AN ANTHROPOLOGICAL STUDY OF THE ABO BLOOD GROUP DISTRIBUTION AMONGST THE YORUBA OF NIGERIA

BY

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ABSTRACT

Twenty-five (25) sub-groups of the Yoruba language sub-family in Nigeria were identified based on such similarities as: territory, dialect, descent, cultural and economic ties. The ABO blood group samples and records of the identified Yoruba sub-groups were analysed and evaluated. These Yoruba sub-groups included: Akoko, Akure, Awori, Bunu, Egba, Egbado. Ekiti, Eko, Ibarapa, Ibolo, Ife, Igbomina, Ijebu, Ijesa, Ijumu, Ikale, Ilaje, Ilorin, Kabba, Ondo, Owo, Owu, Oyo, Remo and Yagba.

Frequency distribution and percentiles of the ABO blood groups in each Yoruba sub-groups were determined through statistical analysis and subjected to X^2 distribution analysis to detect deviation significance levels about the expected mean of ABO blood groups for the Yoruba language sub-family.

The majority of the individual blood group types within the Yoruba sub-groups were of the type 'O'. Percentiles and frequencies for this blood group type for each Yoruba sub-group exhibited two distinct mean pulses.

The mean percentiles for the type 'O' blood group were 51.6% and 55% with mean frequency values of 0.718 and 0.742 respectively, indicating the presence of two dialect groups within the Yoruba

language sub-family.

The Yoruba sub-groups hereby identified from the ABO blood sample analysis and subsequently classed into two dialect groups coincide with the "i" and "u" linguistic dialect areas into which the Yoruba territory of Nigeria is divided, thus confirming the existence of a definite anthropological divide of the Yoruba language sub-family.

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CERTIFICATION

I certify that this work was carried out by Bola Babatunde, Adekoya in the Department of Archaeology and Anthropology, University of Ibadan, Ibadan, Nigeria.

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JUNE, 1994.

DEDICATION

To

my Son,

BUNMI BABAJIDE ADEKOYA

in acknowledgement

of his reflection of God's love

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CHAPTER ONE

INTRODUCTION

General Background

The ABO blood group distribution amongst the sub-groups of the Yoruba language sub-family of Nigeria is not known in detail. This applies as well, to many other populations in Nigeria in particular, and Africa in general.

The study of such ABO blood group distribution amongst the sub-groups of the Yoruba language sub-family is useful for the reconstruction of their historical relationships, settlement history and anthropological affiliations or stratifications, as not hitherto known.

Efforts at such historical and anthropological reconstruction in the past have been largely anchored on data from linguistics, oral traditions, some written history based on early colonialists' visits, some archaeological works, ethnography, palynology and other anthropology related studies. However, significant discoveries through such interdisciplinary research could not be corroborated by other valuable scientific studies, especially on the history of the Yoruba language sub-family in Nigeria (Fig. 1).

The Importance of ABO Blood Group Study

The study of the ABO blood group distribution among the Yoruba

Fig. 1: Nigeria: (Ethnic Groups) Showing Yorubaland

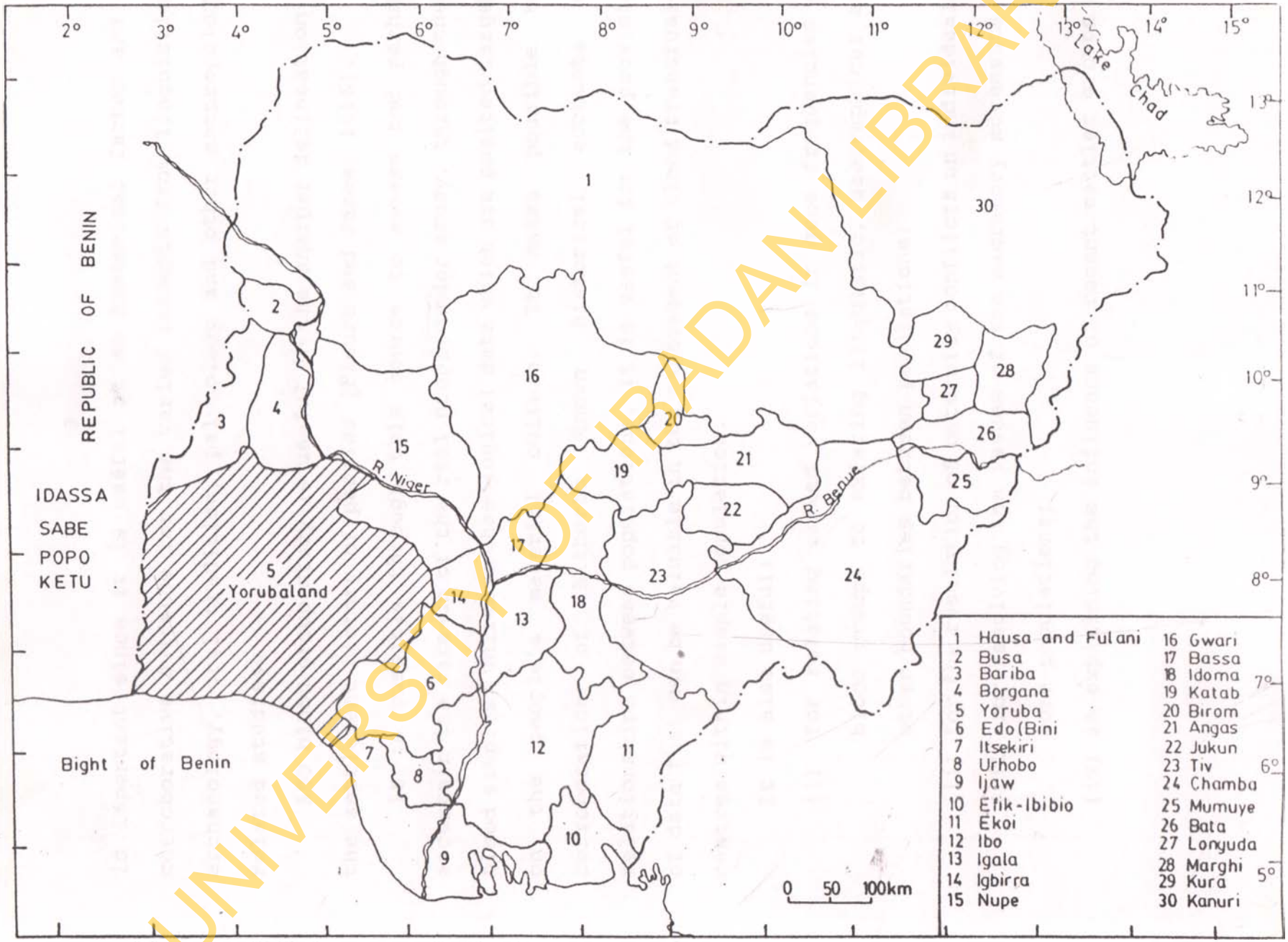


Fig. 1: Nigeria : (Ethnic groups) Showing Yorubaland.

is important since it is useful as an historical factor and as corroborative evidence for the varied accounts from linguistics, archaeology, oral tradition, palynology and other anthropology-related studies.

