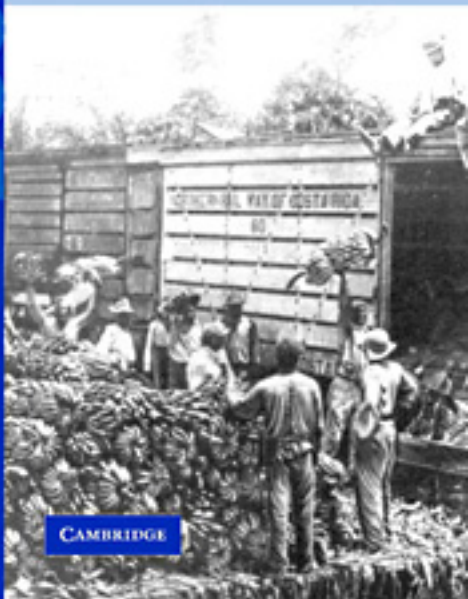


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# Human Biology of Afro-Caribbean Populations

Lorena Madrigal



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## Human Biology of Afro-Caribbean Populations

Lorena Madrigal provides a microevolutionary study of Caribbean populations of African descent, reviewing the conditions endured by the slaves during their passage and in the plantations and how these may have affected their own health and that of their descendants. The book provides an evolutionary framework for understanding the epidemiology of common modern-day diseases such as obesity, hypertension, and diabetes, and in addition looks at infectious diseases and their effect on the genetic make-up of Afro-Caribbean populations. It also reviews population genetics studies that have been used to understand the microevolutionary pathways for various populations and investigates their demographic characteristics, including the relationships between migration, family type, and fertility. Ending with a case study of the Afro-Caribbean population of Limón, Costa Rica, this will be a fascinating resource for researchers working in biological anthropology, demography, and epidemiology, and for those interested in the African diaspora in the New World.

LORENA MADRIGAL is Professor in the Department of Anthropology at the University of South Florida and has worked on historical demography, population genetics, disease and modernization, and the genetics of longevity. She has also published *Statistics for Anthropology* (Cambridge, 1998).

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# Human Biology of Afro-Caribbean Populations

LORENA MADRIGAL

*University of South Florida*



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*Para mis tres amores: Guido, Sofía y Nadia.*

*To the people of Limón: may they achieve what they deserve,  
without losing their beautiful culture.*





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## *Foreword*

MICHAEL H. CRAWFORD, *University of Kansas*

In the mid nineteenth century an American adventurer, diplomat, archaeologist, and newspaper editor (E.G. Squier, who wrote under the pseudonym of S.A. Bard), while exploring the Miskito coast of Honduras, described the Black Caribs living in the region as: “Most are pure Indians, not large, but muscular, with a ruddy skin, and long straight hair” (Bard, 1855, p.317). Similarly, British administrator, Thomas Young (1847, p.123), observed extensive variability among the Black Caribs: “some being coal black, others nearly as yellow as Saffron.”

In the 1970s, having read these graphic descriptions about the Black Caribs (also known as the Garifuna), I expected to see a Native American group similar to one I had observed earlier in Mexico. The Black Caribs originated on St. Vincent Island during the seventeenth century and, after a rebellion, were deported by the British to Roatan of the Bay Islands in 1798. In the following year, the Spanish transported the majority of the newly relocated Black Caribs from the Bay Islands to the coast of Central America. Almost 135 years later, when I arrived in Livingston, Guatemala (a sleepy Black Carib coastal village, nestled against the edge of a tropical forest), I was shocked to see a scene that could only have been “staged” in West Africa. The Garifuna were extremely dark with few morphological characteristics suggestive of Native American origins. They were trading in a market that could have been located anywhere along the Gold Coast of Africa. This did not make much sense! What happened to the Carib Indians who had been deported 177 years earlier from St. Vincent? If the dissidents of St. Vincent Island had been deported selectively to Roatan on the basis of their African features, then Young and Squier should have observed, in the 1850s a predominantly African population in Central America. This was not the case. The most probable answer to this puzzle lies in the history of the Garifuna.

