 article, Andrew Watson coined the term "Arab Agricultural Revolution," which he also later called the "Green Revolution."[93] In this article, Watson argued that between the years 700 and 1100, an agricultural revolution followed the expansion of the early Islamic world. By introducing a new set of crops from India and the conquered lands of the Sassanian empire, Arabs transformed agricultural patterns across the landscape. Watson highlights 17 plants whose movement he studied in detail, which includes 16 food crops and one fiber crop; rice, sorghum, hard wheat, sugar cane, cotton, watermelons, eggplants, spinach, artichokes, Colocasia (elephant ears), sour oranges, lemons, limes, bananas, plantains, mangos and coconut palms. The diffusion of these plants was wide for all except the mango and coconut palm, which could only be grown in tropical climes. Watson notes that this list is not comprehensive, as it does not include other food and fiber crops transported in the same period whose advances were difficult to trace in historical sources, nor does it include plants and trees used as sources of fodder, spices, condiments, medicine, drugs, cosmetics, perfumes, dyes, nuts, wood, and garden and ornamental plants.[94]

Watson's thesis attracted many critiques from historians and archaeologists alike who argued that he was mistaken in the presumption that some of these plants' first introductions in the

[92] Allain 2000, 9.
[93] Watson 1974, 1981 and 1983.
[94] Watson 1974.

Mediterranean belonged to the Islamic era; Asiatic rice, durum wheat, cotton and the artichoke in particular have been central to the ire directed at Watson's thesis. Michael Decker went so far as to state that "[the] Green Revolution thesis is therefore a simplistic, linear model of the movement of ideas and goods that fails to acknowledge the complexities of these transmissions, the correct range of their diffusion, and the real limits of their significance."[95] New scholarship, however, has given credence to Watson's thesis, arguing that critics were conflating the introduction and diffusion of plants, and that the discovery that some plants had been known in pre-Islamic times does not disprove the thesis, which "[…] presents the cumulative effect of diffusion across the Caliphate as decisive, and not in the micro-regional impact of a particular crop's first arrival or acclimatization. The revolution is in the process of widespread dissemination, not an event of introduction."[96] That is, the movement of plants across landscapes had been in effect long before the Columbian exchange, with multiple existing examples of significant introductions, though on a lesser scale.

Novel foodstuffs continued to be introduced to the European continent in the modern period, though more often as finished products rather than as plants intended for commercial cultivation. Coffee, tobacco, sugar, and other commodities were instead brought to, and grown, in the various empires' West Indian colonies. The colonies themselves also received new foodstuffs intended for cultivation and local consumption, a practice often directed at the feeding of enslaved labourers rather than the planter elite. Other times, alternatives to expensive comestibles were sought, such as ginseng from Canada to replace Chinese ginseng.

[95] Decker 2009,191.
[96] Squatriti 2014, 1210.

Additionally, plants and seeds also made their way out of Europe and across the world. On his 1793-94 voyage to locate islands off the western coast of the Americas, James Colnett planted celery, onions and turnips on the Cocos Islands and Socorro, and by the beginning of the 19th century potatoes were being harvested by American whalers on the Falkland Islands.[97] Such plantings were of great interest to Sir Joseph Banks on the voyage he undertook with Captain Cook, as were the similar gardens that Cook created in Tahiti. Though he would later become one of the strongest proponents of using botanical science in an imperial context, Banks was at the time less concerned with the political implications of growing European vegetables on Tahiti and more interested in whether the planting would succeed and if so, how and why.[98] He later refined his theories and believed that specimens from similar tropical environments could be grown interchangeably in completely different parts of the world as long as the ecological conditions necessary to their growth were met. It was realized that such plant transfers could significantly enhance the range of products in the colonies.[99]

In 1788, at the request of the British East India Company, Banks investigated the matter of growing tea in English colonies. Tea was exclusively acquired from China, and its trade was carefully controlled by the Chinese as it was their most important trade item. European merchants were only allowed to conduct business in Canton, in the province of Guandong on the southern coast of China abutting the South China Sea, and tea plantations were located in the north, away from prying eyes.[100] Regardless of the precautions taken by the Chinese, botanical and commercial espionage was rampant at the time. "Green gold" was jealously guarded by European powers, and the monopolies each held on certain natural resources and the secrets they kept led to the rise of

[97] Frost 1996, 66.
[98] Rigby 1998, 84.
[99] Mackay 1996, 47.
[100] Rigby 1998: 86.

bio-pirates. Spain famously closed the borders of South America to prevent other European powers from accessing resources such as the cochineal insect, prized for the rich red dye it produced when crushed.[101] The fight against bio-espionnage was often unsuccessful, and the British did attempt to grow tea in their own territories. Joseph Banks was consulted for this venture, and he specified an area in India between Bengal and Bhutan that had the right environmental conditions for this cultivation. It was an ill-fated pursuit at the time.[102] However, tea is now grown in India, an example that serves as a testament to the lasting impact of the movement of botanicals and the agendas of colonial empires.

New specimens in the form of living plants or seeds still made their way to Europe, though not as commercial crops. Some were collected for the sake of knowledge; in these cases, botanists recommended to send back both live plants and seeds, so that their whole life cycle could be observed.[103] In other cases, the collecting of rare and exotic plants became a symbol of power for upper classes across European cultures. In French politics, land management as a physical representation of wealth and power was uniquely expressed with Louis XIV's walking tours of the gardens at Versailles.[104] The use of plants as microcosms of empire was common to both the French and the English: they were a material, tangible representation of the colonial reordering of the world, its successful "refashioning of nature and its products to suit the needs of the metropolitan power and the centers of calculation it had created."[105] The Palm House at Kew Gardens is perhaps the best illustration of this metaphorical representation of the subjugation of nature and the European concept of universality (Fig. 3.3). Rather than re-creating a specific setting

[101] Schiebinger 2004, 35, 38.
[102] Miller 1996 (II), 31.
[103] Kury 1998, 86.
[104] Mukerji 2005, 20.
[105] Gascoigne 1996, 112.

Fig. 3.3 *The Palm House, Kew Gardens.* Published in *The Illustrated London News*, Aug. 1859. Wood engraving with hand colour.

with the botanical assemblages of British colonies like Jamaica or Tahiti, the Palm House was home to an idealized tropic, where the ecosystems of the East and the West Indies were joined into a kaleidoscopic, undifferentiated jungle.[106] This practice was not exclusive to the Royal gardens: the use of exotic plants as status symbols was possible for anyone wealthy enough to afford them. Tropical houseplants, though ubiquitous now, are an 18th century invention, which circulated in British culture both as imperial trophies and cultural capital, serving to signal one's sophistication and worldliness.[107] One can also observe the decontextualization of plant life in the early modern visual conventions of botanical illustration, with snapped twigs painted on a white background,

[106] Tobin 1996, 276.
[107] Tobin 2005, 6.

framed and removed from both ecological and cultural environments.[108] Though beautifully rendered and still rightfully admired as works of art today, these illustrations reinforce the statement of colonial rule over nature with the decontextualization of these plants' origins, and traditional uses and meanings, all further abstracted by the Linnaean system of taxonomy and the reduction of these plants to outsider-imposed names and categorizations.

Though the study and movements of plant life were hardly novelties of the 17th and 18th centuries, in this period the structuring of the production and dissemination of horticultural knowledge took on new forms, and were enacted on a previously unknown scale. The adoption of Linnean taxonomy resulted in a unified system of classification, which provided a framework that naturalized the imperial character of colonial botanical projects. This took the form of the decontextualization of plant life as mentioned above, as well as the global reconfiguration of ecosystems in the service of the economic and commercial interests of European powers. The British Crown-sponsored breadfruit voyages of 1787 and 1791 emerged in this context and could not have been realized without the underlying structures of the development of botany as a discipline and the establishment of wide-reaching networks of knowledge. Even then, the transfer of the breadfruit plant from Tahiti to the West Indies was a venture of a scale unlike any other attempted before. The logistics pertaining to the transportation of live plants are addressed in the following chapter.

[108] Tobin 2005, 171.

CHAPTER 4

The Transport of Live Plants Aboard Sailing Ships & the Establishment of Botanic Gardens

> With what affection then should we reverence the memory of a Sovereign to whose paternal solicitude for the welfare of his remote subjects it is owning that so many of the richest stores of the vegetable kingdom, transplanted from the happy islands, the delicious groves of the Southern hemisphere, now flourish in our climes, and are become denizens of our soil.
>
> L. Guilding, 1825.[109]

Discussions concerning the transportation of plants aboard wooden sailing ships across long distances would be lacking without a section dedicated to the logistics and challenges of such an endeavour. While the transport of seeds, cuttings, or herbariums presented difficulties – humidity, drought, or rot, among others – the conveyance of live plant and tree specimens across vast expanses of salt water for months on end was far more challenging. Even successful voyages such as Captain William Bligh's on *H.M.S. Providence*, which will be related in detail in Chapter 5, incurred considerable losses. Considerations for the transport of live plants at sea included providing sufficient light and air for the specimens but also coverage from the deadly salt spray of the sea; stores of freshwater dedicated solely to the watering of plants; and precautions to protect the specimens from vermin. Thus, the transportation of live plants was no easy feat unless one's collection was exclusively composed of succulents, epiphytic species such as certain orchids or ferns, or xerophilic species, like cacti – plants requiring little water and care to survive, some only needing to be stored in cardboard boxes for however many weeks until they could be planted again.[110]

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[109] Guilding 1825, 13.

[110] Schnell 1960, 44.

Epiphytes are organisms that grow on the surface of plants and derive their moisture and nutrients from the air, rain, water or from debris accumulating around them. A *xerophile* is an organism that grows in extreme environments with low water availability, like deserts.

Instructions de Voyage, or Treatises on the Transport of Specimens at Sea

As horticultural and botanical publications saw an astronomical rise in numbers in Britain over the course of the 18th century (as referenced in Chapter 2's Fig. 2.1), treatises on the transport of specimens at sea emerged alongside them. When the curators of botanical gardens in Europe came to desire more exotic plant specimens to grow their collections and governments enquired into the possibilities of introducing new foodstuffs to colonies, such writings on the logistics of the transportation of plants in all forms, from seeds to live plants, aboard ships were frequently referenced and translated. Though never an exact science, much was written about the transport of natural specimens, both faunal and floral, aboard sailing ships. One could even argue that the *instructions de voyage*, these travel instructions for naturalists, represented a literary genre.[111] Such texts supposed a goal of furthering the nation's knowledge to benefit the empire. These instructions were often issued to ship's captains, and were procured by amateur naturalists and professionals alike.[112]

One such famous treatise is the French botanist Henry-Louis Duhamel du Monceau's *Avis pour le transport par mer des arbres, des plantes vivaces, des semences et de diverses autres curiosités d'histoire naturelle* (1752), which translates to "Notice for the seaborne transportation of trees, of perennial plants, of seeds and of diverse other natural history curiosities."[113] Duhamel du Monceau proposed an exceedingly detailed record-keeping method for collected specimens, in which individual specimens were assigned a number, and tags referencing said numbers were attached to the plants, their boxes, and buried at the bottom of the crates to ensure no information was lost due to a lack of redundancy. These numbers were to be kept in a catalogue, along with

[111] Kury 1998, 65.
[112] Parsons and Murphy 2012, 513.
[113] Duhamel du Monceau 1752.

seven other pieces of information for each specimen: the French name for the plant used in its place of provenience, any foreign names, its "real" scientific name, qualities and uses, environment from which it hailed, time of year when picked, and any other relevant observations.[114] The time of year when it was picked was an important detail, as plants were not always gathered in ideal conditions, either when off-season or when expeditions were jumping from island to island, never staying in one place long enough to observe changes in the vegetation. This information, and the state in which plants arrived at their destinations could help determine in what stage of their development their transport was made the most efficient: palm trees, for examples, had a higher rate of survivability when transported as seeds.[115] Regarding the care of plants, Duhamel du Monceau posited that trees acclimated in nurseries for a period of two to three years had a better success rate at sea than those freshly collected from forests and groves. He felt that removing the native soil from around the plant's roots – though recommended by some – was harmful to the plants, and recommended the collection of additional soil from the plants' native lands in order to refill the pots as their level of dirt gradually collapsed over time.[116]

The English botanist John Ellis wrote similar instructions for voyages which were published two decades later, in 1770.[117] In his *Directions for Bringing Over Seeds and Plants, from the East-Indies and Other Distant Countries,* Ellis suggested adapting into plant cases the barrels and casks already aboard vessels.[118] Although a fine idea in theory, in practice it was a failure. Regarding the use of barrels as plant boxes, Duhamel du Monceau had already written: "Les cercles glissent ou pourrissent, le fond tombe, la terre se sépare, et tout ce qui est planté est

[114] Duhamel du Monceau 1752, 2-4.
[115] Bois 1911, 14.
[116] Duhamel du Monceau 1752, 9, 12, 19.
[117] Ellis 1770.
[118] Rigby 1998, 87-8.

perdu : le maniement et le transport en sont aussi beaucoup plus difficiles que ceux des caisses."[119] Their bottoms tended to rot and fall off, and they were less easily handled than crates, as they were originally intended to be rolled.[120] Duhamel du Monceau thus recommended the use of square boxes over round containers or barrels. In order to be easily handled by a pair of men even when filled with soil, he suggested the ideal dimensions of such crates or boxes should not exceed 2-2.5 feet (61-76 cm) in length, 15-18 inches (38-46 cm) in width, and about 2 feet (61 cm) in height.[121]

Shipping methods varied with the composition of the shipment. Plants in all their forms were collected by naturalists, and all presented different preservation difficulties on long voyages at sea. When collecting fruits, James Petiver suggested the following in his *Brief Directions for the Easie Making and Preserving Collections* (1709): "All large pulpy moist Fruit that are apt to decay or rot, as Apples, Cherries, Cowcumbers, Oranges, and such like, must be sent in Spirits or Pickle, as Mangoes, &c. and to each Fruit, its desired you will pin or tye a sprig of its Leaves, and Flowers."[122] When pressing flowers, he suggested periodically shifting the specimens into fresh books to prevent the rotting of either the plants or the books.[123] Such transportation methods aimed to keep specimens in a state of equilibrium. Over the years, other methods and containers were suggested for this purpose, with varying success rates. Tubers and trees were packed dormant in peat, and seeds were said to be best stored in air-tight bottles, coated in beeswax or sugar, or dried and kept in papers. This last method was preferred by the naturalist Joseph Banks, though he was once blamed for losing such a shipment of seeds when the paper they were kept in got damp, and

[119] Duhamel du Monceau 1752.
[120] Duhamel du Monceau 1752, 17.
[121] Duhamel du Monceau 1752, 24.
[122] Petiver 1709.
[123] Petiver 1709.

they did not germinate.[124] Contemporary recommendations for shipping containers to store seeds, bulbs, and cuttings, included an imaginative range of materials, including wood, metal, glass, bamboo, clay, canvas and leather shaped into flasks, vases, pots, bags or boxes.[125] The specimens were then often stored in live plant cases to maximize space and prevent damage by vermin or the crew.