ABO blood group study is useful in the sharper delineation of the settlement history of peoples (Fleure and James, 1916).

It is possible through this source to assess and perhaps ascertain the make-up of the real people under study, through their blood samples, unlike archaeological data which are posited largely on the people's material culture. It makes possible the corroboration of hitherto known historical accounts of relationships between populations. It is useful for the provision of data that can be valuable in the management of blood transfusion centres within sample population.

It is also useful:

(i) for relating marked variations in gene frequencies of blood groups to existing linguistic, geographical and other boundaries between populations;

(ii) for the resolution of paternity conflicts on individuals;

(iii) for resolving the issues of the migratory movements of some populations;

(iv) in explaining the influence of recent settler groups on

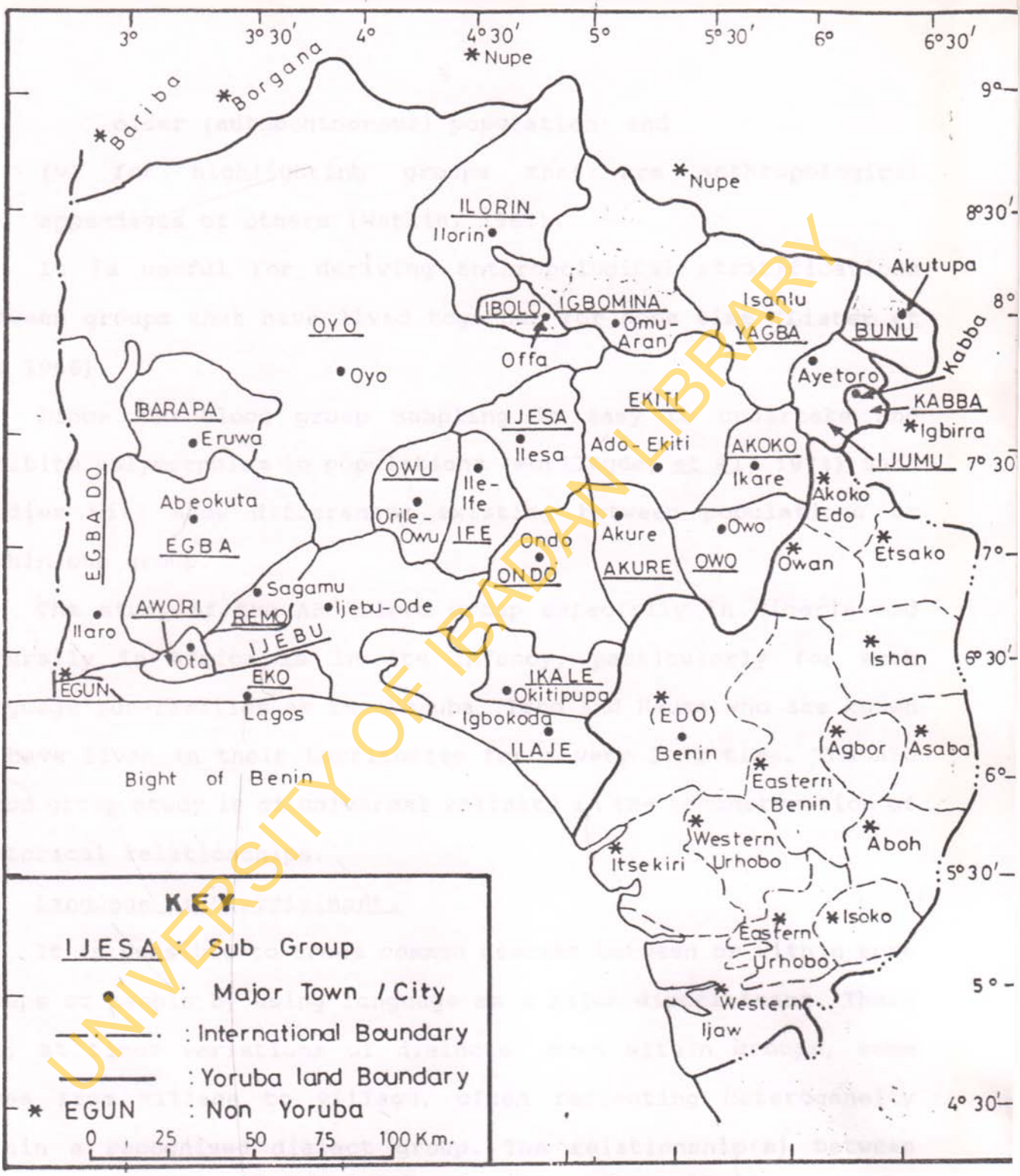


Fig. 2 : Yorubaland showing sub-groups

older (authochthonous) population; and

(v) for highlighting groups that are anthropological appendages of others (Watkin, 1963).

It is useful for deriving anthropological stratifications between groups that have lived together for some time (Lister et al, 1966).

Since ABO blood group sampling is easy to undertake and exhibits polymorphism in populations (Worllegde, et al, 1974) Such studies will show differences existing between populations or within one group.

The study of the ABO blood group especially in Nigeria and generally in Africa is in its infancy, particularly for such language sub-families as the Yoruba, Igbo and Hausa who are known to have lived in their territories for a very long time. The ABO blood group study is of universal validity in the reconstruction of historical relationships.

Language as Discriminant.

It is possible to trace common descent between or within some groups or people by using language as a major discriminant. There are, at times variations of dialects, even within groups, some times from village to village, often reflecting heterogeneity within a recognised dialect group. The relationship(s) between

language and common descent must, always be well studied.