*The Rise of the Garifuna*

The Caribbean Islands were settled originally by Arawak Indians who had expanded demically from South America in approximately AD 100. This initial settlement was followed approximately 1000 years later by the diffusion of Carib Indians from South America into the Lesser Antilles. Following Contact with Europeans, the native populations of the Caribbean islands experienced a dramatic numerical decline. At Contact, the total aboriginal population of the Caribbean islands was estimated by Cook and Borah (1971) to be approximately 6 million persons. Within 100 years of Contact, as a result of epidemics, warfare, and slavery, many of the islands were totally devoid of Amerindians. A few Amerindian enclaves persisted into the seventeenth and eighteenth centuries on Dominica and St. Vincent, while most of islands saw the tragic disappearance of their Native American residents. With the importation of slaves into centers such as Barbados, the African component was added to the St. Vincent gene pool in the seventeenth century as a result of the sinking of a slaver from Benin and some escapees from the adjoining island of Barbados. Due to a revolt against the British by the inhabitants of St. Vincent Island (possibly inspired by the French), all but a few Black Carib families were deported by the British Navy to the Island of Roatan, off the coast of Honduras in Central America. The Spanish Crown, notified of the presence of a hostile army on their colonial possessions, immediately deployed their military to investigate. On arrival, they learned that the Black Caribs were peaceful and preferred passage to the coast of Central America, which was gladly provided.

Upon arrival in Honduras, the Black Caribs rapidly spread out geographically from a single village to the present 54 communities, distributed over 1000km of Central American coastline from Dangriga, Belize to La Fe, Nicaragua. Numerically, they have expanded in Central America from fewer than 2000 persons in 1800 to more than 70,000 persons by 1980 (Crawford, 1983). The success of the Black Caribs in colonizing the Central American coast is not only impressive due to their sheer numbers, but because they were able to survive in an inhospitable region plagued by malaria, brought earlier by infected Africans. In this evolutionary success story, the Carib/Arawak genes from St. Vincent were preserved in Central America, "packaged" with African phenotypes. The numerical success of the Black Caribs can be explained not only by the presence of a large African genetic component but also by

the extractive efficiency of Arawak/Carib Indian culture. Because of their African and Native American ancestry, the Black Caribs possess exceptionally high genetic variation and a number of genetic adaptations to malaria. These adaptations were the result of their residence in malarial environments in Africa for thousands of years before coming to St. Vincent Island and the malaria-infested Central American coast (Crawford, 1998).

What does this history have to do with the conflicting reports from the mid nineteenth century of the Amerindian appearance of the Garifuna in Central America in contrast to my observations of an African population, approximately 125 years later? There are two possible explanations. (1) Since the 1850s the Black Caribs could have intermixed with a variety of populations of predominantly African ancestry, brought earlier to Central America to labor on the fruit and sugar plantations. As a result of this gene flow, the Garifuna of 1975 resembled African populations more closely and indeed exhibited African admixture estimates of 70% to 80% (Schanfield *et al.*, 1984). (2) The transplanted, admixed population of Carib/Arawak and African may have experienced the effects of natural selection on the coast of Central America. Did selection favor those individuals with hemoglobinopathies (AS and AC), G-6-PD deficiency, and the absence of the Duffy chemokine receptor (FY\*0), or specific gamma globulin markers brought from Africa? These regions of the genome, protective against malaria and bearing the molecular signature of natural selection, would more likely be found in individuals of African ancestry who would survive their encounters with *Plasmodium falciparum*, and their genes would be present disproportionately in subsequent generations. In her dissertation, Lorena Madrigal-Díaz (1988) explored differential fertility as a mechanism of selection in a cohort of Afro-American women residing in Limón, Costa Rica. She concluded that differential fertility of women with hemoglobinopathies (Hb AS) in a malarial environment cannot maintain the balanced polymorphism but that differential mortality better explains the evidence for selection.

