



DNA Tribes® Digest March 1, 2012
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Introduction

Hello, and welcome to the March 2012 issue of DNA Tribes® Digest. This month’s feature article explores genetic links in two parts of Eastern Africa: the Horn of Africa and African Great Lakes. These regions near the Rift Valley and Red Sea are home to several ethnic groups and have been shaped by several language expansions.

Results include both autosomal STR- and autosomal SNP-based analyses, each providing an independent source of information about genetic links in Eastern Africa.

Best regards,
Lucas Martin
DNA Tribes

Genetic Links and Language Expansions in Eastern Africa

Historical Background

Since prehistory, Eastern Africa has been shaped by waves of culture, migration, and innovation from multiple directions. From these processes of change (often associated with new technologies and forms of society), several language groups have emerged (illustrated in **Figure 1**).

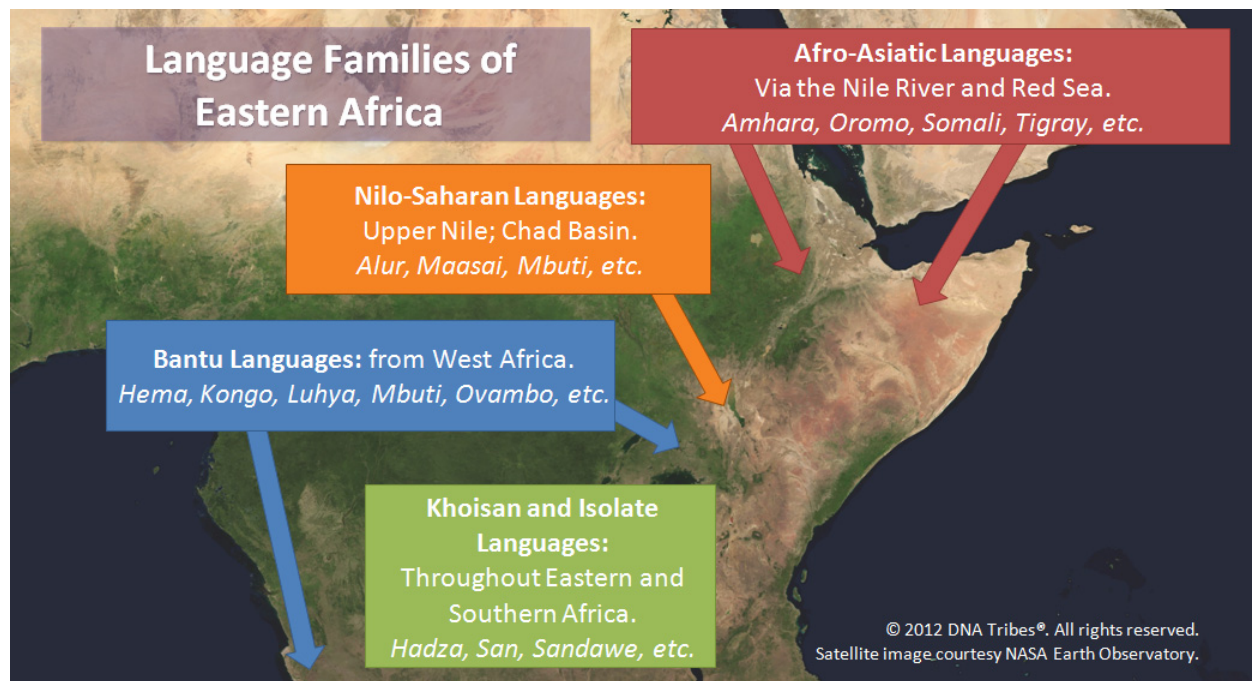


Figure 1: Language families of Eastern Africa. Studied populations are listed in italics. Mbuti peoples speak both Nilo-Saharan and Bantu languages.