Oduyoye (1972:25) classified the Yoruba into two: the "i" and the "u" dialect units. He said that:

> The /i-/ and /u-/ dialect distintion coincides with a shibolleth /siboleth dialect distinction: wherever the speakers of the /i-/ dialect say the sibilant sh, the speakers of the /u-/ dialects say the sibilant s, and vice-versa. The common dialect has drawn its features from both groups: it has the /i-/ and not the /u-/. But it chooses its sibilant and shibilant forms according to the practice of the /u-/ dialect group. Examples are:

Oyo/Ibadan	Ondo-Ekiti/Ijebu-Ijesa
"Yam" Isu	Usu
"Work" Ise	Use

Adetugbo (1973) identified three main Yoruba dialect units. Two of these, which he believed exhibit the characteristics of greatest antiquity and hence of older settlement status constitute the central group which includes: Ife, Ilesa, and Ekiti areas; and the south-eastern group (including Ondo, Owo, Ikale, Ilaje, and Ijebu areas). He believed all these were within the forest zone by the twelfth century.

The third group of dialects in Adetugbo's (1973) classification, includes: Oyo, Osun, Ibadan and the northern Egba area; this north-western group historically associated with the Oyo

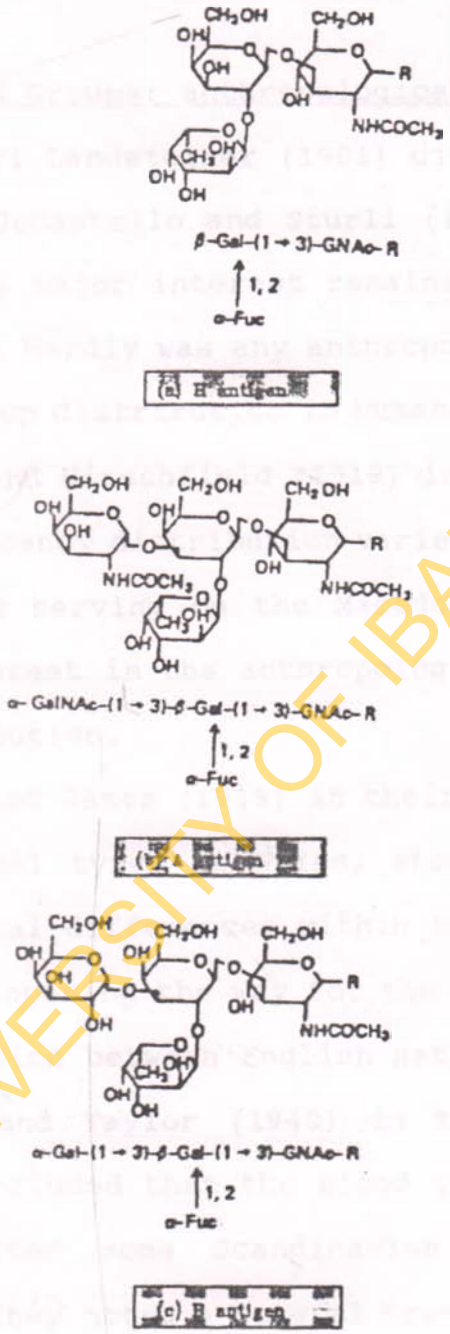


Fig. 3. Biochemical Formulae of Antigens.

empire, he believed shows fewer traces of antiquity than the other two.

ABO Blood Groups: anthropological works

When Karl Landsteiner (1901) discovered the A, B and O blood groups; and Decastello and Sturli (1902) the fourth, AB (Bell et al, 1971) the major interest remained simply that of transfusion therapeutics. Hardly was any anthropological value ascribed to the ABO blood group distribution in human populations until the work of Hirschfield and Hirschfield (1919) in their pioneer studies of how the gene frequency distribution varied among the group of different nationalities serving on the Macedonian battle front. This thus awakened interest in the anthropological aspects of the ABO blood group distribution.

Fleure and James (1919) in their study of the distribution of anthropological types in Wales, showed that there were physical anthropological differences within the population that settled in Wales; thus, opening the way for the resumption of further studies on the variation between English settlers and the Welsh in Wales.

Fisher and Taylor (1940) in their blood group studies in Scotland, concluded that the blood group gene frequencies in some parts reflected some Scandinavian influence on the Scottish population. They noted a general trend of some south to north rise

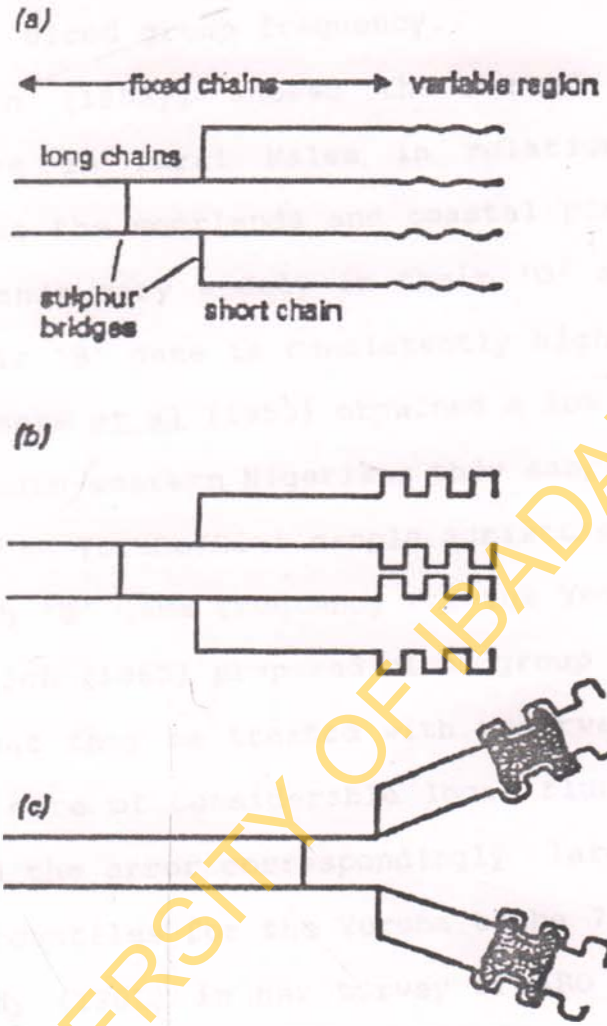


Fig. 4: Antigen-antibody reactions.
Source: P.T. Marshall (1978, Fig. 84, p. 196).

in 'O' blood groups frequencies in England, while Scotland has a higher 'O' blood group frequency.