The Evolution of Plant Boxes

Wooden boxes and cases were used from the onset for the transport of live plants. They evolved over the centuries into increasingly efficient, though never foolproof, containers. Allain distinguished five different categories of such cases: *caisses de jardinier* (gardener's cases), *caisses grillagées* (wire mesh cases), *caisses fermées* (closed cases), *caisses de Ward* (Wardian cases) and *caisses ordinaires* (ordinary cases).[126] The first type, the *caisse de jardinier*, was described in 1762 in the abridged Trévoux dictionary as "… un coffre carré, ouvert par le haut, que l'on remplit de terre, et où l'on plante des orangers, des grenadiers…"[127] These were square boxes open at the top, with handles on the sides to move them, and sometimes covered in a wire-mesh cage tall enough to not inflict damage on the plants within (Fig. 4.0). Their dimensions varied with the size of the specimens they contained. The same sort of basic tub was described in John Fothergill's short paper, *Directions for taking up plants and shrubs and conveying them by sea* (1796).[128] These directions were for ship captains rather than botanists, with the boxes intended to be made from material on board the ship by the carpenter. Additionally, gardener's cases were

[124] Rigby 1998, 84.
[125] Allain 2000, 62.
[126] Allain 2000, 43.
[127] Allain 2000, 43.
[128] Fothergill 1796.

Fig. 4.0. Coffee plant in a gardener's case, watered by Clieu on his voyage to the Antilles.

often constructed on legs a few centimeters tall to avoid them sitting in the water washing up on deck, to prevent the rotting of their bottom, and to facilitate the drainage of excess water out of the cases.[129]

The next category of cases, the *caisses grillagées*, were short lived. Only used between the years 1765 and 1790, their sides were open and protected by wire mesh to let in sunlight, with panels that could be drawn closed in inclement weather. They were expensive to build and were soon replaced by closed cases (*caisses fermées*).[130] These were similar to mariners' chests, and usually employed for plants on long voyages. They were also called *caisses de Thouin*, "Thouin's

[129] Allain 2000, 38.
[130] Allain 2000, 47.

cases."[131] The closed case evolved into the Wardian case in the 19th century. Invented by the London-born physician Nathaniel Bagshaw Ward (1791-1868), it was a sealed glass-panelled case that would stay closed throughout the voyage at sea – a precursor to the modern terrarium. Ward shared his discovery that plants could still thrive in a sealed environment as long as they had light and appropriate moisture in the British *Botanical Magazine* in May 1836, and it did not take long for his theories to be tested and put into effect. Though showing a much greater success rate than any of the preceding variations of cases, Wardian cases were expensive and extremely heavy; they were often worth more than their contents. They were reserved for valuable specimens, and others would be transported in *caisses ordinaires*, or ordinary cases (Fig. 4.1). Often made according to demand and for single voyages, they had to be transportable by only two men when full, quickly and efficiently. They also needed to accommodate a large number of live plants, either dormant or in a state of vegetation.[132]

Shipboard Hazards to the Health of Plant Specimens

Plants were rarely a ship's primary cargo, as most captains were reluctant to take on tubs of plants and boxes of seeds which competed for space with goods that were more profitable and less troublesome.[133] They needed to be out of the way of the daily maneuverings of the ship, out of the way of salt spray, easily moveable to the hold in case of storms or attacks, but still needed air and sunlight, among other considerations.[134] When captains did take on plants, it was not uncommon for entire cargoes of plants to be lost. Voyages could last months or even years when ships sailed from Europe to Asia and back again, allowing plenty of opportunities for the plants to be damaged.

[131] Romieux 2004, 410.
[132] Allain 2000, 50-57.
[133] Parsons and Murphy 2012, 513.
[134] Allain 2000, 35.

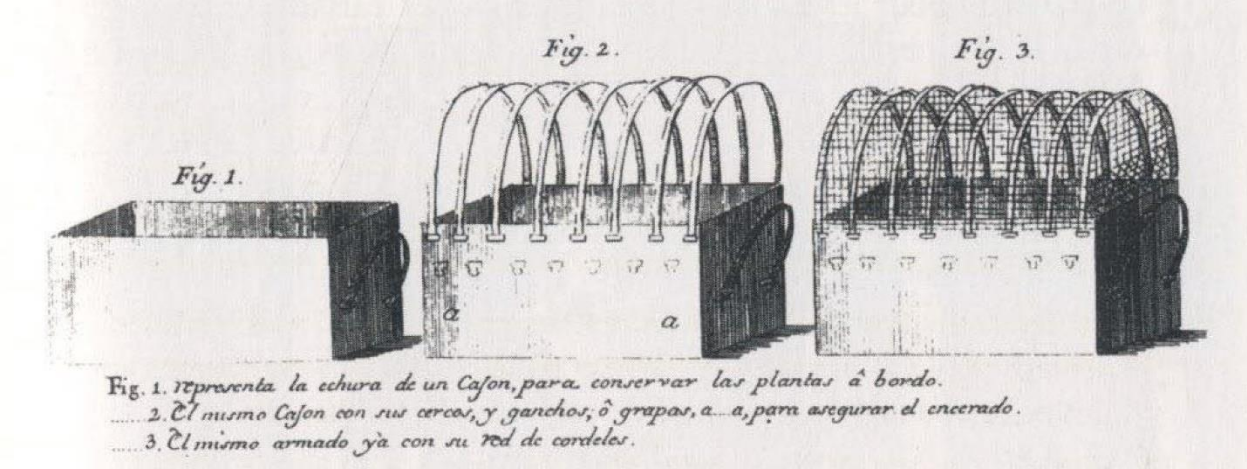

Fig. 4.1. *Caisses ordinaires*, ordinary cases (18th century). From Allain 2000, 57.

When the French attempted to transfer spice plants from Île de France to South America for further distribution in the Caribbean in the 1780s, only 15 out of 400 plants survived.[135] J. Ellis also mentions that in most cases fewer than one in fifty plants survived voyages from the East Indies.[136]

As few ships were specifically designed for the transport of plants, the safest storage location on the ship was the captain's cabin. There they could be exposed to light from the windows and watered with relative ease while being shielded from salt spray and other potential hazards.[137] Some unfortunate specimens travelled uncomfortably on ships' decks, sustained only by recommendations such as Fothergill's to draw canvas over the tubs in bouts of foul weather to protect from salt spray.[138] Other ships were modified for live plant transportation. These modifications included small greenhouses built on deck when the captain's cabin could not be used. One such "small coach" was built on Banks' orders on board *HMS Guardian* for its voyage to Australia's Botany Bay in 1784. No plans of this greenhouse survive, but similar structures were

[135] McClellan III and Regourd 2011, 347.
[136] Ellis 1770.
[137] Rigby 1998, 93.
[138] Fothergill 1796.

built for Captain George Vancouver's *Discovery* in 1791, for *HMS Investigator* and *HMS Porpoise* in 1801, as well as for a few East India Company ships. These cabins were glazed to let in sunlight but keep out the salt and the cold. They improved the survivability of plants dramatically, but still needed constant attention.[139] The ships of Captain William Bligh's breadfruit voyages in 1787 and 1791, *HMS Bounty* and *HMS Providence*, are prime examples of vessels modified to carry a cargo composed only of living plants; these voyages and ships will be addressed in detail in the following two chapters.

Beyond access to light and protection from the elements, an appropriate supply of fresh water was critical to the health of living plants aboard ships. According to their mode of transportation – in open or closed cases, transported individually or with multiple plants per case – plants needed half a liter to three liters of water daily.[140] Rainwater was collected on board ships for the plants, and experiments were made starting from the beginning of the 18th century to distill salt water, though it was not until 1836 with Rocher and Peyre's distilling apparatus that potable results were achieved.[141] When rain was scarce or other troubles led to the rationing of water, the well-being of sailors took precedence over the plant life. In extraordinary circumstances, individuals shared their own limited water rations to save botanical specimens: the French captain Gabriel de Clieu is said to have done so for two coffee plants he carried to Martinique in 1720.[142]

Another shipboard hazard to which plants fell prey was that of pets and pests. The elementary form of the first plant cases – gardener's cases – meant they were particularly vulnerable to the activities and appetites of ships' fauna, including but not limited to rats, cats,

[139] Rigby 1998, 95-96.
[140] Allain 2000, 29.
[141] Romieux 2004, 413.
[142] Allain 2000, 28.

dogs, and monkeys. The resemblance of such crates to cats' litter boxes did not escape Banks' notice. He commented in his writings that as cats had the habit of burying their excrement, they should not be let anywhere close to the plants.[143] The fight against vermin took many forms, some more radical than others. The Spanish naturalist Ortega suggested to mix up the plants' soil with broken glass; how this would not in itself damage the plant specimens is unclear.[144] Others did not go quite as far, recommending instead that packages and cases be covered in or exposed to vapours of sulphur, turpentine, camphor, or tobacco.[145]

Much was done to mitigate possible damages to plant specimens during their transit on the open ocean, but the efficacy of these solutions was nonetheless limited. Networks of botanical gardens for the nursing, acclimatization, and propagation of plants were thus established by empires across their overseas territories to aid in the transport of colonial flora.

Networks of Gardens

Europe's first botanical gardens were founded in the 16th century. [146] These early gardens served primarily as "physic" gardens, or repositories of *simples*, medicinal plants. They were often attached to universities and hospitals, providing teaching spaces for physicians and apothecaries to learn medical botany. Two centuries later, more than 1,600 botanical gardens assisting colonial scientific enterprises had been established around the world. Networks of these gardens stretched from the East to the West Indies, where Britain's first botanical garden in the New World was founded on the island of St. Vincent in 1765.[147] The function of these gardens had by then moved

[143] Rigby 1998, 88.
[144] Ortega 1779.
[145] Allain 2000, 31.
[146] Schiebinger 2004, 57-58; McClellan III 1992, 148; Schiebinger and Swan 2005, 13.
[147] Schiebinger 2004, 57-58; McClellan III 1992, 148; Schiebinger and Swan 2005, 13.

beyond the sole cultivation of medicinal plants, into the international commercial and scientific spheres. New crop, commodity, or curiosity specimens benefitted from the gardens as spaces of rehabilitation, study, and propagation. Thomas Dancer, the island botanist in Jamaica, wrote in 1804: "The necessity of a botanical garden for promoting the knowledge of plants in general, and for the introduction and cultivation of exotics that are rare, curious, and useful, whether in medicine or the arts, is, in the present, age, so universally apparent, that there is hardly in any part of the civilized world wanting some such establishment."[148]

In the French context, many plants were destined for the King's Garden in Versailles. To nurse sea-transported specimens back to health before they undertook a land journey in horse-drawn carriages, coastal botanical gardens were established in port cities, including Nantes, Lorient, Brest and Rochefort.[149] Royal gardens were also established in the French colonies: on Île-de-France (1735, 1748), Île Bourbon (1769), Guadeloupe (1707, revived 1775), Louisiana (1728), Port-au-Prince (1777), Cayenne (1778), New Jersey (1786) and South Carolina (1787).[150] The state-funded botanical infrastructure and intercontinental botanical system of Old Regime France was one not easily rivaled.

In Britain, botanical ventures – commercial, scientific, or otherwise – were more often private than state-sanctioned and sponsored. Voyages were funded by wealthy individuals, companies, or scientific societies. As early as 1758, advertisements for botanical prizes ran in the *Transactions of the Society of the Arts*, the publication of the organization founded in 1754 by William Shipley in London known alternatively as the Society of the Arts, Royal Society of Arts, Royal Society for the Encouragement of Arts, Manufacture and Commerce, and currently Royal Society for Arts,

[148] Dancer 1804, 3.
[149] Romieux 2004, 414.
[150] McClellan III and Regourd 2011, 106.

Manufactures and Commerce (RSA).[151] The Society offered rewards for the successful cultivation of medicinal and profitable commercial plants and establishment of nurseries for crops from Asia and other faraway lands in the West Indies. The first of these prizes was "a gold medal for the first person bringing mango seeds to England to be sent to the West Indies for planting."[152] By 1760, the list of coveted plants had grown to include olives, opium, cinnamon, nutmeg, mace, sarsaparilla, aloe, safflower, indigo, cotton, annatto, vanilla, cloves, pepper, camphor, quinine, various other tinctorial plants and ornamental woods.[153] This scheme was meant to circumvent time and costs sunk into the voyages of trade ships around the globe to acquire spices and other coveted botanicals, by instead growing them in British colonies. Similar in climate to the tropical zones of Asia and Oceania, and a half-world closer to Europe, the West Indies were perfectly suited for the task. Though other botanical gardens would emerge and eventually overtake the one in St. Vincent in importance, the following section focuses on Britain's first botanical garden in the West Indies, as it is of special relevance to Captain William Bligh's breadfruit voyages. Indeed, it is to the St. Vincent Botanic Garden that Captain Bligh's cargo of live breadfruit trees and other exotic plants should have arrived in *Bounty* had the first voyage not ended in mutiny, and it is to St. Vincent again that part of the cargo was first delivered in the West Indies upon the successful completion of Bligh's second voyage.

[151] Howard 1954, 381. The Society of the Arts earned its Royal prefix in the Edwardian Era in 1908, when George V, Prince of Wales was its president (1901-1910).
[152] – "Premiums by the Society, Established at London, for Encouragement of Arts, Manufacture and Commerce" 1758, 262.
[153] Howard 1954, 381.

The St. Vincent Botanic Garden

It is within the framework of society prizes that the Botanic Garden of St. Vincent was established in 1765 (Figs. 4.2, 4.3). Initially, individual colonists in the West Indies sought to win the Royal Society's prizes for their own personal economic gain: they would not only win the prize money but also would have a monopoly on the cultivation of the newly imported crop. A project to benefit all the colonies and its inhabitants rather than individuals was the idea of General Robert Melville, the first Governor of the Windward Islands – the federation of islands composed of Grenada, St. Vincent, Dominica, and Tobago, ceded to the British Empire in 1763 following a treaty with France.[154] In 1765 Melville met Dr. George Young, principal medical officer stationed on the island of St. Vincent, and suggested the establishment of a garden not unlike that of Kew back in England. Melville wondered if Dr. Young would take charge of its care. The idea was met with enthusiasm, and soon Melville cleared 20 acres (8 hectares) of land at his own expense about a half-mile (0.8 km) north of Kingstown, the island's main settlement. The garden would provide medicinal plants for the military and serve as a repository of plants for potential new herbal cures and treatments. In a letter from Melville to Young dated 1766, the general suggested he talk to "natives of experience, and even old Caribs and slaves who have dealt in cures" to aid in his research.[155]

In 1773, less than a decade after the establishment of the garden, Dr. Young wrote a report of his progress, which he submitted to the Society of Arts. For his success in establishing the St.