Khoisan languages: Possibly one of the earliest groups of languages in Eastern Africa includes the Khoisan languages and other isolates, such as Hadza, San, and Sandawe (highlighted in green in **Figure 1**). These languages are thought to descend from several languages once spoken by indigenous hunting and foraging cultures throughout Eastern and Southern Africa. Possibly more widespread in the past, speakers of these languages live today in several pockets of Eastern Africa, as well as Namibia and the Kalahari Desert in southern Africa. Although these isolates are no longer thought to be related as a single language family, they share distinctive click consonants.

Nilo-Saharan languages: Another group of languages with ancient roots in Eastern Africa includes the Nilo-Saharan languages. Nilo-Saharan speakers include Alur, Maasai, and Mbuti (highlighted in orange in **Figure 1**). These languages are spoken primarily near the Chad Basin (formerly home to the much larger “Mega Chad”) and the Upper Nile River.

Proximity to the Nile River location has brought Nilo-Saharan cultures in contact with the Egyptian civilization since ancient times. For instance, the Nubian kingdom of Kush established Egypt’s twenty-fifth dynasty and developed into the iron producing civilization of Meroe. Nilo-Saharan languages

are documented in some of the earliest writings in Africa, including the Old Nubian language (written in Coptic) and possibly the undeciphered Meroitic script.

Ancient Nubians occasionally appear in more distant locations of the ancient world: for instance, a Mycenaean fresco from Knossos is sometimes thought to depict a group of Africans (possibly Nubians) active in the Bronze Age Aegean.¹ By the 15th- 16th centuries CE, some Nilo-Saharan speaking cultures had migrated to the African Great Lakes. Today, Nilo-Saharan speaking cultures include Alur, Maasai, and some Mbuti peoples of Eastern Africa.

Afro-Asiatic languages: Several waves of Afro-Asiatic speaking cultures have linked Eastern Africa to the Near East. For instance, Cushitic cultures have lived near the Red Sea since ancient times, and are represented today by Oromo and Somali peoples of the Horn of Africa. Cushitic societies have traditionally emphasized a pastoral economy based on cattle herding. Rock art discovered in Laas Gaal (in present day Somalia) colorfully depicts humpless cows, attesting the antiquity of the region's indigenous cattle culture.²

Other early Afro-Asiatic links in Eastern Africa include maritime contacts with the Arabian Peninsula and more distant lands to the north, mentioned in Ethiopian accounts recorded in the Ge'ez (South Semitic) text *Kebra Negast*. According to these accounts, the Solomonic line of Ethiopia is descended from the Queen of Sheba and King Solomon of ancient Israel. These legends might relate to early Sabaeans (from present day Yemen) in contact with the Kingdom of Aksum (in present day Ethiopia).

Red Sea cultural links are suggested by cultural landmarks in Ethiopia such as Lalibela, where rock-cut architecture recalls the former Nabataean city of Petra. Trade links with the Arabian Peninsula and Indian Ocean are also expressed in traditional clothing: for instance, the colorful (often plaid) men's sarongs or *macawis* worn in the Horn of Africa are similar to *futah* and *izhaar* of the Arabian Peninsula, as well as *lungi* worn in more distant Sri Lanka and the Indian Subcontinent.

Since the medieval period, contacts with the Arabian Peninsula continued with the spread of Swahili culture that facilitated contacts with the Near East and Asia, as well as nearby Madagascar. Today, Afro-Asiatic languages spoken in Eastern Africa include Amhara, Oromo, Somali, and Tigray.

Bantu languages: Another group of migrations that have linked Eastern Africa with other cultures within the African continent is known as the Bantu expansion. West African farming cultures (possibly from near present day Cameroon) might have spread Bantu languages via two routes: directly south along the West African coast and via the African Great Lakes. Beginning approximately 1,000 BCE, this complex series of expansions eventually reached present day South Africa. Today, Bantu speaking societies include Hema, Kongo, Luhya, some Mbuti, and Ovambo cultures.