Watkin (1952), showed the marked variations in the ABO frequencies in rural Wales in relation to such geographical features as the moorlands and coastal plains. The inhabitants of the moorlands vary widely in their 'O' and 'A' gene frequencies while their 'B' gene is consistently high.

Chalmers et al (1953) obtained a low 'B' gene frequency value for the south-western Nigerians they sampled apparently because it was based on Yoruba/Bini sample admixtures. Blumberg et al (1961) found high 'B' gene frequency for the Yoruba to be 0.2815

Garlick (1962) prepared blood group maps for Africa with some advice that they be treated with reserve, especially as he could not take care of considerable local fluctuations, which size was small and the error correspondingly large. He obtained 'O' blood group percentiles for the Yoruba to be 70-75%.

Hardy (1962) in her survey of ABO blood groups of southern Nigerians, showed that the ABO blood group gene frequencies of the Yoruba significantly different from those of the Bini, Ibo, Itsekiri, Urhobo and others, with a higher value of group 'B' which diminished eastwards through the Bini to the Ibo.

Based on known historical accounts, she stated that the Yoruba

possibly arrived at the present territory about 2000 years before present (Y.B.P.). She recorded the instance of some rise in the blood group 'B' frequency values from the Ibo to the Ibibio/Efik. She obtained the 'O' blood group frequency for the Yoruba to be 0.6925 (Fisher's method); 0.7011 (Bernstein's method).

Watkin (1963) established that Western Shropshire was an anthropological appendage of Wales, from similar, derived blood group frequency data. This is so, especially as the Welsh language has been spoken by native inhabitants since the begining of the eighteenth century.

Dawson (1964) in elucidating the history of settlement in Ireland, found that the highest blood group 'B' values (frequencies) occur in the boglands of central plain thus reflecting the definite influence of the settlers of the moorlands and moorland fringes with whom raised blood group 'B' frequency is associated.

Brown (1965) established an association between her sample of high gene 'B' in the people of the north east of Caithness and down the east coast of Moray Firth, and megalithic tombs thus implying some relationship between the present day population and older (autochthonous) population, whose advent he suggested dated back to neolithic times.

Watkin (1965) found that 'O' blood group genic frequency in Shropshire is significantly higher than those of people of South-Western Chesire, thus suggesting an admixture with people with medium 'A' gene frequency of the latter population. Watkin (1966) went further to show that the raised 'B' gene frequencies of the English element in South Western Chesire and of the Welsh element in Eastern Shropshire point to the survival of elements of the autochthonous groups within these present day populations.

Lister et al (1966) in their work on the Bedouin of Socotra concluded that the blood group frequencies implied that the Badouin were basically a Mediterranean (or Mediterranoid) population related to the continental Arabs with little influence from the African side.

Roberts et al (1972) in their analysis of the ABO blood gene frequencies of the Sinhalese, concluded that there seems to be little genetic evidence for the affinities which tradition and cultural similarities suggest exist between the former (Sinhalese) and the Tamil.

Worlledge et al (1974) in their analysis of the ABO blood group data of major Nigerian language sub-families showed how blood grouping could be easily carried out in large numbers of people with gene frequencies calculated. Such blood grouping they said,

could be useful in population genetics since the techniques for achieving their analysis is very simple, and the blood group genes under consideration exhibit polymorphism. They concluded that a knowledge of the distribution of blood group antigens and their corresponding antibodies in any given geographical area is essential for the management of blood transfusion centres. They obtained the Yoruba 'O' blood group frequency to be 0.717.

Udeozo (1985) noted that issues of the migratory movements of the Nigerian people can be resolved by identifying and studying the gene frequencies of the genetic markers in human blood in Nigerians, notably the Yoruba, Igbo and Hausa. He concluded that this is possible now as the history departments of Nigerian higher institutions add anthropology and archaeology to their specialities, in an attempt to improve on the historical accounts of our people.

Aims of the Study:

This work was conceived with the aim of achieving the following:

a) A correlation between the information on historical accounts of the derivation of the Yoruba language sub-family, its sub-groups and the analysis of their ABO blood group samples.