[154] Howard 1954, 382.
[155] Howard 1998, 12.

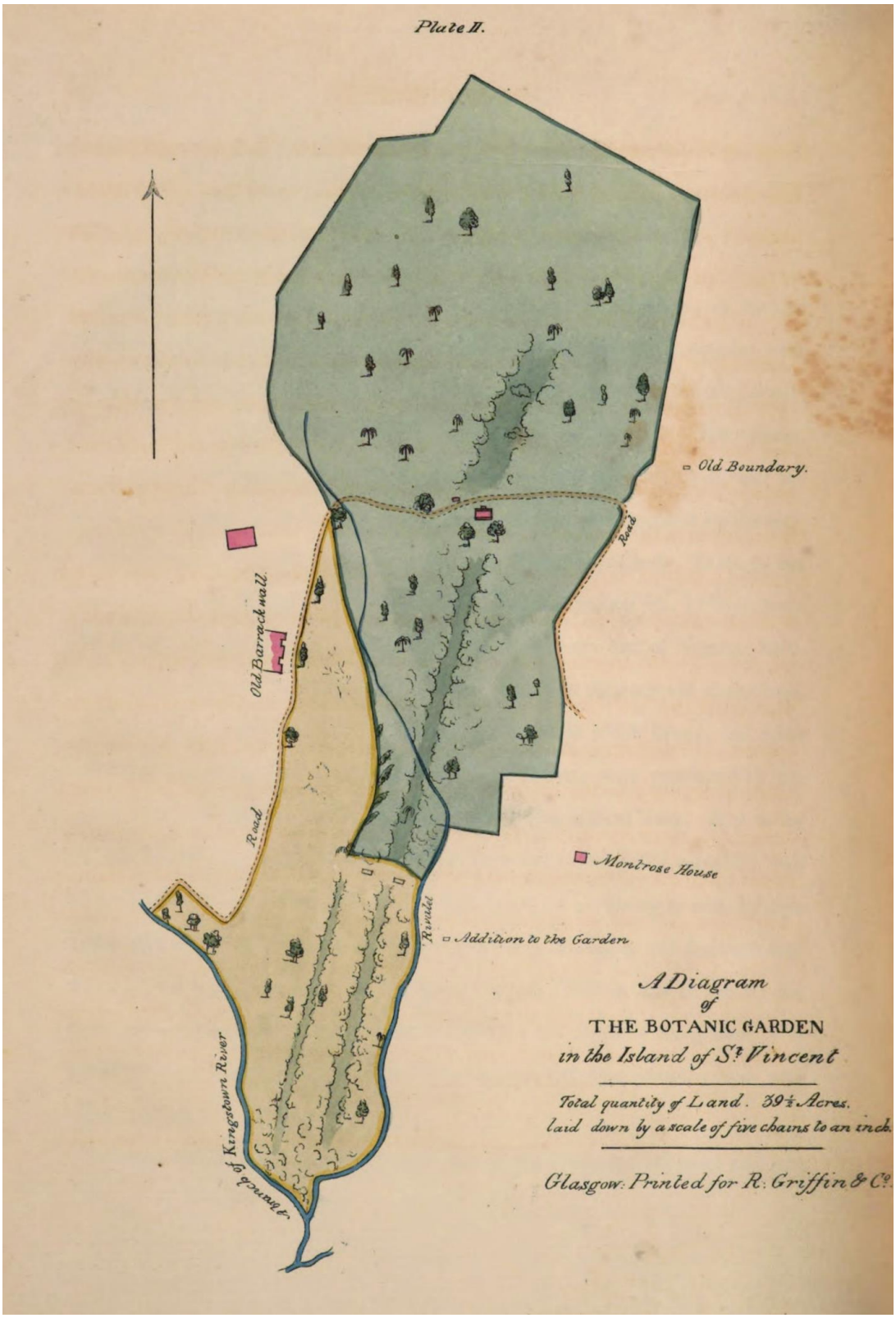

Fig. 4.2 *A Diagram of the Botanic Garden in the Island of St. Vincent.* Guilding 1825, Plate II.

Fig. 4.3. *Botanic Garden from the bottom of Central Walk*, Guilding 1825, Plate I. An illustration of St.Vincent's Botanic garden.

Vincent Botanic Garden in the West Indies and for having 140 healthy cinnamon, mango, and nutmeg trees, among other plants, Dr. Young was awarded 50 guineas and a gold medal.[156]A few years prior, John Ellis, fellow of the Royal Society and Agent for Dominica, visited the recently established botanical garden and offered his support in his treatises, published in London in 1770, *Directions for Bringing Over Seeds and Plants from the East-Indies and Other Distant Countries in a State of Vegetation*.[157] Of the various East Asian plants which Ellis described, the breadfruit

[156] Wood 1912, 93-100. Guilding 1825, 6.
[157] Howard 1954, 382.

stands out. In 1775, he published another work – again to the benefit of the St. Vincent Garden – and once again providing detailed descriptions of the breadfruit and mangostan, and instructions for their transport from the Pacific Ocean to the West Indies.[158]

The success of the St. Vincent Botanic Garden did not go unnoticed, and Jamaica's planters clamored for the establishment of a garden of their own. In 1775, the property of Endfield, near the city of Kingston, was purchased for that purpose by Sir Basil Keith, governor of the island. Keith summoned the botanist Dr. Thomas Clarke from England to take charge of the new gardens. Clarke arrived that same year and brought with him to introduce to the island the China tea plant, camphor, litchi, and the sago palm as an ornamental, among others. The hillside land at Enfield proved to be unsuitable to the establishment of a proper garden, and in 1778 a new plot of land was purchased near Bath. The official establishment of a government botanic garden in Jamaica thus took place in 1779.[159]

With the onset of the American Revolution in 1775, the St. Vincent Garden was neglected until the end of the conflict. The island's government was forced to surrender in 1779 when combined Carib and French troops defeated the local military force, and St. Vincent was occupied from 1780 to 1783, after which it was returned to the British by the Treaty of Versailles. During this brief period of French rule, the Botanic Garden found an unexpected benefactor in General François Claude Amour, Marquis de Bouillé, commander of the French forces in Martinique. An old friend of both Sir Joseph Banks and General Melville, de Bouillé took an interest in Dr. Young and his work. He encouraged the continued development of the garden, even going so far as to procure new plants from French colonies to increase Dr. Young's collection.[160] In 1783, with

[158] Ellis 1775.
[159] Fawcett 1897, 346.
[160] Howard 1954, 384.

England no longer at war, Alexander Anderson succeeded Dr. Young as the garden's superintendent.[161] Determined to bring the garden back to its former glory and more, Guilding noted: "Every exertion was made, as well by private individuals as by the authorities in England, to render his Majesty's Botanic Garden of St. Vincent the source from which valuable plants might be spread over to adjacent islands."[162] Seeds and plants were received from the War Department and the East India Company, and from ships that travelled to tropical India, British North Borneo, and Sabah and Sarawak in the East Indies.[163] In 1782, a French ship with a cargo of living plants destined for Martinique and Haiti was captured by Lord Rodney's Royal Naby squadron, and sent as a prize to the new garden in Jamaica instead. Specimens sent from this cargo to Dr. Anderson in St. Vincent after the peace included mango, cinnamon, plum, mangosteen, jackfruit, screw pine, and woman's tongue tree (*Albizia lebbeck*). A few years later, around 1787, cloves and several new varieties of cinnamon were introduced to St. Vincent from the neighbouring French island of Martinique in a continuation of the exchanges initiated by General de Bouillé during the period of occupation.[164]

In 1798, Anderson compiled a list of all the plants growing in the botanical garden, which had by this time expanded to an area of thirty acres (12 hectares). For this catalogue and his upkeep and development of the garden, the Royal Society awarded Anderson a medal and a prize. A few years later Anderson published an even larger catalogue of the garden in the *Transactions* of the Royal Society, listing 1,170 different plant species. He died in September of 1811, leaving the garden in the hands of William Lockhead.[165] When Lockhead died in 1815, he was succeeded by

[161] Guilding 1825, 6.
[162] Guilding 1825, 10-11.
[163] Howard 1998, 12.
[164] Howard 1954, 384.
[165] Howard 1954, 386.

George Caley. Upon Caley's resignation but a few years later in 1819, most of the plants were transferred to Trinidad where a garden was built the previous year. The St. Vincent Garden was maintained until 1884, but then went to seed. Local demand for the re-establishment of the garden began sometime in 1884, and it was reopened in 1890 as part of a larger botanical and agricultural scheme.[166]

The Botanic Gardens of St. Vincent (now St. Vincent and the Grenadines) are still standing, and one of the island's most popular attractions. Part of the National Parks Rivers and Beaches Authority, the Gardens' mission today focuses on the introduction and propagation of ornamentals and fruits like mango and citrus varieties.[167] A later addition to the gardens, the Nicholas Wildlife Aviary complex, plays a role in animal conservation with its breeding program for the St. Vincent parrot, *Amazona guildingii*, a vulnerable species endemic to the island. Celebrations were planned for the Gardens' 250th anniversary in 2015, including a re-enactment ceremony in commemoration of Captain William Bligh's bringing of the breadfruit tree to St. Vincent aboard *HMS Providence*, and a special issue of postage stamps depicting scenes from the garden and its history. The latter does not seem to have come to fruition as no commemorative booklets of stamps for the Gardens can be found for the year 2015, though stamps were issued in 1965 for its 200th anniversary (Fig. 4.4). The depiction on these stamps of not only the gardens, but of the breadfruit and *HMS Providence* – the latter of which was depicted in another set of stamps issued in 1981 – underline the lasting historical importance of Bligh's botanical voyages on this small Caribbean island. Institutions such as the St. Vincent Botanic Garden, dotting the line between the Earth's continents, allowed all manner of botanical ventures to introduce living plants to Britain's royal gardens and

[166] Howard 1954, 388.
[167] http://botanicalgarden.gov.vc/botanicalgarden/

other destinations. It was only with the invention of the more effective Wardian case, and with the development of improved road transportation and railway systems that these gardens lost their essential role in the acclimatization and rehabilitation of live plants.[168]

Fig. 4.4. St. Vincent postage stamps from 1965 depicting the Botanic Gardens, breadfruit, and Captain Bligh's ship *Providence*. Image from *Stamps For Collectors From The Alexis Connection*.

[168] Allain 2000, 97.

CHAPTER 5

Initial Interest and the First Breadfruit Voyage, 1787-1789

> I now unhappily saw that nothing could be done to effect the recovery of the ship: there was no one to assist me, and every endeavour on my part was answered with threats of death.
>
> William Bligh, 1790.[169]

Why breadfruit?

However useful breadfruit was to sailors travelling in the South Seas, and however much their accounts contributed to European understandings of breadfruit as a reliable food source, these factors alone do not explain the sudden late 18th century interest in having it brought to Britain's West Indian colonies as a staple crop. Rather, breadfruit was suddenly perceived to be of value when the need arose for a cheap and dependable food to sustain starving enslaved workers on British plantations in the Caribbean.[170]

The origins of Captain William Bligh's breadfruit saga can be traced to a confluence of environmental and political crises, from hurricanes to the American Revolutionary War (1775-1783). Disease and famine as a result of these events and calamities took a heavy toll on the West Indies' enslaved African labour. In August of 1784, a British planter by the name of Simon Taylor wrote to his brother in England. He was desperate, as for the past three months the island of Jamaica on which he resided was the victim of "some Evill Genious": crops were destroyed by storms, timber was scarce, food supplies were threatened, and unless the situation changed, all seemed destined to ruin.[171] Planters in Jamaica, hoping to gain any access to food while waiting

[169] Bligh 1790, 17.
[170] Newell 2010, 1.
[171] Newell 2010, 147.

for sufficient provisions to be brought from England, wrote a memorial to their governor requesting he lift the trade interdiction with the former colonies. The governor wavered, torn between his allegiance to the King and the planters' immediate needs. The planters let themselves despair, and Taylor wrote to his brother: "[…] if the importation is not allowed we must inevitably Perish or bring in Provision without Permission and indeed if some Intercourse is not opened with America we must throw up the Sugar Estates into Provision Grounds and Penns or Migrate with our Negroes to the French Islands."[172]

In the period between 1772 and 1786, several requests had been made by planters for the introduction of the breadfruit tree. Unsurprisingly, turning productive revenue-producing sugar cane fields into fields growing staple foods was an unappealing idea for the planters, more so considering that locally-grown foods for feeding enslaved workers were largely cassava, taro and plantain, the cultivation of which necessitated considerable amounts of space and time.[173] A solution to the planters' predicament, then, was thought to be found in breadfruit. Though originating from the islands of the South Pacific, the plant was presumed to be well adapted to the West Indian climate. It was said to spread rapidly while taking up little space, to be resistant to the high winds of hurricanes – common place and destructive in the Caribbean islands – and to require almost no cultivation while bearing nutritious fruit nearly all year-long. Hinton East, a planter from Jamaica, expressed these generally held views in a letter to Sir Joseph Banks in 1784:

> The acquisition of the best kind of the Breadfruit wou'd be of infinite Importance to the West India Islands in affording exclusive of variety, a wholesome and pleasant Food to our Negroes, which wd. have this great Advantage over the Plantain Trees from whence our Slaves derive

[172] S. Taylor to Sir J. Taylor from Kingston, 9 Aug. 1984. Institute of Commonwealth Studies, London (TAYL/1A).
[173] Howard 1953, 88.

> a great part of their Subsistence, that the former wou'd be rais'd with infinitely less labour and not be subject to be destroy'd by every smart Gale of Wind as the latter are.[174]

If this evaluation of the breadfruit sounds too good to be true, it was. Few domesticated plants can truly thrive without some level of attention, particularly those grown to provide produce. Additionally, because breadfruit bears no seeds and requires propagation via suckers, it could not easily be procured by the colonies, as potted plants were notoriously difficult to keep alive on sailing ships of the period. The proposed trans-ocean transplant required considerable investment of minds, time, and capital. Not to be deterred, the British Crown willingly rose to the challenge.