In summary, Eastern Africa has been shaped by trade links and migrations from several neighboring cultures, both within Africa and via the Red Sea and Indian Ocean. For this reason, this part of the world is home to a variety of languages and traditional lifeways. The next section of this article includes analysis using both STR and SNP data, each providing independent source of information about genetic links in Eastern Africa.

¹ See "The Mycenaeans c. 1650-1100 BC" by Nicolas Grgric, p. 27. For more information about the cosmopolitan "East Mediterranean *koiné*" that brought together multiple cultures during the Bronze Age, see "The Common Background of Greek and Hebrew Civilizations" by Cyrus H. Gordon.

² Notably, Sanga cattle breeds of Africa are thought to represent an ancient mixture of indigenous cattle with South Asian Zebu, possibly dating to approximately 1600 BCE. Another domestic animal of eastern Africa is the African Wild Ass, thought to be the ancestor of the donkey.

STR Analysis of the Horn of Africa and African Great Lakes Regions

Genetic contributions to the Horn of Africa and African Great Lakes regions (excluding local contributions from these two regions) were identified based on autosomal STR data. Results are summarized in **Table 1** and illustrated in **Figure 2**.

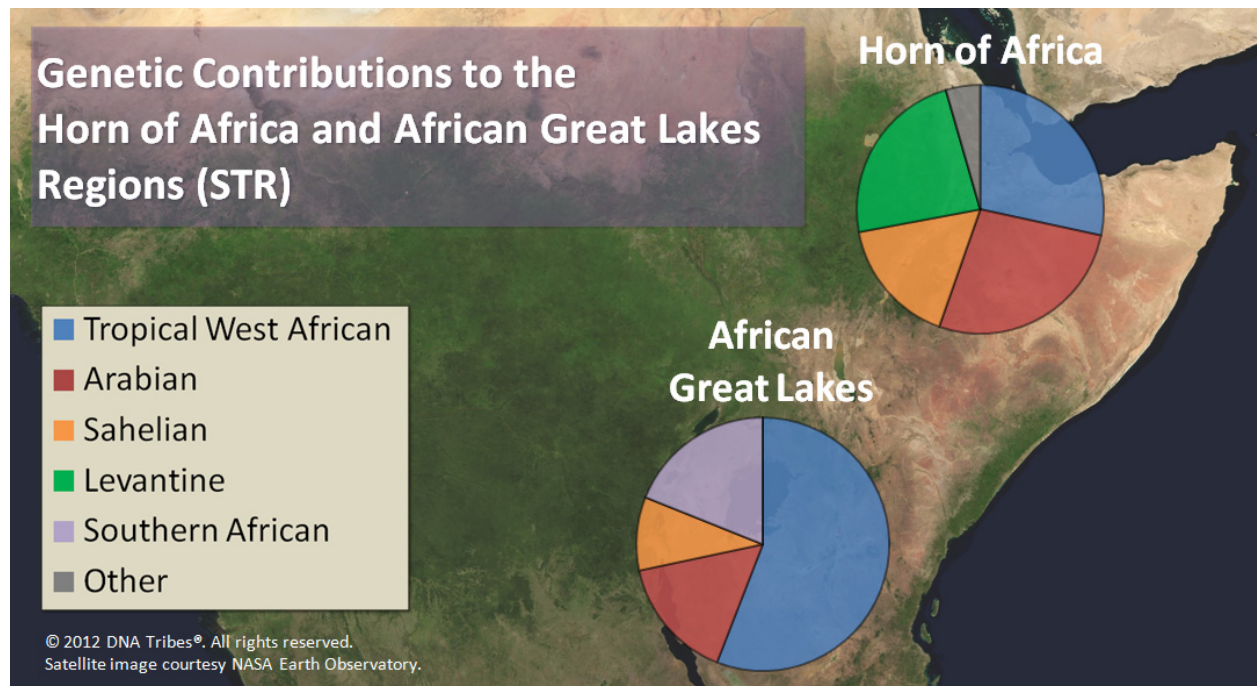


Figure 2: Genetic contributions to the Horn of Africa and African Great Lakes regions (STR), excluding local contributions from either of these two studied regions. For more about the world regions in DNA Tribes® STR based 15, 21 and 27 Marker Kit tests, see <http://dnatribes.com/populations.html>.