This volume by Lorena Madrigal examines the complexities of health, population genetics, and demography of the descendants of the African slaves imported into the Caribbean Islands and into some regions of Central America. In the initial phases of slavery in the Americas, African slaves came primarily from West and Central Africa. In the later phases of slavery the southeastern and the western regions of Africa were also raided for slaves. Thus, the slave populations in the Caribbean were highly heterogeneous, both culturally and genetically, and contained enormous biodiversity – a reflection of the antiquity of human habitation

in Africa. In addition to the rich genetic variation brought from Africa, the descendants of the slave populations also interbred with Native Americans, and Europeans. There is considerable variation in the degree of African, Native American, and European admixture seen on various islands of the Caribbean and along the Atlantic coast of Central America. Varying degrees of African, Native American, and European admixture in these Caribbean populations complicate any analyses of risk factors for chronic diseases associated with specific ethnicity.

Lorena Madrigal has been conducting research on the genetics and demography of the descendants of African populations of Central America since her graduate school days at the University of Kansas. Her dissertation focused on the community of Limón, Costa Rica and she has continued working in Central America for almost two decades. Her background and training have qualified her uniquely to write this highly complex history, demography, and genetics of the descendants of the African slaves of the Caribbean. The examination of the genetic and disease patterns of African populations against a backdrop of history and demography allows Professor Madrigal to weave a rich biocultural tapestry, highlighting the unique patterns of human evolution in the Caribbean and Central America.

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# 1 *The African slave trade and the Caribbean*

## 1.1 The Caribbean

The question of what geographical region is actually to be included in a book about the Caribbean is not as easy a question as it sounds. However, since this book deals with the biology of human populations of African ancestry, it will cover those regions in the Caribbean, broadly defined, occupied by people whose ancestors were brought from Africa by the European slave traders. A broadly defined Caribbean includes the Antilles – the Greater Antilles and the Lesser Antilles – the Grenadines, the Windward Islands, the West Indies, the northern coast (the “shoulder”) of South America, the Atlantic coast of Central America (Belize had true plantation economies with slave populations, whereas most of Central America did not), and Bermuda (though the latter is situated well into the Atlantic Ocean; Figure 1.1). Excluded here are the coast of the Gulf of Mexico and Florida. The Internet provides excellent cartographic resources on the Caribbean. For example, see <http://palmm.fcla.edu/map>.

## 1.2 The European invasion of the Caribbean and the early import of African slaves

For an overview on the origin and evolution of Native American populations, the reader is referred to Crawford (1998). For recent work on ancient DNA of Caribbean native groups the reader is referred to Lalueza-Fox *et al.* (2001, 2003). Also recommended is Cook’s *Born to Die* (1998), a book which details the earliest stages of the European–Amerindian contact in the Caribbean. The sad conclusion to Cook’s account is that after a quarter century of contact the Taino and their circum-Caribbean neighbors were approaching extinction. When the native populations of the Caribbean essentially died off (Cook, 2002; Kiple and Ornelas, 1996), the Europeans turned to African sources of labor (Klein, 1978).



Figure 1.1. A map of the Caribbean.

That Europeans (Franco, 1978; Klein, 1978; Knight, 1991; Thomas, 1997) and Africans (Klein, 1986; Rawley, 1981) were immersed in a culture of slave trading by 1492 was helpful to the establishment of the trans-Atlantic slave trade. Indeed, by the time of the collapse of the Caribbean Indian population, the Portuguese in particular (though not exclusively) had extensive trade routes in Africa, and were ready to engage in a trans-Atlantic trade (Bah, 1993; Rawley, 1981). Indeed, the Portuguese had successfully integrated themselves into the ample slave-trading networks of Arab and African traders (Klein, 1986). According to Bah (1993), most of the African slaves traded in this network were from the eastern and central areas of northern Africa. Curtin (1969) discusses a number of sources, and concludes that for the second half of the 1400s as many as 500 African slaves were brought to Europe. It is interesting to note that within the slave culture of Africa, female slaves were highly valued as producers of children and as agricultural workers who could also perform many other tasks in the household (Moitt, 2001; Morrissey, 1989). Within the Caribbean plantation system, however, they lacked any sort of status, as will be discussed below.