French interest in breadfruit

A deciding factor in the British pursuit of breadfruit was the belief that the French had already established the trees in the Caribbean, thus they thought themselves to be at an economic disadvantage. The French did indeed also have a keen interest in introducing breadfruit to their colonies. In 1772, the French naturalist Pierre Sonnerat introduced seeded breadfruit collected in the Philippines to the Indian Ocean island of Isle de France (Mauritius). This type of breadfruit was initially considered by European naturalists to be a wild variant of the seedless breadfruit. Both had been given the scientific name *Artocarpus communis* (the seedless breadfruit would later be renamed *Artocarpus altilis* as discussed in Chapter 1), though they had different common names. The British called the seeded breadfruit "breadnut," while the French called it "chataigne."[175]

[174] Mackay 1974, 61-77.
[175] Leakey and Roberts-Nkrumah 2016, 36.

Breadnut reached Jamaica in 1782 when a French ship with a cargo of plants travelling to Martinique was captured by the British. Among the plants, some that were thought to be breadfruit were sent as a prize to the colony, as the planter Matthew Wallen wrote in a letter to Banks in 1784.[176] That same year, Hinton East, another Jamaican planter with his own private plant collection who received some of these supposed "breadfruit" trees. He wrote to Banks: "I have two other plants that came from the Isle of Bourbon supposed by some to be the breadfruit, but I am extremely doubtful as they do not in the shape of the leaf by any means correspond to the account and drawing given by Mr. Ellis. The acquisition of the best kind of breadfruit would be of infinite importance to the West India islands."[177] Indeed, these were breadnut plants, the fruit of which was never accepted as a food source in Jamaica.[178] The breadnut was also introduced to St. Vincent between 1779 and 1783 when the island fell under French control; the plants were gifted to Alexander Anderson, superintendent of the St. Vincent Botanic Garden at the time.[179] Breadnut and breadfruit are in fact two very different plants, and it is the latter that British planters desperately wanted brought to their islands.

The British obsession with breadfruit at this time has been termed a "collective national madness".[180] In April 1772, on the eve of his departure on a second Pacific journey, Sir Joseph Banks received a letter from Valentine Morris, Governor of St. Vincent and himself an important planter.[181] In this letter, Morris enquired "whether there was no possibility of procuring the bread

[176] Leakey and Roberts-Nkrumah 2016, 36.
[177] Sheridan 1989, 37.
[178] Leakey and Roberts-Nkrumah 2016, 36.
[179] Leakey and Roberts-Nkrumah 2016, 36.
[180] Newell 2010, 143.
[181] The first of these journeys (1768-1771) was achieved on *H.M.S. Endeavour* and was the first of Captain Cook's voyages. Banks' permission to accompany Cook on his second journey aboard his new ship *Resolution* was, however, withdrawn at the last moment.

tree, either in seed or plant so as to introduce that most valuable tree into our American Islands."[182] While plant transfers were hardly new, no large-scale operation to transport a shipload of living specimens from the Pacific to the Caribbean had ever been accomplished, or even attempted, at the time. Such a venture would provide Britain with the opportunity to showcase to the world a never-before-seen feat: to send a ship around the world and turn it into a successful plant nursery. It is important to note that such a voyage, and the introduction of such a quantity of plants to the West Indies, could only be entertained because of the botanic garden established in St. Vincent in 1765. Without the existing infrastructure to rehabilitate and propagate the plants, a venture of this scale would not have been worth attempting.

In 1775, in support of the interest shown in migrating breadfruit to the West Indies, the naturalist John Ellis submitted a paper in which he provided a detailed description of breadfruit along with drawings of specialized boxes and accompanying notes on the manner of its transportation aboard ships to the Admiralty. That same year, the recommendation to introduce breadfruit and the offering of a prize for the successful completion of this feat was accepted by the government's West India Committee. This prize requirements were advertised to ships travelling to the South Seas, that they might pick up plants during their travels and bring them along on their return voyages. Not to be outdone, the Society of Arts also announced a prize for the introduction of breadfruit to the West Indies the next year: a gold medal, or a prize of 50 pounds for the period between 1778-1780.[183] Requests continued to be made from planters in the West Indies, particularly from Jamaica, as the food shortage situation remained dire. Sir Joseph Banks was to be the link between the planters and the British Crown: in 1784, East and Wallen petitioned King

[182] Newell 2010, 148.
[183] Leakey and Roberts-Nkrumah 2016, 36.

George III through Banks. Three years later, in 1787, Banks' request to the government to mount an expedition with the sole intention of collecting breadfruit was approved.[184]

Sir Joseph Banks

The activities of British natural historian and botanist Sir Joseph Banks have already been discussed in Chapter 2 of this thesis, but a closer look at his life is warranted here in light of his central role in the famous breadfruit voyages. Banks was born in London in 1743 into a wealthy family (Fig. 5.0). By the young age of 23 he had already obtained memberships in the Society of the Arts and the Royal Society, the latter of which he served for 40 years as president beginning in 1778. He was a friend and advisor to King George III and is credited for the royal gardens at Kew's blossoming into the world epicenter of economic botany.[185] Indeed, the collection and redistribution of economic plants for the betterment of the empire and its subjects lay at the core of Banks' lifework. His early studies in botany at Oxford were followed by a series of tours and voyages in which he amassed an impressive collection of natural specimens. During a 1766 voyage to Newfoundland and Labrador, Banks gained valuable experience in the collection and transport by sea of mineral and live floral and faunal specimens.[186] He then accompanied Captain James Cook on his first voyage of discovery to the South Seas on *H.M.S. Endeavour* from 1768 to 1771. Banks was advised by an acquaintance prior to his departure to pay particular attention to the breadfruit tree while on his travels.[187] He did, writing about the abundance of breadfruit on the island of Tahiti:

[184] Leakey and Roberts-Nkrumah 2016, 36-37.
[185] Leakey and Roberts-Nkrumah 2016, 32.
[186] Leakey and Roberts-Nkrumah 2016, 34.
[187] Gascoigne 1994, 91.

Fig. 5.0 *Joseph Banks*, oil on canvas by Benjamin West (1773). Usher Art Galley, Lincoln, UK

> […] scarcely can it be said that they earn their bread with the sweat of their brow when their chief sustenance Bread fruit is procured (sic) with no more trouble than that of climbing a tree and pulling it down… if a man in the course of his lifetime plant 10 such trees, which if ite were done might take the labor of on hour or thereabouts, he would as completely fill his duty to his own as well as future generations as we natives of less temperate climates can do by toiling in the cold weather to sew (sic) and in the heat of summer to reap the annual produce of our soil… benevolent nature has not only supplyd them with the necessaries but with abundance of superfluities… Bread fruit from what I can find, remains in season only 9 or 10 of their 12 months so that a reserve of food but be made for those months when they are without it.[188]

Banks returned from the Cook expedition a famous man, and he had every intention of sailing with Cook again on his second voyage to the South Seas, but permission to sail was rescinded when his list of required scientific personnel and equipment was deemed unreasonable. The last sailing voyage he made outside of the British Isles was to Iceland and the Isle of Wight in 1772 aboard the brig *Sir Lawrence*. Nevertheless, though Banks had stopped travelling beyond Britain himself, he was invariably consulted whenever voyages of discovery were mounted.[189] He was described by his peer Charles Burney (1726-1814) as the "Patron and Friend to all deserving Circumnavigators."[190]

Banks corresponded with residents of St. Vincent and Jamaica in the 1770s and 1780s; his fame, his renown, and his position as the King's advisor in matters concerning the Royal Garden at Kew made him an obvious choice of patron for the planters. It seems that the first concrete

[188] Leakey and Roberts-Nkrumah 2016, 35.
[189] Chambers 1999, 41.
[190] Chambers 1999, 41.

suggestion for importing the breadfruit to the Caribbean to address food shortages in the colonies was the work of Prime Minister Pitt, in a conversation with Banks.[191] Though he never returned to the South Seas, Banks maintained an interest in the breadfruit and Tahiti, and became the main organizer of William Bligh's breadfruit voyages. Pitt and Banks discussed the possibility that the ships transporting the first convicts to Botany Bay in Australia in 1787 could, on their return journey, transport breadfruit specimens back to the West Indian colonies. This project was abandoned when the logistics of constructing suitable plant boxes in the new colony proved too difficult; in a letter addressed to Charles Jenkinson, Banks discussed how outfitting an expedition for the sole purpose of conveying the breadfruit to the West Indies would in fact be more economical than diverting the return voyage of the vessel sent to Botany Bay, as the necessary modifications to be made to the ships to render them useful in the mission of transporting live plants "[could] be done better & cheaper here than abroad."[192] Bligh's first voyage was prepared instead.

The First Breadfruit Voyage: *H.M.S. Bounty* and its Mutiny

With the assistance of associates, Sir Joseph Banks was responsible for the main decisions regarding the voyage, namely the choice of the ship, choice of the captain, modification of the ship for transport of the plants, and selection of gardeners for the expedition. Captain William Bligh's previous experience sailing in the West Indies, in the Pacific for scientific purposes with Cook, and his keen interest in natural history qualified him to lead the breadfruit expedition.[193] He was appointed commander of *H.M.S. Bounty* on August 16th, 1787. A vessel of nearly 215 tons, *Bounty*

[191] Chambers 1999, 1.
[192] Chambers 2000, 86.
[193] Leakey and Roberts-Nkrumah 2016, 37; Howard 1953, 88.

measured 90 feet, 10 inches (27.50 m) in length, 24 feet, 3 inches in breadth (7.4 m), and its depth of hold under the beams at the main hatchway was 10 feet, 3 inches (3.25 m).[194] The ship was bought from Duncan Campbell, a trader in the West Indies with whom Bligh had previously been employed; one of five vessels selected for Banks' consideration, *Bounty* was chosen with Bligh's recommendation.[195] Initially masted in accordance with the British Navy's proportions, Bligh had the masts of *Bounty* shortened for the expedition, reasoning that a lofty rig was unnecessary for a voyage such as theirs. Additionally, he lessened the quantity of iron and other ballast, giving directions that only nineteen tons of iron should be taken on board rather than the customary forty-five tons for a vessel of this size. Bligh judged the stores and provisions sufficient to serve as ballast, as he was wary of the ship being unstable in storms or other rough weather when overladen. The ship's great cabin was appropriated for the storage and upkeep of most of the breadfruit trees to be taken on board in the South Sea (Fig. 5.1). It had two large skylights and three scuttles for air on each side of the cabin, to provide both sunlight and air circulation to the room, vital conditions for keeping floral specimens alive and healthy. The cabin's deck was covered with lead – presumably to keep the planking from rotting under the soil-filled pots and crates carrying the plants, though Bligh does not specify in his account – and pipes were affixed at the foremost corners of the cabin to carry off any excess water draining from the plants into tubs located below, to be recycled for future use. Copious quantities of water were necessary for the plants, which also needed "[…] to be washed from the Salt dampness which the Sea air will deposit upon them."[196] Items such as watering cans were provided for the care of the plants, and a stove was installed in

[194] Bligh 1792, 1.
[195] Leakey and Roberts-Nkrumah 2016, 37.
[196] Chambers 2000, 83.

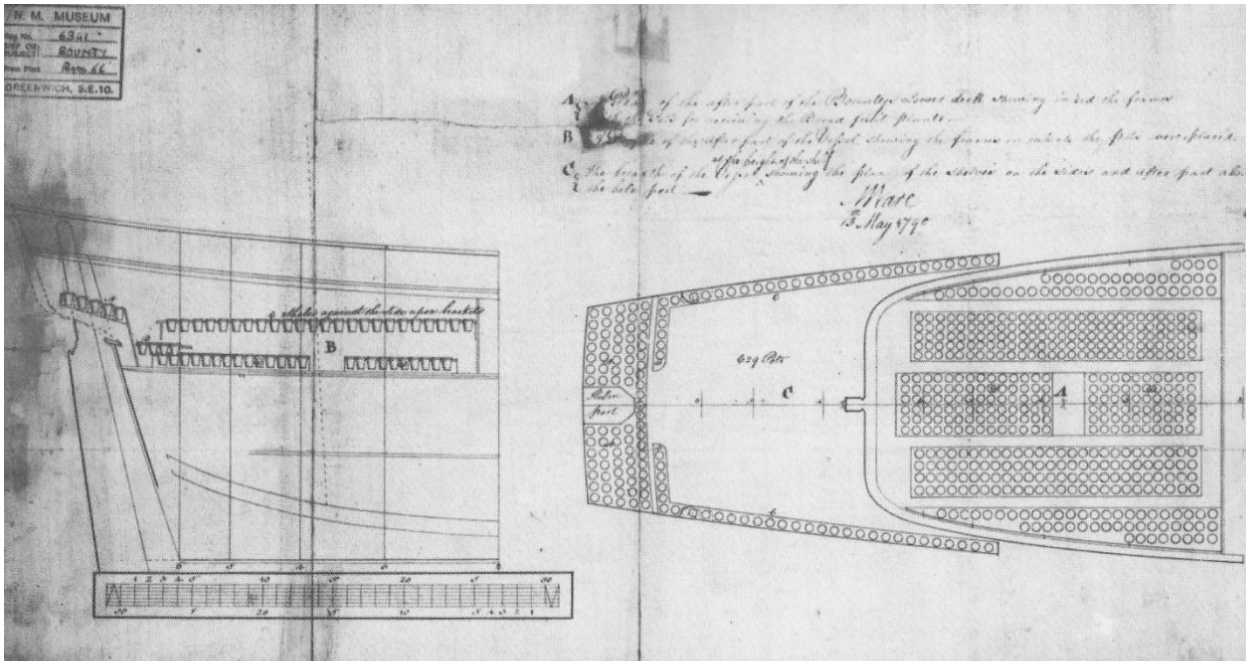

Fig. 5.1 Admiralty plan of the stern cabin of Bounty for the arrangement of plant pots. Image courtesy of the National Maritime Museum (neg: 6341/66DR).

the great cabin to keep its climate temperate for the plants even when rounding the Cape in the biting cold.[197] Additional instructions were provided by Sir Joseph Banks:

> It is necessary, therefore, that the Cabin be appropriated to the sole purpose of making a kind of Greenhouse, & the key of it given to the Custody of the Gardiner… No Dogs, Cats, Monkies, Parrots, Goats, or, indeed, any animals whatever must be allowed on board, except Hogs & Fowls for the Company's use; & they must be carefully confined to their coops. Every precaution must be taken to prevent or destroy rats as often as convenient… As poison will constantly be used to destroy them & Cockroaches, the Crew must not complain if some of them who may die in the ceiling make an unpleasant smell.[198]

[197] Mackay 1974, 71.
[198] Chambers 2000, 83-4.