STR Region	Tropical West African	Arabian	Sahelian	Levantine	Southern African	Other
Horn of Africa	28.4%	27.0%	16.7%	23.5%	-	4.5%
African Great Lakes	55.9%	15.8%	9.4%	-	18.9%	-

Table 1: Genetic contributions to the Horn of Africa and African Great Lakes regions (STR), excluding local contributions from either of these two studied regions.

Discussion: Results in **Table 1** indicate that for both regions, the largest contribution was Tropical West African (28.4% for Horn of Africa; 55.9% for African Great Lakes). This might express contacts with West African populations migrating eastwards during the Bantu Expansion.

Results also indicate Arabian contributions for both regions (27.0% for Horn of Africa; 15.8% for African Great Lakes). These genetic links might express ongoing contacts with Afro-Asiatic speaking cultures near the Red Sea, including multiple waves of Cushitic and Semitic cultures in contact with Eastern Africa since early antiquity.

A third component identified for both regions was Sahelian (16.7% for Horn of Africa; 9.4% for African Great Lakes). This might express contacts with neighboring populations of eastern and central Africa, including Nilo-Saharan speaking populations living near Sudan and Lake Chad.

However, two components were not shared for these studied regions. For the Horn of Africa region, results indicated a link with the Levantine world region (23.5%) that includes populations of Egypt and the East Mediterranean. This might express links with Egyptian related cultures via the Red Sea and Nile River, such as the ancient kingdoms of Punt and Kush.

For the African Great Lakes, results identified a substantial Southern African link (18.9%). This might express links with indigenous communities speaking Khoisan and isolate languages, or possibly with Bantu speaking populations that emerged in Southern Africa during the Bantu Expansion.

SNP Analysis of Individual Eastern African Populations

Regional admixture components in Eastern African samples and several neighboring populations (excluding Horn of Africa and African Great Lakes admixture components) were estimated based on autosomal SNP data. Results are summarized in **Table 2** and illustrated in **Figure 3**.

SNP Population	West African	Arabian	Central African	North African	Southern African	Other
Alur	66.7%	2.6%	15.1%	0.5%	12.5%	2.6%
Amhara	23.7%	57.0%	6.3%	10.0%	2.8%	0.2%
Fulani	69.0%	1.8%	0.2%	27.7%	-	1.2%
Hadza	39.7%	6.3%	25.0%	4.9%	20.5%	3.7%
Hema	51.2%	14.7%	6.8%	5.5%	20.6%	1.2%
Kongo	78.5%	-	-	-	21.5%	-
Luhya	64.5%	4.7%	4.2%	0.3%	25.2%	1.1%
Maasai	46.8%	22.5%	8.6%	7.9%	12.9%	1.3%
Mbuti	16.1%	-	83.8%	-	-	0.2%
Oromo	34.6%	39.8%	9.2%	11.0%	5.0%	0.3%
Ovambo	74.4%	-	4.2%	2.5%	17.8%	1.1%
San Namibia	-	-	100.0%	-	-	-
Sandawe	43.2%	17.8%	16.5%	3.1%	18.0%	1.4%
Somali	31.5%	41.1%	7.0%	13.5%	6.3%	0.7%
Tigray	22.9%	57.7%	3.9%	9.6%	5.9%	-
Yemen	7.8%	84.0%	1.2%	-	4.5%	2.5%
Yoruba	100.0%	-	-	-	-	-

Table 2: Regional admixture in Eastern Africans and neighboring populations (excluding Horn of Africa and African Great Lakes admixture) based on autosomal SNP data. For more information about *DNA Tribes®* SNP analysis, see <http://www.dnatribes.com/snp.html>.