b) The analysis of the blood group genic frequencies

Fig. 5: Kogi State Showing Yoruba Sub-Groups

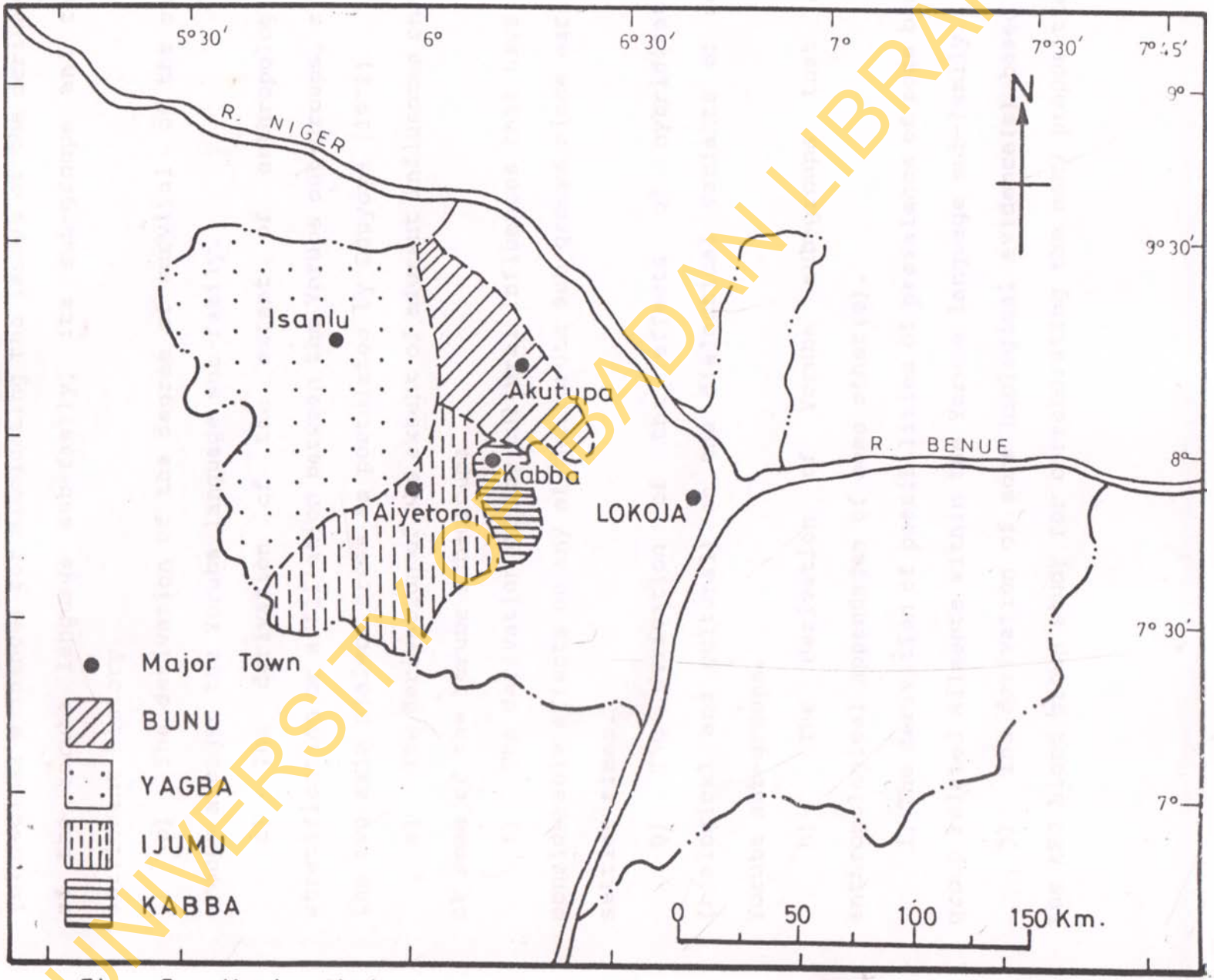


Fig. 5 : Kogi State showing Yoruba sub-groups

(biological evidence) for elucidating the issues of the derivation of the Yoruba language sub-family, its sub-groups and their settlement history.

c) The derivation of the degree of survival of the older groups amongst the Yoruba language sub-family.

d) The derivation of the extent of anthropological stratification or affiliation between the Yoruba sub-groups, along the two main dialect areas as postulated by Oduyoye (1972).

e) The derivation of the extent of migrant influences on all or some of the Yoruba sub-groups.

f) The derivation of any cultural influences that have had considerable effects on any of the Yoruba sub-groups since earlier settler times.

g) The derivation of the effects of hybridization (biological and cultural) on the dialectical variants of some Yoruba sub-groups.

h) The derivation of Yoruba sub-groups that are anthropological appendages of some other(s).

i) The derivation of possibilities of prevalence of some blood group related ailments within the Yoruba language sub-family.

j) The derivation of some biological evidence(s) based on the ABO blood group study for corroborating the many propositions

Fig. 6: Kwara State Showing Yoruba Sub-Groups

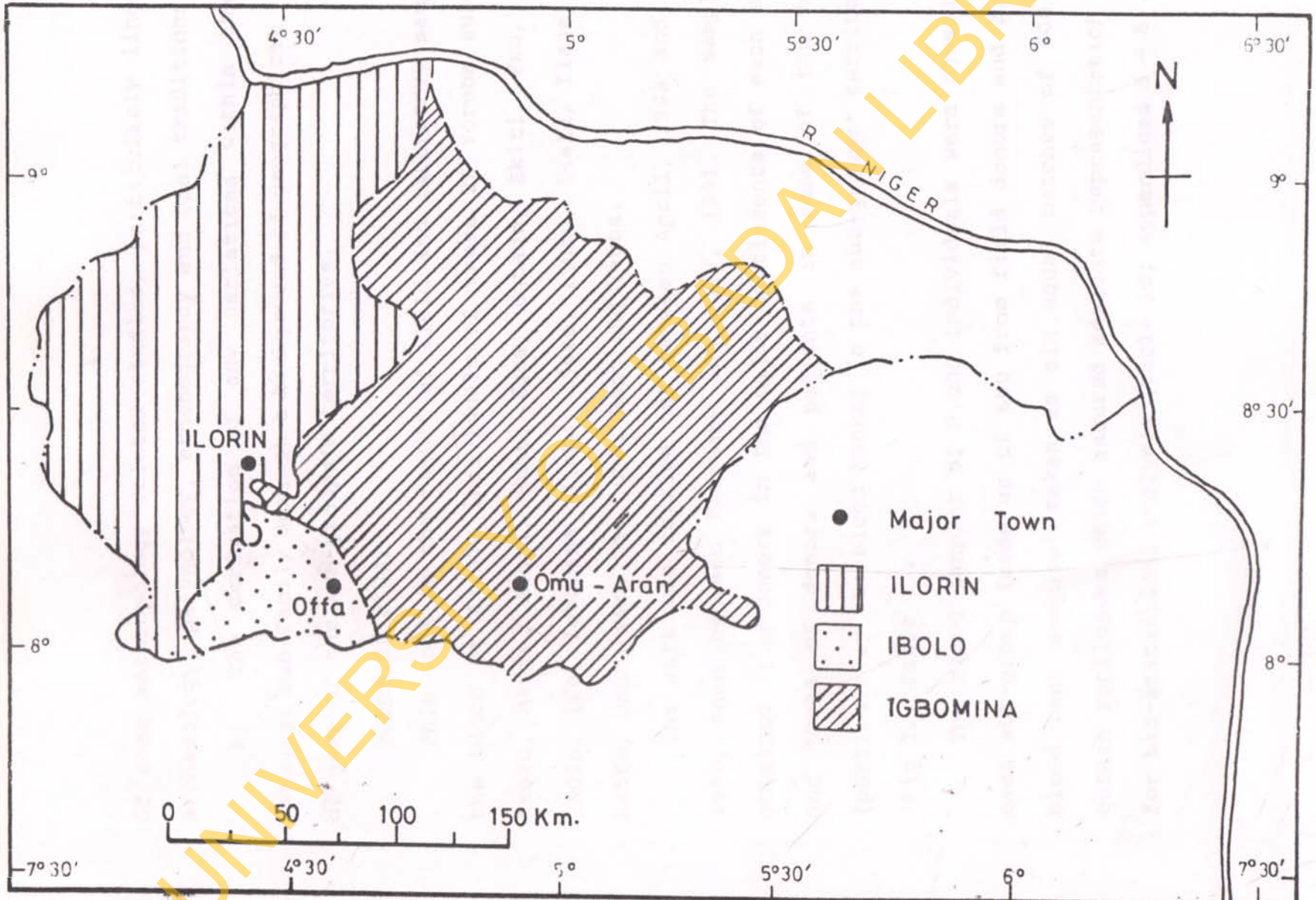


Fig. 6 : Kwara State showing Yoruba sub-groups

of some anthropology related studies, particularly linguistics, archaeology, palynology, ethonography and oral traditions.

k) The derivation of any variations within the Yoruba language sub-family against a background of geographical features of some of the sub-groups's territories.