A crew of 44 men and officers was appointed for this voyage, with an added two horticulturalists from Kew Gardens selected by Banks to tend the ship's plants. These were David Nelson, who had held a similar position on Captain Cook's last expedition, and William Brown who served as Nelson's assistant. This brought the total number of men on this first breadfruit voyage to 46, a small number compared to Bligh's crew on *H.M.S. Providence* a few years later. The ship was stored and victualled for 18 months with the expectation that they would be dropping anchor in various places along the way to replenish water stores and acquire fresh food. Bligh's task, as appointed by King George III, was to take on as many useful plants and breadfruit trees as necessary from the Pacific island of Tahiti (Otaheitee), following the route rounding Cape Horn at the southernmost tip of the South American continent. Noting that all other voyages to the South Seas had been of an exploratory nature, Bligh was proud to state that "This voyage may be reckoned the first, the intention of which has been to derive benefit from those distant discoveries."[199]

Captain William Bligh first published an account of the mutiny on board *Bounty* before he penned the full account of his breadfruit voyage to the Pacific; the following narrative is derived mostly from these two accounts by Bligh.[200] On the morning of Sunday, December 23rd, 1787, *H.M.S. Bounty* sailed from Spithead in Portsmouth on the south coast of Britain. Though the first few weeks of the Atlantic crossing went smoothly, it did not take long for bad weather to strike. On Monday, February 4th, Bligh wrote:

> Had very heavy rain; during which we nearly filled all our empty water casks. So much wet weather, with the closeness of the air, covered everything with mildew. The ship was aired below

[199] Bligh 1792, 5.
[200] Bligh 1790; Bligh 1792.

> with fires, and frequently sprinkled with vinegar; and every little interval of dry weather was taken advantage of to open all the hatchways, and clean the ship, and to have all the people's wet things washed and dried.[201]

Bligh still managed to keep a generally happy crew, and from his writings seemed to genuinely care about his men's well-being. It wasn't until a month later, on March 10th, that Bligh doled out his first punishment for insubordination. The seaman Matthew Quintal was corrected with two dozen lashes for insolence and mutinous behavior, the first such incident on *Bounty*. About a fortnight later, Tierra del Fuego came within their sight. However, by mid-April, due once again to the whims of the weather, the ship had still not managed to round the Cape and enter the Pacific. The rains were both so heavy and so consistent that Bligh noted on April 12th that the ship had to be pumped every hour, and as the decks became leaky, space was allotted in the great cabin for sailors to hang their hammocks, providing more space in the between-decks for everyone's comfort. Not only were they not making enough progress, at the end of each day *Bounty* was losing ground. The following day, the violent motion of the ship in the storm caused the cook to fall and break a rib, and another man to dislocate his shoulder. The gunner was laid up with a rheumatism, the first sickness to appear on the voyage. On April 22nd it was decided, to the joy of all on board, to abandon the South American passage and head instead for the Cape of Good Hope. The sick men now numbered eight, all affected with rheumatic complaints, but otherwise the crew was "in good health, though exceedingly jaded."[202]

The Table Mountain of the Cape of Good Hope came within sight on May 22nd, and on the 24th, they dropped anchor. *Bounty* required extensive caulking, as well as repairs on its sails and

[201] Bligh 1792, 23.
[202] Bligh 1792, 34.

rig: it was 38 days before they were ready to set sail again. During this stay Bligh and the gardeners procured some plants which would be valuable in Tahiti and the various places they would land on their way to the Polynesian Islands, adding to the collection of British plants they had on board for this purpose. They sailed on July 1st, 1788, for Tasmania. There they stopped briefly to plant some of the trees picked up from Africa and gather fuel wood.[203]

The first fatality was James Valentine who died on October 9th, due to an asthmatic complaint. *Bounty* finally came in sight of Tahiti on the evening of Saturday, October 25th. Knowing that they would spend a considerable amount of time on the island and that it was expected his men would engage in relationships with the local women, Bligh ordered that every person be examined by the surgeon before they set foot on land. He "had the satisfaction to learn, from his report, that they were all perfectly free from any venereal complaint."[204]

The ship anchored the following day. Natives came to meet the crew, and they immediately enquired about Captain Cook (who established a good relationship with the Tahitian Islanders), Joseph Banks, and some other of their former friends. News had reached the island via a passing ship that Cook was dead, though the circumstances of his passing remained unknown. Bligh instructed his crew to not share the details of this story with the natives, to avoid any unnecessary tensions.[205] Shortly thereafter, Nelson and his assistant were sent out to look for plants and reported that the object of their mission – securing the breadfruit for the West Indian colonies – would likely be easily accomplished. The purpose of the *Bounty*'s journey was kept concealed from the islanders, "lest it might enhance the value of the bread-fruit plants, or occasion other

[203] Howard 1953, 88.
[204] Howard 1953, 59.
[205] Captain Cook's demise was met at the hands of native Hawai'ians in 1779 during his third visit to the island, following a strain in their relationship.

difficulties."[206] Bligh was waiting for the right opportunity to broach this subject with the local chief; he did not have to wait long. In a conversation with Tinah, the local ruler, Bligh asked if his people would not send something to King George in return for the goods the British had brought to the island, as a token of their thanks. Tinah acquiesced enthusiastically, relishing the opportunity to establish a relationship with such a powerful king. In his enumeration of the different articles in his power to send, the breadfruit was mentioned. Bligh seized his opportunity, making it known the breadfruit trees would make a fine gift for King George; Tinah promised a great many should then be put on board, not expecteding the King of England would be so easily pleased. Bligh and his crew thus had the natives' blessing to collect the plants as well as their assistance, which was much welcome as they understood the method of taking and pruning them which would keep the breadfruit trees strong and healthy.

By Saturday, November 8th, barely a fortnight after their arrival on October 25th, 252 breadfruit trees had been collected, and the renovations made to the ship's cabin to accommodate the large shipment of plants had been completed. About a week later, 12 of the plants were taken on board to discover where on the ship they would thrive best. At this point, everything was going smoothly and according to plan. By early January, however, stirrings of unrest were felt. On January 5th, the small cutter of the ship was found missing, along with three men – two seamen and one corporal. They had taken arms and munitions and deserted to a neighbouring island. They were retrieved a fortnight later when they gave themselves up, not having enjoyed their time in the wilderness and away from the security of the ship. The following week, Bligh punished another crew member

[206] Bligh 1792, 67.

with 19 lashes for striking a native. By the end of January, preparations were under way for the return voyage. Bligh wrote in his diary:

> This morning I ordered all the chests to be taken on shore, and the inside of the ship to be washed with boiling water to kill the cockroaches. We were constantly obliged to be at great pains to keep the ship clear of vermin… By the help of traps and good cats, we were freed from rats and mice.[207]

This did not quell the unrest, as the ship's cable was found to have been cut in the night on February 6th. Bligh's initial suspicions fell onto strangers who had been coming to visit from other parts of the island; he wrote in his account that it only occurred to him much later that this action was likely the work of his own men, reluctant to leave the island and seeking a resolution without confrontation by allowing the ship to drift ashore.

The removal of the plants to the ship started almost two months later, on the afternoon of Friday, March 27th (Fig. 5.2). By the 31st, all the plants had been loaded: a total of 1,015 breadfruit plants, accompanied by several other native plants stored in 774 pots, 39 tubs, and 24 boxes. A week later, on April 4th, 1789, *Bounty* slipped its moorings and left Tahiti behind. By the 27th, the voyage had "advanced in a course of uninterrupted prosperity."[208] This changed on the early morning of the following day, when Captain Bligh was awakened before sunrise by Master's Mate Fletcher Christian, the master-at-arms, the gunner's mate, and a seaman who came into his cabin and seized him, tying his hands behind his back and threatening instant death if he spoke or made the least noise. This threat did not keep Bligh from calling out loudly when seized, though to no avail, as the mutineers had already secured

[207] Howard 1953, 89.
[208] Bligh 1792, 153.

Fig. 5.2 Transplanting of the Bread-Fruit-Trees from Otaheite. Painted and engraved by Thomas Gosse. London, 1796. Image courtesy of the National Library of Australia.

the officers who were not of their party by placing sentinels at their doors. This mutiny had been a well-kept secret: Bligh and Christian were on good terms, and even had plans to share a meal together that day. None of the people removed from the ship had been the wiser about the event.

A total of 19 people were sent off on the *Bounty*'s boat: Bligh, the ship's master, acting surgeon, botanist, gunner, boatswain, carpenter, master's mate, two midshipmen, two quartermasters, the sailmaker, two cooks, a quartermaster's mate, the boy, butcher, and the clerk.

Most of the seamen remained on board, including the botanist's assistant William Brown, and various other mates and midshipmen totalling 25 people (Fig. 5.3). As he was forced out of the ship, Bligh asked Christian if this was any way of repaying the friendship he had extended to him. The mutineer is reported to have answered: "That, - Captain Bligh, - that is the thing; - I am in hell – I am in hell."[209]

Fig. 5.3 The mutineers turning Lieut. Bligh and part of the officers and crew adrift from His Majesty's Ship the Bounty. Engraved and painted by Robert Dodd, 1790. London. Image courtesy of the State Library of New South Wales

[209] Bligh 1790, 25.

Now stuck on an open boat with barely enough space for all the castaways to sit, Bligh's first determination was to secure a supply of water and breadfruit at the nearby island of Tofoa, and to sail for Tongataboo from there. The mutineers had not sent them off empty-handed, but the provisions they provided – 150 pounds (68 kg) of bread, 16 pieces of pork weighing two pounds (0.9 kg) each, six quarts (5.7 lt) of rum, six bottles of wine and 28 gallons (106 lt) of water – would not be enough to sustain 19 adult men for very long. Not only did Bligh and his men make it to Tofoa, but 41 days after leaving the island they reached the coast of Timor in June of 1789. In total, the men had travelled 3,600 miles (5793 km) in *Bounty*'s open boat. It is nothing short of extraordinary that not a single life had been lost on this excruciating journey. Upon their arrival, Bligh and his men were taken under the care of the residents of the Dutch settlement of Batavia, where they regained some of their strength. In October, Bligh wrote the following note to Sir Joseph Banks:

> You will know, Sir, with all your generous endeavours for the public good, see an unfortunate end to the undertaking; and I feel very sensibly how you will receive the news… To those, however, who may be disposed to blame, let them see I had in fact completed my undertaking… I had most successfully got all my plants in a most flourishing and fine order… I even rejected carrying stock for my own use, throwing away the hen-coops and every convenience. I roofed a place over the quarter-deck and filled it with plants, which I looked at with delight every day of my life.[210]

Having recovered his strength, Bligh sought passage on a ship to England and returned in March of 1790. Some of his officers and people stayed behind for a while longer and were provided with passages in the first ships back to Europe. At the time of Bligh's departure, all were in good

[210] Howard 1953, 89.

health. All would not, however, live to depart Batavia. Of the 19 men who were forced into the launch boat by the mutineers, 12 eventually made it back to England.

As for the mutineers, a detailed account of what befell them is beyond the scope of this research.[211] They eventually settled on Pitcairn Island, far east of Tahiti, and destroyed any evidence of *Bounty*, thus binding them to the island. *Bounty'*s mutiny has lived on in the public imagination, overshadowing the mission of the voyage itself – to bring breadfruit to the West Indies – and the eventual success of this mission with Bligh's second voyage to Tahiti. Readers may be aware of the 1984 film *The Bounty*, starring Anthony Hopkins as Captain Bligh and Mel Gibson as Fletcher Christian, but four other films about *Bounty*'s mutiny preceded it. The first was the Australian silent movie *The Mutiny on the Bounty* by Raymond Longford, in 1916, followed by another Australian film in 1933, Charles Chauvel's *In the Wake of the Bounty* with Errol Flynn's screen debut as Fletcher Christian. In 1935, Clark Gable took on the role of Christian and Charles Laughton as Bligh in MGM's *Mutiny on the Bounty*, and in 1962, from the same studio in a film with the same title, Marlon Brando portrayed the lead mutineer. None of these films were vying for authenticity, nor were any particularly concerned with the ship's mission to transplant the breadfruit. Rather, the mutiny took precedence in their storylines, and the drama between Captain Bligh and Fletcher Christian was emphasized.[212] Countless books have also been published about the Bounty's mutiny, from Bligh's own account of the events published in 1790 to various novelizations across time.[213] *Lloyd's Weekly Newspaper*, a London paper published every Sunday, notably featured a serial romance novel starring Fletcher Christian from June to August 1897. *The Mutineer: A Romance of Pitcairn Island* by Louis Becke and Walter Jeffery had 36 chapters with

[211] For an account of the voyage of the ship sent out to retrieve the mutineers, *H.M.S. Pandora*, see Hamilton 1793.
[212] For a more in-depth discussion of these films as well as Bligh's portrayal through the ages, see Dening 1992.
[213] Bligh 1790.

titles the likes of “Mine, and Mine Alone” and “Together Again”, in which Christian’s romantic involvement with an island girl was played against Captain Bligh’s tyrannical rule.[214] *Bounty*’s mutiny has lived on in the public imagination, likely an effect of the publicity the event garnered at the time with *HMS Pandora*’s mission to retrieve the mutineers and bring them to justice. Consequently, the goal of *Bounty*’s voyage – to gather breadfruit and transplant it in the West Indies – has faded to the background. Few know of the second expedition outfitted for the same purpose, organized by the Crown and sent out but a year after Bligh’s return to England, and once again captained by him. The voyage of *HMS Providence* and *HMS Assistant*, from the years 1791-1793, and its successful outcome, will be the subject of the following chapter.

[214] Becke and Jeffery 1897.

CHAPTER 6

Captain Bligh's Second Breadfruit Voyage: The Successful Expedition of *H.M.S. Providence* and *H.M.S. Assistant*, 1791-1793

> […] a floating garden transported in luxuriance from one extremity of the world to the other.
>
> Letter to William Bligh, 1793.[215]

The Second Breadfruit Voyage

Only a few months after Captain William Bligh's return to England in March 1790, plans to send him back to Tahiti were being formulated. Apropos of this second breadfruit voyage, Sir Joseph Banks wrote the following in a letter to a member of the House of Assembly in Kingston, Jamaica in 1791: "It is difficult, in my opinion, to point out an undertaking really replete with more benevolence, more likely to add comforts to existing people, and even to augment the number of those for whom the bounties of creation were intended, than that of transporting useful vegetables from one part of the earth to another where they do not exist."[216] Bligh was cleared of blame for the mutiny of the *Bounty* at a court martial in October 1790 and received orders for a new breadfruit expedition in March 1791.[217] Though his first experience may have ended in disaster, it made him better qualified than all others to lead the second voyage. He was familiar with the Pacific, with Tahiti, its people, language, and customs, as well as with rearing plants on board a ship during long voyages.