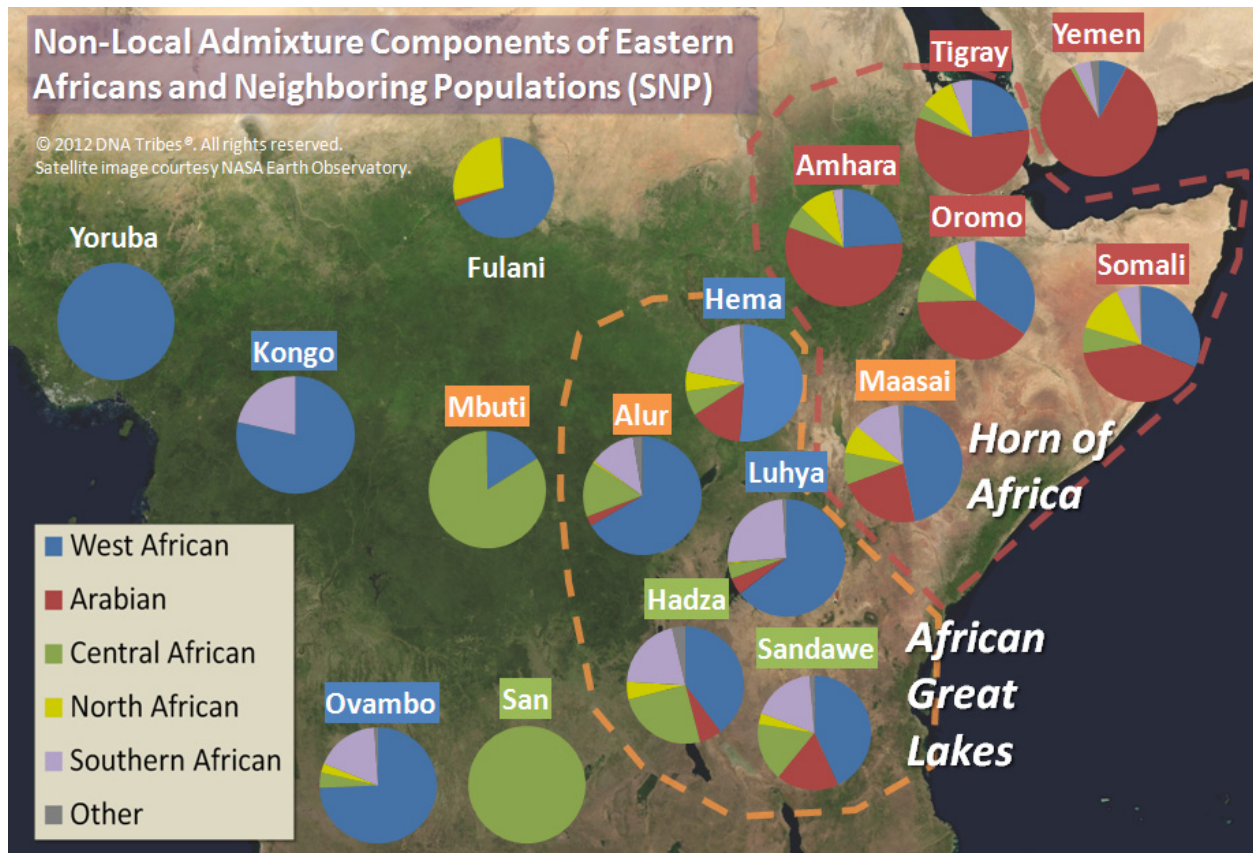


Figure 3: Regional admixture in Eastern Africans and neighboring populations (excluding Horn of Africa and African Great Lakes admixture) based on autosomal SNP data.³ Labels for Afro-Asiatic speaking populations are highlighted in red; Nilo-Saharan speakers in orange; Khoisan and isolate speakers in green; and Bantu speakers in blue. Mbuti speak both Nilo-Saharan and Bantu languages. Yoruba and Fulani speak non-Bantu languages of the Niger-Congo family. Ovambo and San are shown north of their present day locations.