It should be noted that African slaves participated in the earliest stages of the European invasion of the New World, as members of the various conquistador teams (Klein, 1978; Yelvington, 2004). Indeed, African slaves began arriving in the Americas as soon as the European conquest

started (Conniff, 1995; Morrissey, 1989). In Costa Rica for example, African slaves were initially brought during the early 1500s as members of exploration teams, who focused their efforts in the north-central Pacific areas of the country, specifically Guanacaste and Puntarenas (Blutstein, 1970). Just like in Costa Rica, there are several African-derived populations in the Caribbean and in Latin America that descend from these early African slaves, quite apart from those that descend from the slaves brought in by trans-Atlantic trade. The former slaves, called *ladinos* by the Spanish and Portuguese, were Christian and actual members of the invading parties. The latter, called *bozales* by the Spanish and Portuguese, were non-Christian, non-Portuguese or -Spanish speakers, and were taken directly from Africa (Klein, 1986).

### 1.3 The establishment of the slave trade: 1492–1650

Due to the Papal demarcation of 1494, Spain owned no land in Africa, the source of slaves (Rawley, 1981). At that time, Portugal had a solid grip on the African supply of slaves, established during the previous century (da Veiga and Carreira, 1979; Knight, 1991). During the 1500s, Spain attempted to counteract Portugal's supremacy in the African trade by assigning licenses (*asientos*) to private Spanish enterprisers and to foreign traders (mostly Dutch and Flemish, according to Klein, 1978) to trade the slaves (Bah, 1993; Franco, 1978). Based on these licenses, Curtin (1969) estimates that approximately 2882 slaves were imported during 1595–1640, and 3880 during 1641–1773. However these figures have been challenged (Bah, 1993). According to Bah (1993), most of these slaves were taken to Peru and Mexico, from where the Spanish were deriving tremendous wealth from mining. In these regions, groups derived from African and Amerindian founders grew dramatically, sometimes becoming part of the ruling, slaving elite (Klein, 1978). Klein (1986) estimates that by 1650 between 250 000 and 300 000 slaves had been brought to these two areas by the Spaniards. Yelvington (2004) notes that most estimates on how many slaves were brought to the New World do not account for the exceedingly large number of Africans who were killed in the raiding wars in Africa, wars often caused by the Europeans themselves.

Portugal, as opposed to the other European powers, did not place as much emphasis on the importation of slaves to Brazil as part of its economic strategy before the 1600s, until French and British merchants started cruising the South American coast. But by the late 1500s, both the

Portuguese crown and the Brazilian colonizers had established the sugar-plantation regime, which demanded a large number of slaves (Klein, 1978). Although the Amerindian population had been enslaved to work in these plantations, it proved to be too elusive and too sickly for the Portuguese, who eventually started mass importations of African slaves (da Veiga and Carreira, 1979). Moreover, the joining of the Portuguese and Spanish crowns (1580–1640) resulted in a push to de-emphasize Amerindian slavery (Klein, 1986). According to Klein (1986), the producers of Brazil (with the help of Dutch merchants) became the prime suppliers of sugar to Europe, and Antwerp and Amsterdam their primary importing centers (Klein, 1978). Supporting this supremacy were the African slaves.