Scope of Study

This work is the result of field and laboratory sampling of the blood of 75,000 individuals of these 25 Yoruba sub-groups: Akoko, Akure, Awori, Bunu, Egba, Egbado, Ekiti, Eko, Ibarapa, Ibolo, Ife, Igbomina, Ijebu, Ijesa, Ijumu, Ikale, Ilaje, Ilorin, Kabba, Ondo, Owo, Owu, Oyo, Remo and Yagba.

The work was carried out between April, 1988 and October, 1990; then between February and July, 1991. The samples were obtained from donors in the major settlements of each sub-group and those of donors and patients in some of the hospitals (particularly the blood banks) in the sub-groups' territories (Fig 2.; Table 1).

The blood samples of 3,000 individuals were considered for each sub-group (made up of 600 from field donors and 2,400 from blood bank samples) taken as six equal batches of 500 each to obtain replicates which assured adequate representation required for bio-statistical analysis (table 10; appendices 5 - 6). The co-

Fig. 7: Lagos State Showing Yoruba Sub-Groups

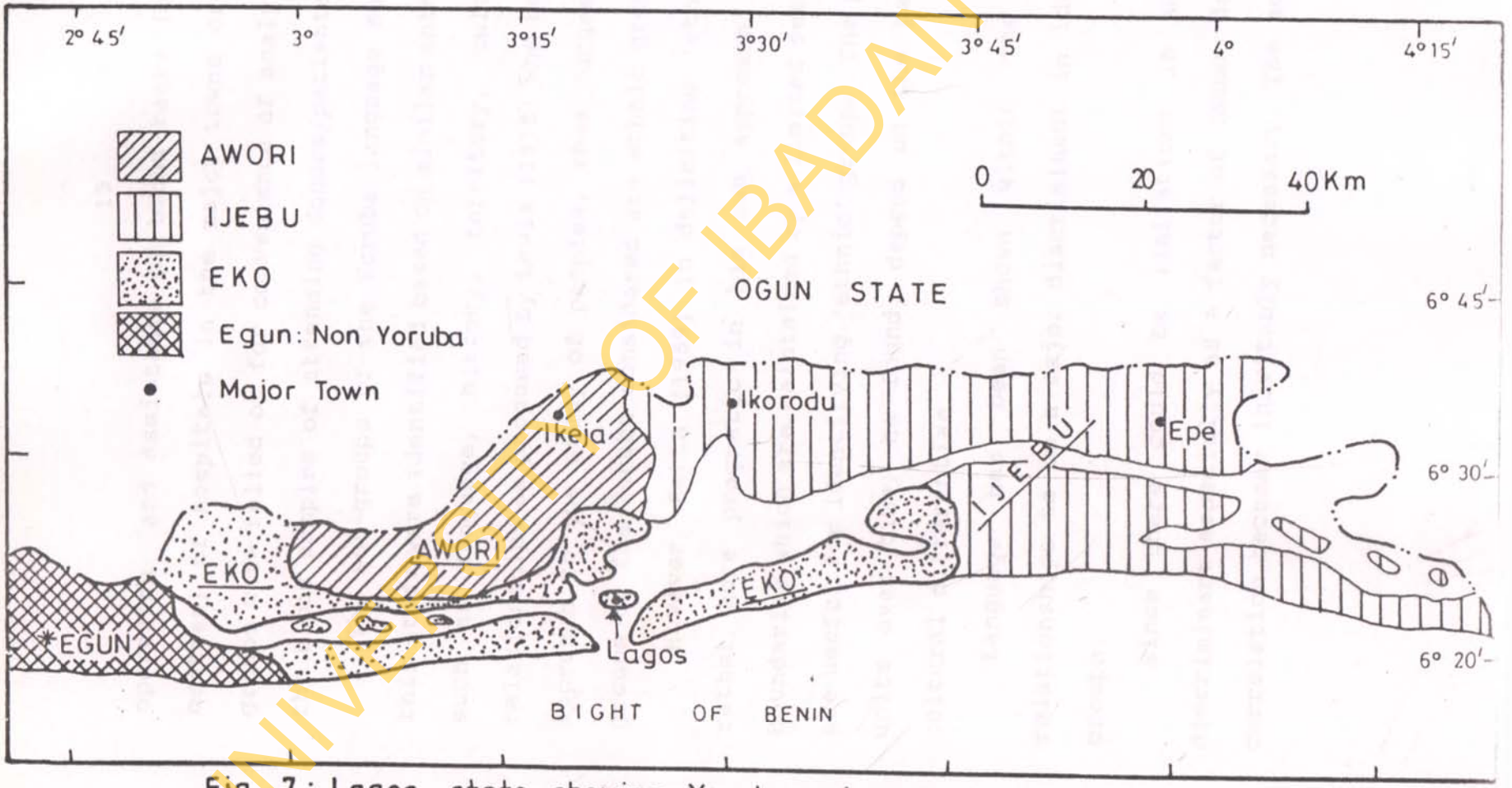


Fig. 7: Lagos state showing Yoruba sub-groups

operation and assistance of blood banks (or blood transfusion centres) of hospitals in the major towns of the different sub-groups were relied on for convenience of analysis and of obtaining the blood samples of attending donors/patients.

The sub-groups of the Yoruba language sub-family sampled in this study were identified based on similar anthropological factors such as language, history, territory, cultural and economic relationships as proposed by Lewis (1978) who reflects a historical approach to the study of peoples, thus suggesting that the sub-groups of the Yoruba considered are ethnic groups.

However, Barth (1969) in delimiting 'ethnic' boundaries is rather more pragmatic in his own approach. He explains that boundaries which are maintained by a limited set of cultural values are useful for identifying 'ethnic' groups. The persistence of such units over time, he found, depend on the persistence of some cultural differentiae.

Language has been shown within the larger language relationships to be a major discriminant in identifying 'ethnic' groups.