[215] Letter from governor of St. Helena to Captain William Bligh prior to their departure for St. Vincent with the cargo of breadfruit plants from Tahiti.
[216] Gascoigne 1994, 204.
[217] Newell 2010, 160.

The second voyage's narrative can be gleaned from the correspondence of the expedition's botanist-gardener, James Wiles, with Sir Joseph Banks, as well as from a book written by Lieutenant George Tobin (1768-1838) based on his journals from his time serving Bligh on the *Providence*.[218] Though Bligh himself wrote an account of the expedition, it was never published.[219] In this chapter, the voyage's narrative is largely derived from George Tobin's writings. The son of a sugar planter and pro-slavery campaigner, Tobin was a naval officer and artist from Salisbury, England. He entered the navy in May 1780 at the age of twelve as a captain's servant on *Namur*, a ship bound to the West Indies and on board of which he participated in the Battle of the Saintes in 1782. This was the start of a long career at sea, with Tobin taking on other assignments and rising through the ranks. In April 1791, he was made third lieutenant of the ship *Providence* for Bligh's second breadfruit voyage. As the expedition's official artist withdrew from his assignment, Tobin also took on the role of principal illustrator. *Providence* came back to England in 1793, and Tobin continued both his career in the navy and his artistic hobby, recording moments at sea in sketches and watercolours for posterity on his most eventful assignments until the end of his life. He was made commander of the sloop *Dasher* in 1798 and became captain in 1802. He then went on to capture French ships as the captain of *Princess Charlotte* (later renamed *Andromanche*) from 1806 to 1813. Tobin was promoted rear-admiral of the White in January 1837, a little over a year before his death in April 1838.[220]

Captain Bligh's Second Chance is Tobin's memoir of Bligh's second breadfruit voyage, which took place from 1791 to 1793 from London to Tahiti and back, rounding the Cape of Good Hope on both legs of the voyage. This account combined nautical and naturalist observations, with

[218] Tobin 2007 (1791-1793).
[219] Powell 1977, 395.
[220] Small 2004 (2008).

Tobin's commentary and paintings of the plant life and wildlife he encountered (Fig. 6.0). He dabbled in anthropological observations as well, describing at length the people of Tahiti whose sexual customs offended his European sensibilities, but which he still sought to rationalize and understand. A character one would have expected to figure more prominently in this account but who is strangely erased is *Providence*'s captain, William Bligh. It does not appear to be out of any sort of resentment Tobin had for Bligh, as the few mentions he makes of him are positive. Nevertheless, Bligh is but a distant figure in this account of his most notable voyage. Tobin's primary target audience for this memoir was his brother James, whom he repeatedly asks to pardon his nautical language as he identifies passing sailing ships, anchorages, and notes *Providence*'s position and compass variations at every change of location. It seems, however, that Tobin had a larger audience in mind for his musings. Though used primarily as a tool for self-reflection – unhappy sailors aboard *Bounty* chose to mutiny, Tobin put pen to paper to squelch his discontent – it is likely he desired his writings and illustrations to be published upon *Providence*'s return. This unfortunately was not done in his lifetime. His journal and artistic renditions were seized by the navy upon the expedition's return to England and filed in their archives, not to be seen by the public until only a few years ago when the manuscript was edited and published in 2007.[221]

[221] Tobin 2007 (1791-1793), 15.

Fig. 6.0 Wildlife illustrations by George Tobin, 1792. Image courtesy of Mitchell Library, State Library of New South Wales, Australia.

Outfitting the Second Voyage

In this second installment of the breadfruit voyages, the British government spared no expense and expanded the scale of the expedition, having realized that the first attempt five years prior had been severely under-equipped. Two copper-clad ships set sail on August 3rd, 1791: *HMS Providence*, captained by Bligh, and *HMS Assistant* to accompany it, captained by Lieutenant Portlock (Fig. 6.1). *Providence* was a new West Indiaman built at William Perry's yard at Blackwall.[222] At about 400 tons burden, it was almost double the size of *Bounty*. The ship was manned by a complement of 134 men, among whom were 23 officers; no doubt Bligh, an educated

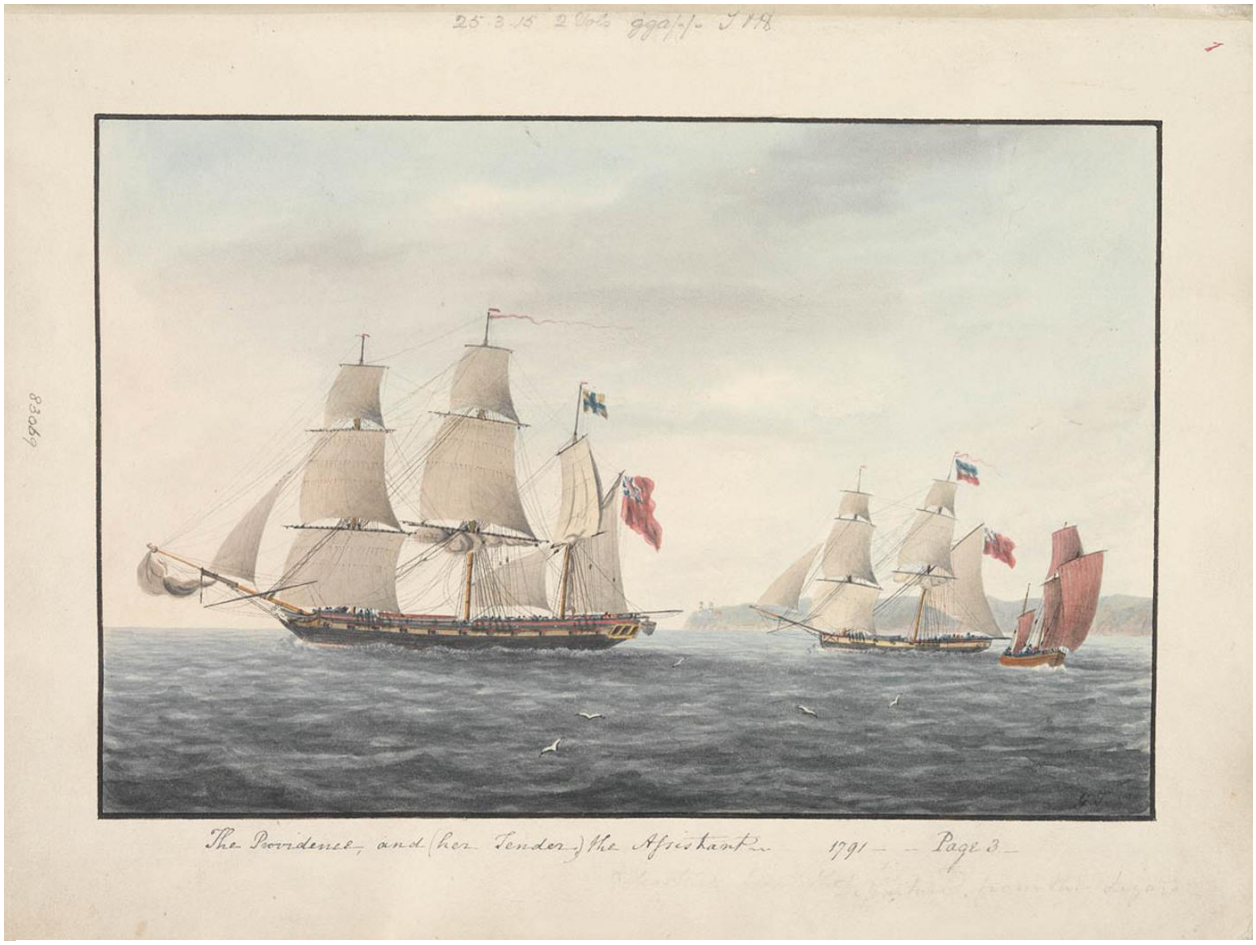

Fig. 6.1 The *Providence* and (her Tender) the *Assistant*. Illustration by George Tobin, 1791. Image courtesy of Mitchell Library, State Library of New South Wales, Australia.

[222] Tobin 2007 (1791-1793), 16.

and inquisitive man, found himself in better company here than on *Bounty*. The brig *Assistant* was rated at 110 tons, its crew 27 men. An detachment of 20 marines accompanied the expedition.[223]

The botanist-gardeners were once again selected by Banks.[224] These were James Wiles, who had worked at Kew Gardens, and Christopher Smith. Indeed, Banks can be considered as the chief architect of this expedition. Both Bligh and Wiles were tasked with sending Banks reports documenting the various plants taken on aboard at Tahiti, and those collected and delivered at every leg of their voyage, continuing even after the final delivery of the breadfruit plants at St. Vincent and Jamaica.[225] Before the expedition set sail from the shores of England, Banks sent instructions to Wiles pertaining to the care of plants aboard ships. One letter dealt with their watering:

> As watering with Rain water is observed to be more conducive to the health of Plants than with that which has been long kept in Casks, you must, whenever it rains in moderate weather, set open the top gratings & Lights, that the plants immediately under them may receive the rain. You must also give your assistance, under the direction of the Commanding Officer, to catch rain water in proper vessels to water the rest, & procure a supply for future use, as rain water, tho it may taste of Tar, will always be better for the Plants than any other that can be procured.[226]

Additionally, every attention was paid by the officers of the dockyard at Deptford to make the ship as commodious as possible. Frames and other conveniences were fitted for the carrying of plants

[223] Powell 1977, 390.
[224] Chambers 2000, 134 – 39.
[225] Leakey and Roberts-Nkrumah 2016, 37-8.
[226] Chambers 2000, 135. Letter from Banks to James Wiles, 25 June 1791.

after embarking them from Tahiti, and had Tobin complaining that "as the whole of the after-cabin was allotted to them, it encroached in a great measure on our accommodations."[227]

Outbound Voyage

The vessels reached Spithead on July 16th, 1791, where the crew was completed before they sailed out into the Atlantic.[228] Rather than attempt the passage around Cape Horn as *Bounty* had done in 1787, *Providence* and *Assistant* rounded the Cape of Good Hope (Fig. 6.2). By October, they had reached the Cape. By then it had become clear that *Providence* held a considerable sailing advantage over *Assistant*, which made the men fearful that the vessels would need to part ways on the return voyage as great haste was necessary to get the plants back on land. Alterations were made to *Assistant*'s masts and sails at the Cape, increasing its speed to nearly that of *Providence*.[229]

As with *Bounty*, the expedition had left England with plants to exchange for local flora and to plant along the way wherever they anchored. At the Cape, for example, 240 trees were picked up to bring to Tahiti, and three nectarine trees were left behind. The *Assistant* left England with a horseradish plant, and over the course of the voyage accumulated other specimens including figs in two iron pots from the Cape, ten potato plants and two melon or pumpkin plants from Tasmania. In all these containers Lt. Portlock had sown cress seeds, which he hoped would keep his men in good health by supplying them with "salading."[230]

[227] Tobin 2007 (1791-1793), 16.
[228] Tobin 2007 (1791-1793), 17.
[229] Tobin 2007 (1791-1793), 28.
[230] Powell 1977, 391.

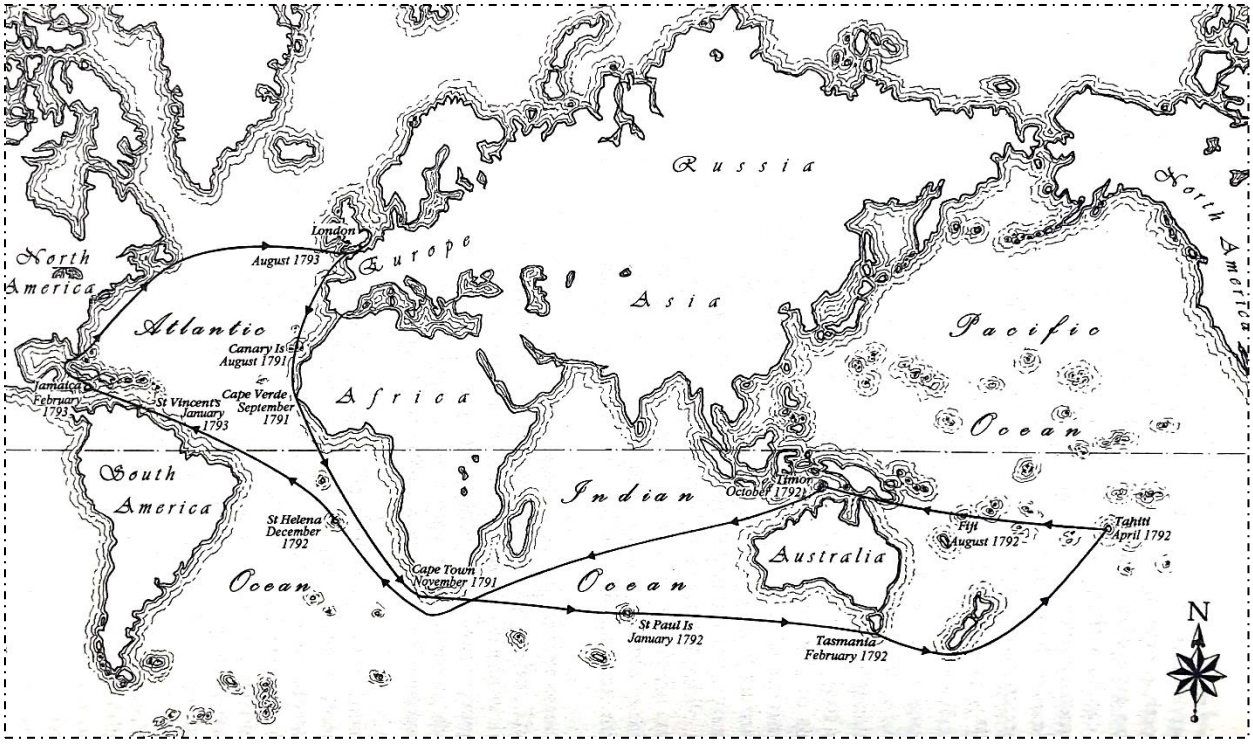

Fig. 6.2 Voyage of the Providence. From Tobin 2007 (1791-1793), 4.