#### **1.4 The loss of Iberia's supremacy: the 1600s**

Although the French and the British expanded their African slave raids and purchases in Africa, as well as their slave sales in the New World (Thomas, 1997), the supremacy of the Iberian powers lasted until the 1600s (Curtin, 1969; Emmer, 1998). By the 1600s, however, the Dutch, having just gained their independence from Spain, made their entrance into the slave market, eventually turning against their former Brazilian partners, and even occupying Brazilian territory (Rawley, 1981). During the seventeenth century, Amsterdam had become the financial capital of the world, and it supported a large army and a larger fleet of commercial ships involved in trade between Africa, the New World, and Europe (Rawley, 1981). The Dutch started slaving in earnest by 1621, when the Dutch West India Company was founded (Emmer, 1998; van den Boogaart, 1998). Indeed, much of the 1600s saw a constant struggle for African and New World ports and markets between the Dutch and the Iberian powers (da Veiga and Carreira, 1979; Emmer, 1998; Franco, 1978; Klein, 1986; Rawley, 1981; Shepherd, 2002). According to Thomas (1997), most African slaves taken to the New World by the Dutch had been captured at sea from the Portuguese. Interestingly, van den Boogaart (1998) has proposed that the importance of the Dutch in the early Atlantic slave trade has been over-emphasized.

Because of the struggle and eventual loss to Portugal of Brazilian territory, Dutch planters and their slaves migrated in the mid 1600s to Martinique, Barbados, and Guadeloupe to establish sugar plantations. Some also migrated to Dutch Guiana (Emmer, 1998). Opinions vary on the extent to which the rise of these islands in the world economy was

aided by Dutch credit and Dutch importation of slaves (Klein, 1986; Morrissey, 1989; Rawley, 1981; Thomas, 1997), since the Dutch West Indian Company had been left bankrupt after the loss of Brazil (Emmer, 1998; Solow, 1998; van den Boogaart, 1998). The rise of other European powers was only helped by the collapse of the joint Portuguese–Spanish Empire, which resulted in a temporary stop to the Spanish slave trade. The Dutch in particular aligned themselves with African suppliers, and nearly achieved supremacy in the Caribbean with Curaçao, a strategically placed port (Thomas, 1997) from which they sold African slaves to the Spaniards (Rawley, 1981).

In the case of the French, the development of the tobacco plantations in colonies such as Guadeloupe, Martinique, St. Lucia, St. Vincent, Grenada, and the Grenadines provided the initial market for the importation of slaves. But this market was amplified with the adoption of sugar as the main crop.

Concurrently, the British had declared the Leeward Islands to be theirs in the early 1600s, and started importing slaves (Klein, 1978). Although cotton, tobacco, and indigo had been planted, sugar eventually became the dominant crop, transforming the Caribbean (Klein, 1986; Thomas, 1997). These changes towards the adoption of a monoculture throughout the Caribbean were accompanied by a change in the composition of the population. In the French colonies, by the end of the 1680s the population of African slaves had increased as dramatically as that of the European indentured servants had fallen (Klein, 1986). In the French colonies after the 1670s the number of farms and property-owning Europeans declined, and the number of African slaves increased dramatically. For example, by the end of the 1600s Barbados had a population of African slaves of 50 000, controlled by fewer than 200 White planters (Klein, 1986). Indeed, during the 1700s the percentage of African slaves in the total population was probably close to 80%. Even in the Caribbean regions with larger European settlements, such as Cuba and Puerto Rico, with the adoption of sugar as a monoculture the number of African slaves increased dramatically and the number of European indentured servants decreased equally, so that the Caribbean became truly Africanized (Morrissey, 1989).

The French and the British attacked, conquered, or occupied former Spanish holdings (Emmer, 1998). In this manner the British gained Jamaica and the French the western part of Santo Domingo. Spain only had Cuba, Puerto Rico, and the eastern region of Santo Domingo left. With the occupation of Jamaica, the British started actively participating in the slave trade (Franco, 1978). Therefore, by the end of the 1600s the

Spanish colonies became the third largest importer of African slaves, with the French and British Caribbean islands being the second, and Brazil being the first (Rawley, 1981; Shepherd, 2002). For a discussion of the participation of other European powers (Sweden, Denmark, etc.) in the African slave trade see Rawley (1981). During this century, slavers in the Caribbean favored the importation of male slaves, whom they conceived to be better workers (Morrissey, 1989).