Since there could be limitations in using language as discriminant especially as a factor of common descent, biological correlation becomes inevitably necessary. The scope of this study

TABLE I: YORUBA SUB-GROUPS: LOCATIONS AND MAJOR TOWNS (To read with Fig. 2)

	Yoruba Sub-Groups	Territories/Local Government Areas and States	Major Towns
1.	Akoko	Akoko Local Government Area, Ondo State	Ikare
2.	Akure	Akure Local Government Area, Ondo State	Akure
3.	Awori	Ado-Odo/Ota Local Government Area, Ogun State; Lagos State	Ota
4.	Bunu	Oyi Local Government Area, Kogi State	Akutupa
5.	Egba	Egba Division, Ogun State	Abeokuta
6.	Egbado	Egbado Division, Ogun State	Ilaro
7.	Ekiti	Ekiti Division, Ondo State and Ekiti Local Government Area, Kwara State	Ado-Ekiti
8.	Eko	Lagos Island, Ikeja, Isolo, Apapa, Ebute Metta, Mushin, Yaba, and Ketu Areas of Lagos	Lagos
9.	Ibarapa	Ibarapa and Ifeloju Local Government Areas, Oyo State	Eruwa
10.	Ibolo	Offa and Oyun Local Government Areas, Kwara State	Offa
11.	Ife	Oranmiyan Local Government Area, Osun State	Ile-Ife
12.	Igbomina	Ifelodun and Irepodun Local Government Areas, Kwara State	Omu-Aran
13.	Ijebu	Ijebu Division, Ogun State; Epe, Ibeju-Lekki and Ikorodu Local Government Areas, Lagos State	Ijebu-Ode
14.	Ijesa	Ijesa Division, Osun State	Ilesa
15.	Ijumu	Oyi Local Government Area, Kogi State	Ayetoro
16.	Ikale	Okitipupa Local Government Area, Ondo State	Okitipupa
17.	Ilaje	Ilaje Division, Ondo State	Igbokoda
18.	Ilorin	Ilorin, Asa and Moro Local Government Areas, Kwara State	Ilorin
19.	Kabba	Oyi Local Government Area, Kogi State	Kabba
20.	Ondo	Ondo Local Government Area, Ondo State	Ondo
21.	Owo	Owo Local Government Area, Ondo State	Owo
22.	Owu	Irewole Local Government Area, Osun State	Orile-Owu
23.	Oyo	Oyo, Osun and Kwara States	Oyo
24.	Remo	Remo Division, Ogun State; Part of Ikorodu Local Govt. Area, Lagos State	Sagamu
25.	Yagba	Yagba Local Government Area, Kogi State	Isanlu

Fig. 8: Ogun State Showing Yoruba Sub-Groups

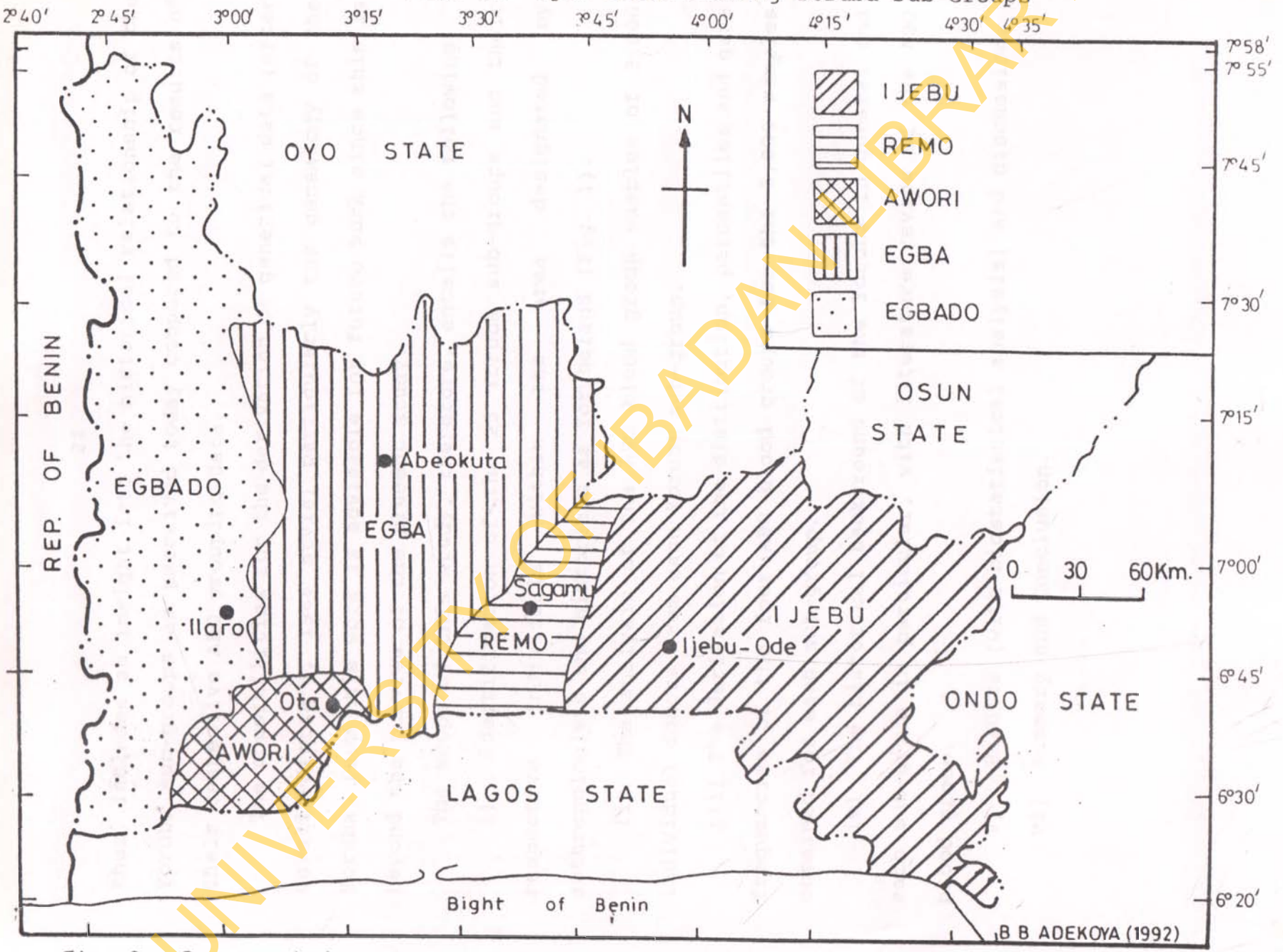


Fig. 8 : Ogun state showing Yoruba sub-groups

thus, includes an insight into the historical relationship of the Yoruba sub-groups as perceived today compared to the results of their respective ABO grouping data.