Sight of the African coast was lost on December 24th, and with it the good weather the ships had been enjoying. Well into January, damp winds blew strong between the northwest and southwest. The avoidance of their bad effects became Captain Bligh's priority. A fire was kept in *Providence*'s galley throughout the night, and Brodie stoves were lit in both cockpits during the day. The ships finally anchored in Adventure Bay, Tasmania, on February 9th,1792. Watering and wooding parties were formed, and for some weeks the sailors got to enjoy dishes of trout and mussels, and the occasional parrot or seagull. The 21st of the month brought some commotion when parties had to be sent out to look for one of *Assistant*'s men who had deserted the boat, but he was quickly found, and the misunderstanding resolved. Two days later the ships took leave of Tasmania, shaping their course southward of New Zealand. March brought with it squalls and gloomy weather, and even a hail storm early on the morning of the 6th. By the end of the month,

the temperatures began warming up as they approached the tropics.[231] This relief from the cold was accompanied by unwanted guests, as cockroaches swarmed the ship. To kill them, "the beams and carlings were frequently washed with boiling water. Many methods are practiced to get rid of these troublesome and destructive insects, but hot water thrown with force into their hiding holes seems the most effectual…"[232] There is little doubt this pest-control method was used on the return voyage to keep the plant cargo safe.

On April 6th all men, including officers, were examined by the ship's doctor for venereal diseases as they approached Tahiti.[233] Bligh had no delusions about his men partaking in all of the pleasures the island had to offer, and thus took appropriate precautions. The ships landed in Matavai Bay on the 8th, 36 weeks after their departure from England (Fig. 6.3). Bligh and his crew were warmly welcomed to the island and immediately visited by old friends and acquaintances. By the 15th the botanists Wiles and Smith were making progress in the collection of breadfruit and other plants, storing them in a shed built ashore for this purpose alone. In this task they enjoyed the assistance of some of the Tahitians who had been employed for the same purpose on the previous expedition.[234] By May 26th, Bligh recorded: "… all the plants are now in charming order, and spreading their leaves delightfully. I have completed nice airy spaces for them on the quarter deck and galleries, and shall sail with every inch of space filled up."[235] Breadfruit was eaten almost daily on the island, and the men themselves took a liking to it. Tobin noted that: "not an ounce of European bread had been expended since our arrival, and so familiar had our palates become to the vegetable kind as not at all to feel the deprivation of the 'king's own'."[236] By the beginning of

[231] Tobin 2007 (1791-1793), 55-65.
[232] Tobin 2007 (1791-1793), 67.
[233] Tobin 2007 (1791-1793), 69.
[234] Tobin 2007 (1791-1793), 78.
[235] Powell 1977, 391.
[236] Tobin 2007 (1791-1793), 114.

July, the ships' departure was quickly approaching, and their watering began. *Providence* alone had a considerable stowage capacity, which was indispensable as their stores would not be replenished before the ships had journeyed through the treacherous Torres Strait to Timor. The plants alone requiring sizeable shares, every cask was filled, completing the stock to over a hundred tons.[237] On July 13th more than half the collected plants were embarked on *Providence*, with some help from the natives. Rough weather the following day prevented the loading of the rest, though other supplies were at this time brought aboard. These included a quantity of *mahee*, the long-lasting and nutritious paste made of fermented breadfruit. On the 15th the last of the plants were boarded, stowed in a manner similar to that employed on *Bounty*. The great cabin, as well as both sides of the after part of the quarterdeck, were fitted in Tahiti to welcome the plants, leaving only narrows gangways next to the skylights for the crew's movements. The next day, the ships slipped their moorings, raised anchor and set sail.[238]

The total number of breadfruit plants loaded onto the ship prior to *Providence*'s departure was 2,126. This was 756 more plants than predicted, which they achieved by leaving only narrow gangways between the pots for the crew. This total was more than twice the number the *Bounty* had carried, if only for a short period of time. Accompanying the breadfruit plants were 472 pots of fruits and other plants, and thirty-six 'curiosity plants' Bligh had obtained for the King's gardens at Kew, bringing the total to 2,634 plants on *Providence* alone. The weight of this cargo on the ship is reported to have made it sit nine inches (23 cm) lower on the water than in its unladen state. Both ships were also stocked with tropical produce to serve as food for the crews, as well as fresh livestock and the occasional parrot.[239] The *Bounty*'s stay in Tahiti had been more than five months;

[237] Tobin 2007 (1791-1793), 116.
[238] Tobin 2007 (1791-1793), 116-119.
[239] Newell 2010, 163.

Providence only stayed for three, perhaps in an attempt from Bligh to avoid another mutiny caused by his men's attachments to island pleasures. The shortened stay was also due to the breadfruit plants hardly requiring such a long trial period, and the time of year: with the expedition leaving in July, they travelled at a rate to round the Cape of Good Hope in November, springtime at the Cape.

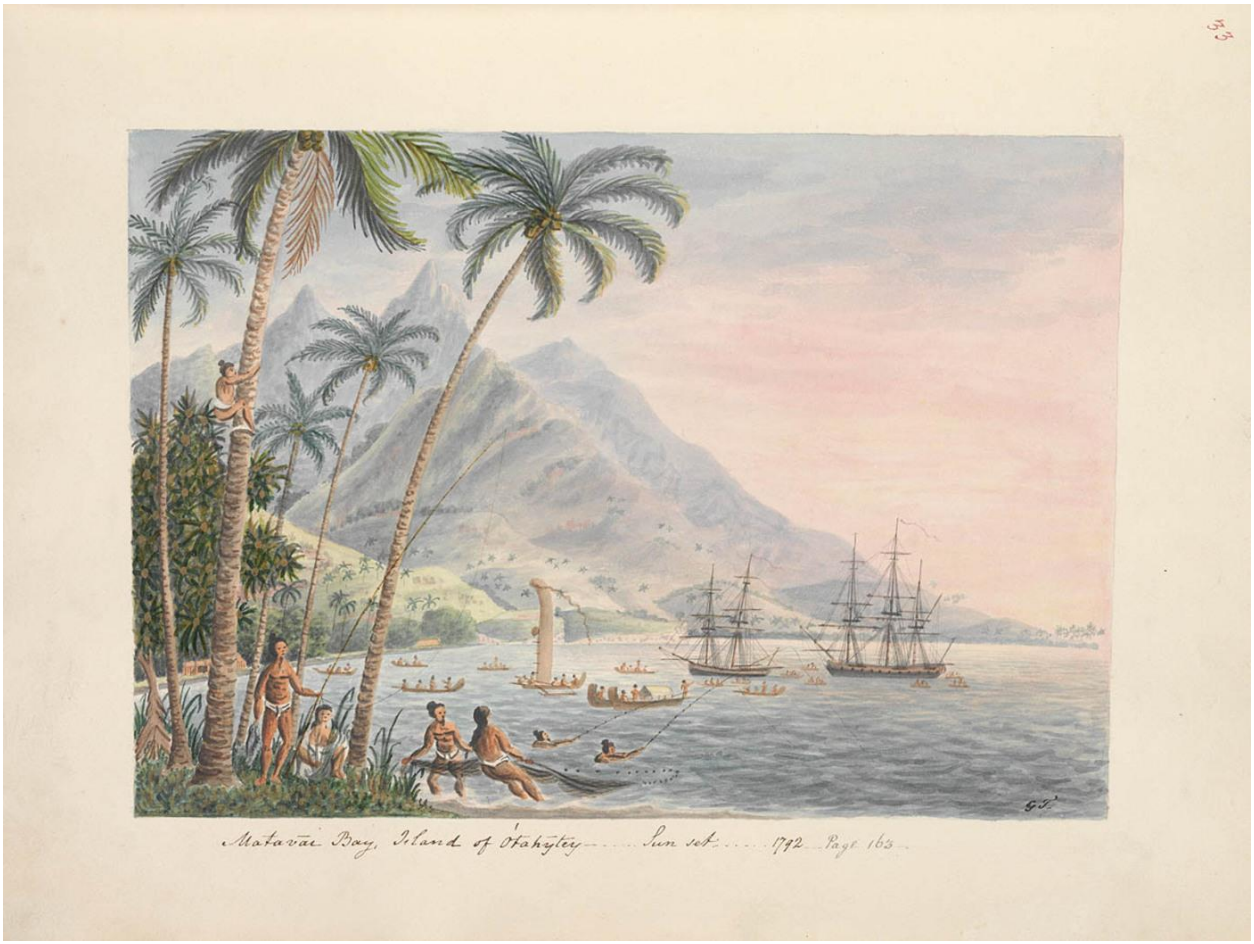

Fig. 6.3 *Matavai Bay, Island of Otahytey – Sun set*. Illustration by George Tobin, 1792. Image courtesy of Mitchell Library, State Library of New South Wales, Australia.

Return Voyage

The ships sailed from Tahiti on a westward course. A few days after their departure, two Tahitians were discovered on board and welcomed as part of the crew; Mideedee and Baubo, the latter of which attached himself to the expedition's botanists. The coast of New Guinea was reached on August 27th, with the dangerous passage through the Torres Strait now ahead. The following weeks were some of the voyage's most unpleasant, and the ships looked for a passage westward through a "labyrinth of rocks and shoals."[240] Both ships made it through "by the great care and caution of their commanders, [entering] the Indian Ocean over a bank with less than four fathom water on it […]."[241] Of this leg of the journey, *Assistant*'s commander wrote: "Every day now becomes more critical on account of the plants; a number of them have dropped off and our prospect of getting through becomes very uncertain… It is absolutely necessary to shorten their allowance of water so that in case we are foiled in finding a passage there may be enough left to save the ship's company during the time of beating back. The want of water is all we dread."[242] The crossing of the Strait was followed by an encounter with hostile natives, who discharged a volley of arrows at *Assistant* and wounded two of the crew, one fatally.[243] Finally, the ships reached Coupang on Timor on October 2nd. By this time, 224 pots of breadfruit had been lost. Not wanting to waste any space, Bligh ordered Wiles and Smith, accompanied by some of the natives, to collect an additional 92 pots of the best plants of Timor to make up for the loss. This new assemblage included mangoes, betel nut, and more breadfruit, among others. The crew also suffered from the long continuance of dry weather; Tobin noted (as they would subsequently find at St. Helena), rainfall was conspicuously absent for the better part of the year between the Equinoctial Line and

[240] Tobin 2007 (1791-1793), 150.
[241] Tobin 2007 (1791-1793), 150.
[242] Howard 1953, 89-90.
[243] Tobin 2007 (1791-1793), 151, 155.

the southern tropic in the path followed by the expedition. They did have a machine on board to distill sea water, though 15 gallons (57 liters) was the most it could produce in a day, and it was not "by any means free of a brackish quality."[244]

The expedition arrived at St. Helena on December 17th, having lost of one of the oldest marines.[245] The breadfruit casualties consisted of an additional 272 potted plants. Upon their landing, ten of the healthy breadfruit plants were gifted to the British Governor of St. Helena, Lieutenant-Colonel Robert Brookes.[246] The fate of these plants was ignored by Tobin, though he noted that the soil of this island was not favourable to them. Modern studies of plant life do not list the breadfruit there, indicating the ten left by *Providence* must have perished.[247] In a letter addressed to Sir Joseph Banks also dated to December 17th, Wiles stated he was confident at least 500 breadfruit plants could be safely carried to the West Indies, and some of the rare and exotic specimens taken all the way back to England to the gardens at Kew. Additionally, he noted that 107 oranges, 20 lemons and the pine plants which had been brought from England had been successfully raised from seed on the ship – no easy feat! [248]

Before leaving St. Helena, Bligh received a letter from the governor and his council expressing their gratitude to the King, and stating that the sight of *Providence* "had raised in them an inexpressible degree of wonder and delight to contemplate a floating garden transported in luxuriance from one extremity of the world to the other."[249] The ships sailed on December 27th, 1792, to complete the Atlantic crossing. On this passage to the West Indies, *Providence*'s cook

[244] Tobin 2007 (1791-1793), 162.
[245] Tobin 2007 (1791-1793), 166.
[246] Powell 1977, 396.
[247] Tobin 2007 (1791-1793), 113.
[248] Powell 1977, 397-98.
[249] Howard 1953, 90-2.

also passed away.[250] On January 23rd, 1793, both ships safely dropped anchor in Kingstown Bay, St. Vincent, in the West Indies. The number of plants on board the ships had been more than halved during the return voyage from Tahiti; they now numbered 1,245, including the specimens picked up along the way to make up for losses at sea. Regardless, the expedition was a resounding success: 678 breadfruits from Tahiti, with four plants and four seedlings from Timor, survived the long passage. At St. Vincent, Bligh left 559 plants under the care of Dr. Alexander Anderson, superintendent of the island's Botanic Garden. Of these, 331 were breadfruit from Tahiti with an additional two from Timor. In exchange, 350 local plants were taken on board, intended for the King's gardens.[251] Conflicting accounts depict the arrival of breadfruit to St. Vincent. Guilding's interpretation of the events, written in 1825, is as follows: "The young trees were as vigorous as if they had only travelled from our mountains, instead of having crossed a wide and troubled ocean, were instantly planted out, and after a proper interval distributed among the colonies."[252] No doubt the passing of years and the expedition's overall success had begun to cloud details of the events that had actually transpired. Writing at the time of the plants' arrival, Alexander Anderson paints quite a different picture:

> … In two years and three months all the fifty plants reserved in the Garden produced a large crop. This will appear the most surprising as the half left here were the smallest and the most sickly looking plants. The largest and most healthy in appearance went to Jamaica. In this division there appeared partiality; however, I conceived it just and could not with propriety object to it, as there was still the risk by sea of ten or twelve days passage from St. Vincent to it. Therefore necessary for the preservation, the weakest and the most probable to suffer by continuing them in their confined situation should be landed as soon as possible, and I was

[250] Tobin 2007 (1791-1793), 166.
[251] Powell 1977, 399-401.
[252] Guilding 1825, 14.

> confident that out of the number of 300 plants I should be able to preserve sufficient as a nursery for the Windward Islands.[253]

With a dramatic halving of the plants during the ships' return voyage, it was to be expected that the remaining ones would be worse for wear. As mentioned by Anderson, the second half of the breadfruit plants were disembarked in Jamaica (Fig. 6.4). It was decided that Mr. Wiles should remain there to superintend the plants. The Tahitian stowaway Baubo joined him, hoping to accompany him on the last stage of the trip to England once the plants were established. He quickly become a favourite on Jamaica by his good humour. Baubo's death – of unknown cause – was announced in the papers shortly after the expedition's return to Europe.[254]

Fig. 6.4 Bluefields Jamaica. Illustration by George Tobin, 1793. Image courtesy of Mitchell Library, State Library of New South Wales, Australia.