### **1.5 The establishment of the sugar plantation economy: the 1700s**

According to Thomas (1997), the establishment of the sugar plantation economy, dominant during the 1700s, was undertaken by the British and French colonists, but it rested upon the knowledge gained by the Dutch in Brazil, and their capital, trade networks, and African slaves. Such Dutch prominence, however, is challenged by van den Boogaart (1998), who argues that British and French planters were responsible for the creation of the sugar plantation economy, and that the role of the Dutch was marginal.

In the early 1700s the political alliances were changed, as the French and Spanish crowns became aligned with one another, and the Portuguese and British did the same. Thomas (1997) argues that the British clearly had the upper hand against their competitors, and in 1713 were able to take over Spain's *asiento* from the French. The British started importing the African slaves firstly to Jamaica and Barbados, where they would be "refreshed" for further shipping to the Iberian ports, such as Panamá, Buenos Aires, and Cartagena.

According to Klein (1978), by the mid 1700s the Jamaican trade was the largest within the British empire. The sources of the slaves changed from the entire Western coast to the Bight of Biafra and the Congo–Angola region after the 1790s. The majority of slaves were adult males (Klein, 1978; Shepherd, 2002). A large number of ports besides London were involved in the trade. In fact, Bristol overtook London in the 1730s as the most prominent port, only to be overtaken 20 years later by Liverpool. Rawley (1981) discusses the role of other British ports in the slave trade. He notes that the presumed unimportance of London during the 1700s has been overstated, and that the city did remain a vital port. London was apparently very important in the importation of Jamaican-produced sugar (Rawley, 1981). Indeed, it was during this time as well that Jamaica became the largest producer of sugar, surpassing Barbados.



The estimates of how many slaves were transported by the British vary according to historical sources and authors. For the 1700s, the estimates run from 2.5 to 3.7 million slaves from 1701 to 1807, with an annual shipment rising from 12 000 to 14 000 before 1720 to about 42 000 during the 1790s (Richardson, 1987). Curtin (1969) presents a decade-by-decade analysis of the number of slaves imported by the British. He also discusses the place of origin in Africa of these slaves. An important point made by Curtin (1969) is that the place in Africa from which the slaves were taken depended in great part on the choices made by the buyers in the New World, who had specific preferences. During this century as well, the preference for male slaves started to change, and more and more females were being sold as slaves, thus changing the sex ratio of the plantations. This change was probably a result of the slaver's understanding that the female slaves provided them with the possibility of slaves reproducing (although the slavers rarely treated them in a manner compatible with successful pregnancies) and the slavers' wishes to have easy access to sex, but also the slavers' understanding that the male slaves wished for females (Moitt, 2001; Morrissey, 1989).

That British overseas trade grew healthily during the 1700s is not disputed. What has caused more debate among historians is the role of the slave trade and the slave-based plantation economy in the tremendous growth of the British trade and in fostering British industrialization. Whereas some historians (particularly Eric Williams) have seen slavery as the backbone of British industrialization, others see it as an important part of an expanding economy, an expansion in great part dictated by consumer demand for sugar within Britain. Yelvington (2004) states that the slave trade and the plantation system were central to the industrial revolution and that they enabled European colonial expansion. Whatever its cause, the growth of the British slave trade was such that the cost of acquiring slaves in West Africa increased after 1750, simply because the demand was higher than the supply. Moreover, the slaves had such high mortality and low fertility that they were unable to maintain their own numbers. To these rising costs the slave traders responded sometimes by instituting new payment mechanisms which allowed the buyer to afford a higher price. In any case, the slavers had a very high income, and many would be able to pay for the slaves even without credit from the mainland.

The French, on the other hand, after losing Spain's *asiento*, started trading more on an individual basis. In the French Caribbean, St. Domingue was the main port and the main producer of sugar. In France, the main port for the slave trade was Nantes, which obtained its slaves from the coast around Loango Bay (Curtin, 1969; Thomas, 1997). Although

the French shipped fewer slaves than did the British and the Portuguese, they were still responsible for sending as many as 100 000 during the 1730s. More detailed numbers are discussed by Curtin (1969).