Discussion: Results in **Table 2** indicate West African admixture throughout Eastern Africa, highest in Nilo-Saharan speaking Alur (66.7%) and Bantu-speaking Luhya (64.5%). Outside of Eastern Africa, West African admixture was also high in Bantu-speaking Kongo (living near the possible origin of the Bantu Migrations) and Bantu-speaking Ovambo (living near the terminus of a possible west-to-south route of Bantu expansions). West African admixture was not exclusive to Bantu-speaking populations, but was present in all studied populations except for Khoisan speaking San of Southern Africa (possibly reflecting pre-Bantu ancestry in this population).

Also found throughout Eastern Africa was an Arabian genetic component. This was highest in Afro-Asiatic speaking Tigray (57.7%) and Amhara (57.0%). Although Arabian admixture was highest near the Red Sea, it was also found in populations throughout the African Great Lakes, for instance: Maasai (22.5%) and Sandawe (17.8%). This suggests that Eastern African contacts with populations of the Arabian Peninsula were not limited to speakers of any single African language group.

³ For more information about DNA Tribes® SNP analysis, see <http://www.dnatribes.com/snp.html>.

A third non-local admixture component found in all Eastern African populations was Central African. This was highest in Hadza (25.0%) and Alur (15.1%), but was found at low levels in all studied populations of Eastern Africa. This suggests the possibility that modern populations throughout Eastern Africa have been in contact (direct or indirect) with indigenous hunter-forager populations ancestral to present day Khoisan and isolate language communities (such as Hadza and Sandawe).

North African admixture was also found in some populations. North African admixture was highest in populations near the Red Sea, such as Somali (13.5%) and Oromo (11.0%). Genetic links between the Horn of Africa and (western) North Africa might have been mediated by migratory cultures of the Sahara Desert and Sahel, such as the Fulani (27.7% North African).

Another genetic component found throughout Eastern Africa and particularly near the African Great Lakes was Southern African. Within Eastern Africa, this was highest in Bantu-speaking Luhya (25.2%) and Hema (20.6%), but also found in non-Bantu speaking Hadza (20.5%) and Sandawe (18.0%). Notably, Southern African admixture was identified in several Bantu-speaking populations outside Eastern Africa, such as Ovambo (17.8%) and Kongo (21.5%). This suggests that both West African and Southern African genetic components might be associated with Bantu languages in Africa.

Conclusion

STR- and SNP-based analyses indicated several non-local genetic components in Eastern Africa, each possibly related to language families (summarized in **Table 3**). Regional components differed in some cases, in part due to the different population datasets available for STR and SNP markers.

However, both SNP and STR results independently identified several similar genetic components (bold text in **Table 3**). These regional genetic components included:

- (1) Tropical West African (STR) and West African (SNP), possibly associated with Bantu languages;
- (2) Arabian (STR and SNP), possibly associated with Afro-Asiatic languages;
- (3) Southern African (STR and SNP), possibly associated with Bantu and/or Khoisan and isolate languages.

STR Region	SNP Region	Possible Language Links
Tropical West African	West African	Bantu languages
Arabian	Arabian	Afro-Asiatic languages
Sahelian	-	Nilo-Saharan languages
Levantine	-	Afro-Asiatic and Nilo-Saharan languages
Southern African	Southern African	Bantu languages; Khoisan and isolate languages
-	Central African	Khoisan and isolate languages
-	North African	(none suggested)

Table 3: Comparison of non-local STR and SNP regional components in Eastern African populations with possible language links.



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