[253] Howard and Howard 1983, 18.
[254] Tobin 2007 (1791-1793), 137.

The arrival of *Providence* and *Assistant* was recorded for posterity on February 5th in the Jamaican weekly newspaper *The Royal Gazette*:

> It is with infinite satisfaction we congratulate the public on the happy arrival of these vessels at their destined port, enriched with a most valuable collection of plants, all in a flourishing condition… The introduction of the breadfruit into this island will constitute a remarkable era in its annals. In less than twenty years, the chief article of sustenance for our negroes will be entirely changed: - plantains, yams, cocos, and cassava, will be cultivated only as subsidiary, and will be used merely for change; whilst the breadfruit, gaining firm hold in the earth… will afford in the greatest abundance, for nine months of the year, the choicest and most wholesome food.[255]

From the Jamaican government, Bligh received 1,000 guineas "in consideration of the very essential benefit this country hath acquired by the importation of the breadfruit, and other useful plants, and from the constant, tedious, and painful care exerted by him for their preservation, during a long and dangerous voyage."[256] The ships were set to head back across the Atlantic, but April arrived and with it a packet ship bearing news of war having been declared against Britain by France. This altered the return plans, as Bligh and *Providence* were honoured with a "broad pendant": he'd become commodore of a fleet of ships. Plants that had been taken on board for Kew Gardens were once again landed. Tobin lamented that they were being "detained as a mere guard ship"; he suffered at that time from excessive boredom and irritation at this situation detracting from the purpose of the voyage.[257] As very high wages were given by merchants to sailors willing to man their ships, desertion among the crew also became a problem. In Tobin's

[255] Powell 1977, 402.
[256] Powell 1977, 412.
[257] Tobin 2007 (1791-1793), 167.

words, their "detention at Jamaica [may be dated] as the most untoward part of the voyage in every respect."[258]

It was not until mid-June 1793 that the ships we able to leave Jamaica, with the packet *Antelope* and two merchant ships accompanying them. The plants for Kew were taken on board once again. In preparation for the wartime conditions, "everything was done to make the *Providence* and her *Assistant* as warlike as possible" to deter any enemy attacks on the open sea.[259] Finally, on August 2nd, 1793, Bligh anchored at Dungeness, a day short of two years after his initial departure from Spithead. With him were 1,283 plants destined for the gardens at Kew.[260] Surprisingly little mortality had taken place among the plants, with Tobin noting that, of the two, the sailors themselves were "greater sufferers from the cold… although in the very height of summer."[261] The crew had gotten accustomed to the warmth of the tropics, so much so that even the British summer air now felt crisp. The two vessels then proceeded up the Thames to Deptford, where the plants were conveyed to Kew in a lighter. They were contained in 686 pots and tubs, among them a few breadfruit specimens – perhaps the greatest number of plants from tropical countries deposited in the garden at once. The final leg of the journey brought the ships to Woolwich, where they were cleared of stores and provisions, and put decommissioned.[262]

Upon his return, Bligh was awarded the Gold Medal promised by the Royal Society of Arts in London for being the first to successfully complete the mission of bringing at least six living breadfruit trees to the West Indies; a goal he accomplished a hundredfold. In 1801, he was elected a member of the Society, having proven himself an able navigator and provided an invaluable

[258] Tobin 2007 (1791-1793), 168.
[259] Tobin 2007 (1791-1793), 170.
[260] Powell 1977, 411.
[261] Tobin 2007 (1791-1793), 170.
[262] Tobin 2007 (1791-1793), 171.

service to his country by enriching the West Indian colonies with products from the South Seas.[263] Bligh was eventually promoted to the rank of vice-admiral, as well as governor of the colony of New South Wales from 1806 to1810. He died in 1817 at the age of 64.[264]

Outcomes of the successful transplantation of the breadfruit

Alexander Anderson, superintendent of the St. Vincent botanic garden, was also awarded a Silver Medal for his work relative to the culture of various useful plants there. In a 1797 communication, he stated that of the original breadfruit plants brought to him in 1793 by Bligh from Tahiti, 50 were reserved to yield future supplies for different islands.[265] Of these, most were from six inches to a foot (15 to 30 cm) in height, with a few particularly healthy ones that were two feet (61 cm) high, or half an inch (1.3 cm) in diameter at the stem. The first plants to produce fruit did so in October 1794, and by the following March, all were fruiting. At the time of writing, most of the trees had reached thirty feet (9.14 m) of height and their stem, at two feet (30 cm) from the ground, was of three to three and a half feet (0.91-1.07 m) in circumference. Anderson counted six different varieties of breadfruit trees in the garden and observed that at least one of them was always in the process of fruiting. The most productive trees produced fruit in clusters of five or six, the weight of them burdening the lower branches until they bent to the ground. The different varieties produced fruits of various shapes and sizes weighing from four to ten pounds; some were smooth-skinned, others rough or tuberculated. From their first appearance on the trees – when they were about the size of an egg – it took three months before the fruit were fit to eat. The best time to harvest the fruit, according to Anderson, was about a week before they began to ripen, when the skin of the fruit changed to a brownish cast and its juice became somewhat granulated. When ripe,

[263] Powell 1977, 413.
[264] Howard 1953, 94.
[265] Anderson, Sievers and Moore 1798, 325-360.

the fruit's flesh was soft and yellow, and smelled and tasted like a ripe melon. Anderson noted that in the two years preceding the writing of this letter, several hundred new breadfruit plants produced from Captain Bligh's original crop were transported to the different British-owned islands of the West Indies. Not only was its fruit useful, but the tree was also sought after as an ornamental specimen to line the grounds of plantation estates.

In Jamaica, the acclimatization of the breadfruit trees was a similar success. David Brenn, garden assistant to James Wiles, wrote: "The breadfruit thrives (if possible better that in its native soil); all the trees in the garden are full of fruit in all stages; they have been bearing constantly for 18 months past, and I find that being in possession of 3 or 4 trees, there will be a succession of fruit the year round."[266] A few years after breadfruit's introduction to the West Indies, planters recorded that it could be found almost everywhere. Joseph Robley, who became Governor of Tobago, wrote to Banks describing the surprising quantity of fruit produced by the three trees he owned, leading him to propose the establishment of a plantation of 1200 trees. For his successful establishment of the tree in Tobago and this subsequent plan to establish a large planting, Robley was awarded two gold medals in 1802 and 1803, respectively. Others such as A.M. McLeish and S. Mure were also awarded medals for the breadfruit's cultivation in the colonies.[267]

In 1811, Gilbert Mathison commented that breadfruit had been established in Jamaica for upward of 15 years and considered it the island's most valuable vegetable production, as it was resistant to drought and would bear fruit even during the year's dry season. How strange, then, he noted, that it was cultivated but as an ornamental tree, or as a crop of secondary importance.[268] The breadfruit did slip into the West India diet, but not to the extent that had been expected of it;

[266] Leakey & Roberts-Nkrumah (2016): 38.
[267] Leakey & Roberts-Nkrumah (2016): 39.
[268] Mathison 1811, 32.

never did it replace basic foods like plantain and taro. It was rejected as a food source by the enslaved populations it had been meant to feed, turned instead to fodder for pigs and poultry.[269] Mackay argues that West Indian planters in the 1780s had seen their plight as desperate, overstressing the need for relief. By the mid-1790s, conditions were returning to that of pre-war with the restoration of trade to the United States.[270] Breadfruit came to be ignored by colonial authorities and the ruling class, except when dire circumstances led to import shortages of foods like wheat flour, as during the 20th century's world wars. The fruit's consumption was stigmatized due to its associations with slavery and poverty, though its health benefits have in recent years been actively promoted.[271]

[269] Howard 1953.
[270] Mackay 1974, 77.
[271] Roberts-Nkrumah 2018, 5-6.

CHAPTER 7

Coming Full Circle: The Distribution, Consumption and Potential of the Breadfruit Today

> It is difficult, in my opinion, to point out an undertaking really replete with more benevolence, more likely to add comforts to existing people, and even to augment the number of those for whom the bounties of creation were intended, than that of transporting useful vegetables from one part of the earth to another where they do not exist.
>
> Sir Joseph Banks in a letter to the House of Assembly in Kingston, Jamaica, 1791.[272]

In 2001, breadfruit was identified as a crop for conservation for food and agriculture by the Treaty for Plant Genetic Resources for Food Security, and its conservation became law in 2004.[273] Today, breadfruit is listed among the 35 neglected and underutilized crops identified as important for food security by the Global Crop Diversity Trust. Following the British breadfruit voyages and the successful establishment of the plant in the Caribbean, it was taken to Central and South America, reaching Brazil through the help of the Portuguese in the early 19th century.[274] From the Caribbean it was also transported to the shores of West Africa, and by the end of the century had been introduced to Australia and Madagascar from the Pacific. Breadfruit reached East Africa by way of the Seychelles and can now even be found in Kenya.[275] Though hundreds of cultivars exist in the Pacific, no more than a handful were transported to the Caribbean on Bligh's *Providence*, and fewer still have likely then been established elsewhere from this West Indian core. Population estimates for ten Caribbean territories between 1954-58 reported close to 2.7 million breadfruit trees, 85% of which were grown in Jamaica.[276] In recent years, breadfruit has been distributed to

[272] Gascoigne 1994, 204.
[273] Roberts-Nkrumah 2018, 7.
[274] Leakey 1977.
[275] Ragone 1997; Roberts-Nkrumah 2018, 5.
[276] Leakey 1977.

45 countries around the world as part of efforts to mitigate hunger on an international scale, in an uncanny mirroring of the mission of Britain's 18th-century breadfruit voyages.[277]

Still eaten by many in Polynesia and the Caribbean, efforts have nevertheless been made by governments to shine a brighter light on the benefits of breadfruit and to increase its cultivation and consumption, as it remains of minor economic significance. Breadfruit consumption in the Pacific has notably been on the decline, as a preference has developed for imported rice as the main source of carbohydrates in the local diet. Though rice is currently the world's most important food staple, climate change is expected to affect its yields and overall production, especially in tropical regions. As less than ten percent of rice produced is traded internationally, reduced yields will dramatically increase pressure on the available supply for the trade and domestic markets, threatening food security in regions that have grown dependent on grain imports.[278] Traditional crops such as breadfruit are expected to be less aversely affected by climate change in those regions, but are not yet cultivated as orchard crops, which is necessary to achieve a high production volume at low cost.[279] The declining cultivation of breadfruit as a subsistence crop has led to a loss of trees and species diversity, but efforts are on the rise to counteract such effects.[280] The State of Hawai'i, for example, has been hosting large-scale tree giveaways, and has broadened its consumer education through chef campaigns and food festivals centered around breadfruit.[281]

Breadfruit's nutritional benefits have been noted in this thesis' first chapter, but certain obstacles hindered its adoption into worldwide diets in the present day. The most important of these is the fresh fruit's rapid spoiling, which was noted by European explorers. With renewed

[277] Needham and Lincoln 2019, 1.
[278] McGregor 2016.
[279] McGregor 2016, 55.
[280] Roberts-Nkrumah 2018, 5.
[281] Needham and Lincoln 2019, 2.

interest in breadfruit, research is being conducted into its transformation into shelf-stable products. Such processing of the fruit answers both the challenges of the seasonality of the trees' bearings, and the logistical difficulties of fresh fruit exports. Chips are already a common product in all breadfruit-producing regions, and Jamaica exports baked and vacuum-packed as well as canned slices.[282] Investigations into other shelf-stable products include the processing of breadfruit into a high-quality commercial flour or starch, a versatile – and gluten-free – raw material for a wide range of end products from noodles to cake mix.[283] Other researchers have looked into breadfruit's use as a substrate in probiotic beverages. This non-dairy alternative for consumers is particularly relevant to the growing interest in plant-based foods in North American diets.[284] Commercial opportunities to produce pharmaceuticals derived from breadfruit have additionally attracted the attention of researchers, due to its high content of phytochemicals. Phenylpropanoids and phenolic compounds that can be extracted from the plant's leaves, stem, bark, and roots have anti-inflammatory, antioxidant, antidiabetic, antifungal and anthelminthic properties.[285]

Breadfruit's wide and varied uses now being recognized for a worldwide market could hardly have been anticipated by Bligh and his crew as they disembarked the plants in the gardens of St. Vincent and Jamaica in 1793. An undeniable product of colonial botany, the transfer of breadfruit to the West Indies is but one example of global floral exchanges initiated on a large scale following Columbus' late 15th century voyages to the Americas. The importance of the trade and transport of such plants is difficult to discern from archaeological remains, ship infrastructure and cargo lists. The breadfruit voyages aside, plants were rarely a ship's main commodity, and were always a difficult one to keep in a viable state. Where these plants *are* still visible, aside from in the

[282] Roberts-Nkrumah 2018, 10.
[283] Marta et al. 2019; Roberts-Nkrumah 2018, 10.
[284] Gao et al. 2019.
[285] Roberts-Nkrumah 2018, 10.

historical gardens of Europe and their colonial counterparts, is in most of our very own homes and backyards. Plant transfers, once initiated, did not stop. Dominion over the botanical world served as an extension of the power of European colonial empires, illustrated in the re-writing of local botanical knowledge as that of learned men of science and the indiscriminate reordering of the natural world. The consequences of such actions are still with us today. Some, like the breadfruit transfers, have positives that outweigh the negatives. Though initially spurned by the people it was meant to feed – through no choice of their own, let us clearly say here – it is now once again being recognized as a crop with the potential to provide a solution to world hunger. Others have had more dire effects on local environments, both natural and cultural. Invasive species have driven out native ones, and naturalized plants have overtaken diets, with traditional foods now deemed "lesser." The owning and consumption of certain plants has been a symbol of status at least from the time of European colonization of the world. As aristocrats once employed travelling botanists to source exotic plants for their gardens, so do people today spend hundreds if not thousands of dollars to acquire not only full plants, but mere cuttings of rare houseplants such as the variegated "Albo" or "Thai constellation" varieties of *Monstera deliciosa*, native to the tropical forests of Central America (Fig. 7.0). The legacies of colonialism permeate not only our structures of knowledge but reach into our very own gardens. Studying the movement of plant life in state-sanctioned operations, such as the British breadfruit voyages, can help us shed light on such legacies and inform the path forward.

Fig. 7.0 A specimen of *Monstera deliciosa* “Albo”, which sold for $4930 on TradeMe, a New Zealand auction website. Photo credit: Jessixa/ TradMe.

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