The importance of the Portuguese in the slave trade changed during the 1700s, it being the largest trader before the 1730s, but then losing supremacy to the British. The slaves brought by the Portuguese came mostly from Angola and Guinea, and were sent directly to Rio de Janeiro. A difference between the Portuguese traders on the one hand and the British and French on the other is that the former never had a prominent port, as did the latter with Liverpool or Nantes (Curtin, 1969).

Dutch traders (both independent and those with the West Indian Company) were still active in the 1700s, bringing slaves to the Netherland-South American holdings as well as to Curaçao and St. Eustatius. Thomas (1997) discusses the participation of the Danes in the slave trade, and Curtin (1969) the participation of the Danes and other European nations. All in all, the African slave trade during the 1700s clearly rested on a mercantilist ideology. Backed with this ideology, the European governments allowed great individuality in the slave enterprise (Rawley, 1981).

The world appetite for sugar did not diminish; indeed, demand for sugar increased even in the 1800s, after the abolition of the slave trade (1807–24, depending on the European government) and the declaration of emancipation (1834–8). During the 1800s there were some technical developments in sugar production and cane juice processing, such as the steam and then the mechanized mill, which increased production (Morrissey, 1989).

## **1.6 Conditions for the slaves during the trans-Atlantic journey**

Although this review will concentrate on the conditions for the slaves in the slaver ship, it should be noted that before many slaves were taken to sea they had already endured a long and arduous journey from their place of origin (Miller, 1981). Rawley (1981) emphasizes that the condition of the slaves before they boarded was probably an important factor affecting the slave mortality of a specific ship. The crossing took approximately 2–3 months, with the length of time being cut towards the 1700s compared with earlier centuries.

Klein (1986) mentions that although the Portuguese were and have been noted for being more humane with their African slaves, in fact they were not too different from the other European traders. Just how bad the

conditions were during the middle passage is not universally agreed upon (Miller, 1981). Rawley (1981) notes that our current attempts to reconstruct the middle-passage conditions are influenced by the very subjective accounts made by both abolitionists and anti-abolitionists. There seems to be increasing agreement that as abhorrent as the slaves' conditions might seem to an observer of the twenty-first century, the conditions were not significantly worse than those found in European immigrant ships headed for the New World (Bean, 1975; Thomas, 1997). Certainly, from a clearly financial viewpoint, it was not to the captain's advantage to lose a large proportion of the slaves. Rawley (1981) sees the presence of doctors on board slave ships as evidence for concern about the health of the cargo. Bean (1975) proposes that many of what he calls the "horror stories" of the middle passage derived from abolitionist propaganda rather than from actual objective observation. Rawley (1981) notes that the mortality of the European crews in the slave ships was exceedingly high. For Curtin (1968), the mortality of the crew during the eighteenth century was actually higher than that of the slaves.

Although it might be true that European migrants and crew endured great hardship crossing the Atlantic, there are some obvious differences in the manner in which they ended up in a ship, as well as in the manner in which they were transported. Certainly, European migrants did not have to be chained to prevent them from jumping off the ship to try to swim back to their homeland, and nor did they have to be force-fed to avoid suicide by starvation (Thomas, 1997). These behaviors exhibited by the slaves and not by the European migrants speak loudly as to the emotional and psychological state of the slaves. The combination of removal from home, the separation from family and friends, the ill treatment on board, the dismal conditions in the ship, the uncertainty of the future, the fear of being cannibalized by the Europeans, and untold morbid psychological and physical conditions must have affected the slaves' immune system and general health. A number of contemporary accounts by British doctors attest that melancholy was responsible for numerous slave deaths and suicides when crossing the Atlantic (Bah, 1993; McGowan, 2002; Rawley, 1981).

There is general agreement that the male slaves tended to be chained more frequently than did the female slaves, who had more freedom of movement. At the same time, the female slaves were in danger of being raped and had to deal with childbirth and its aftermath in a most difficult situation (McGowan, 2002; Thomas, 1997). Some captains kept male slaves in shackles through most of the voyage but some gave them greater freedom after the African homeland was no longer visible (Rawley, 1981).