The possibilities for the derivation of genetical data (after Cavalli-Sforza's, 1966 style) particularly the genealogy of the Yoruba, from this work is advisable for future work since this is beyond the purview of the present study.

The scope of this study, therefore, entails the following:

i) Identification of the 25 Yoruba sub-groups and their respective individuals within the area designated by anthropologists and historians as Yorubaland (Fig. 1).

ii) The analysis of the ABO blood group samples of 3,000 individual donors from each Yoruba sub-group.

iii) The derivation of the distribution, percentiles and gene frequencies of the four ABO blood groups for the 3,000 samples obtained for each sub-group.

iv) The historical background of the Yoruba in general and each sub-group in particular, with literature review of the ABO blood group.

v) Results (with biostatistical analysis) and discussion.

vi) Summary and Conclusion.

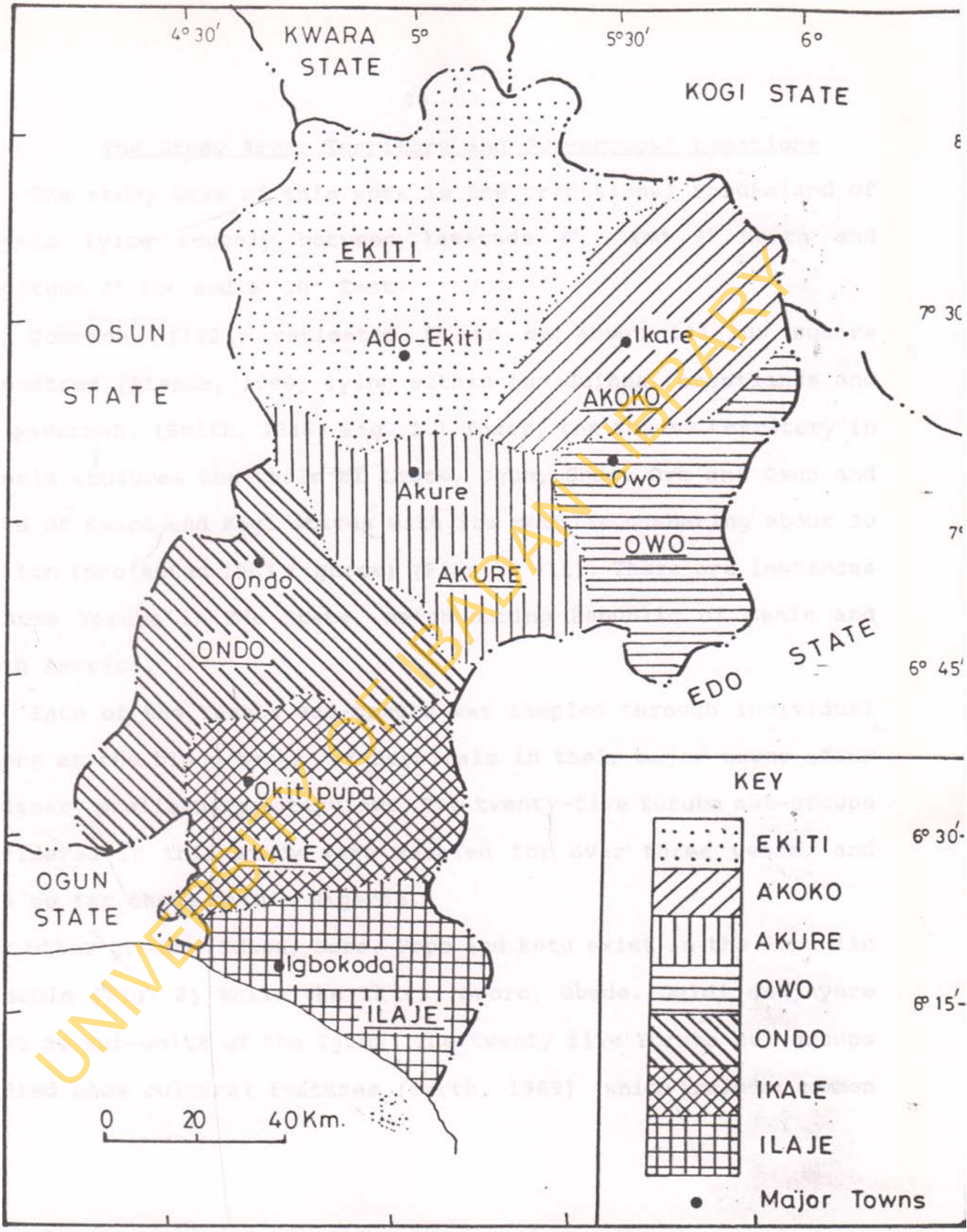


Fig. 9 : Ondo state showing Yoruba sub-groups

The Study Area: Territory and Sub-groups' Locations

The study area of this work is the traditional Yorubaland of Nigeria lying roughly between latitude 6° and 9° North and longitude 2° 30′ and 6° 30′ East.

Johnson, (1921) estimated it to be about 181,300 square kilometres (Atanda, 1980) lying within the Guinea forestlands and the savannah. (Smith, 1988; Fig. 1.) Today, the Yoruba territory in Nigeria includes the whole of Lagos, Ogun, Ondo, Oyo and Osun and parts of Kwara and Kogi states with its peoples numbering about 20 million (projected 1963 figures) (Figs. 5 -11). There are instances of some Yoruba in Edo State, neighbouring Republic of Benin and South America.

Each of the Yoruba sub-groups was sampled through individual donors at the blood banks of hospitals in their major towns after necessary preliminary interviews. The twenty-five Yoruba sub-groups considered in this study were sampled for over three years, and were so far those within Nigeria.

Four other groups: Idasa, Sabe, Popo and Ketu exist in the Republic of Benin (Fig. 2) while the Ikiri, Oworo, Gbede. Ogidi and Ayere exist as sub-units of the Ijumu. The twenty five Yoruba sub-groups studied show cultural features (Barth, 1969) which include: common

language (or dialect), common territory, common descent, common economic, cultural and administrative ties (Lewis, 1978). These twenty five Yoruba sub-groups are shown with their major towns (Figs. 5-11) and locations within the entire territory (Table 1; Fig. 2).

Fig. 10: Osun State Showing Yoruba Sub-Groups

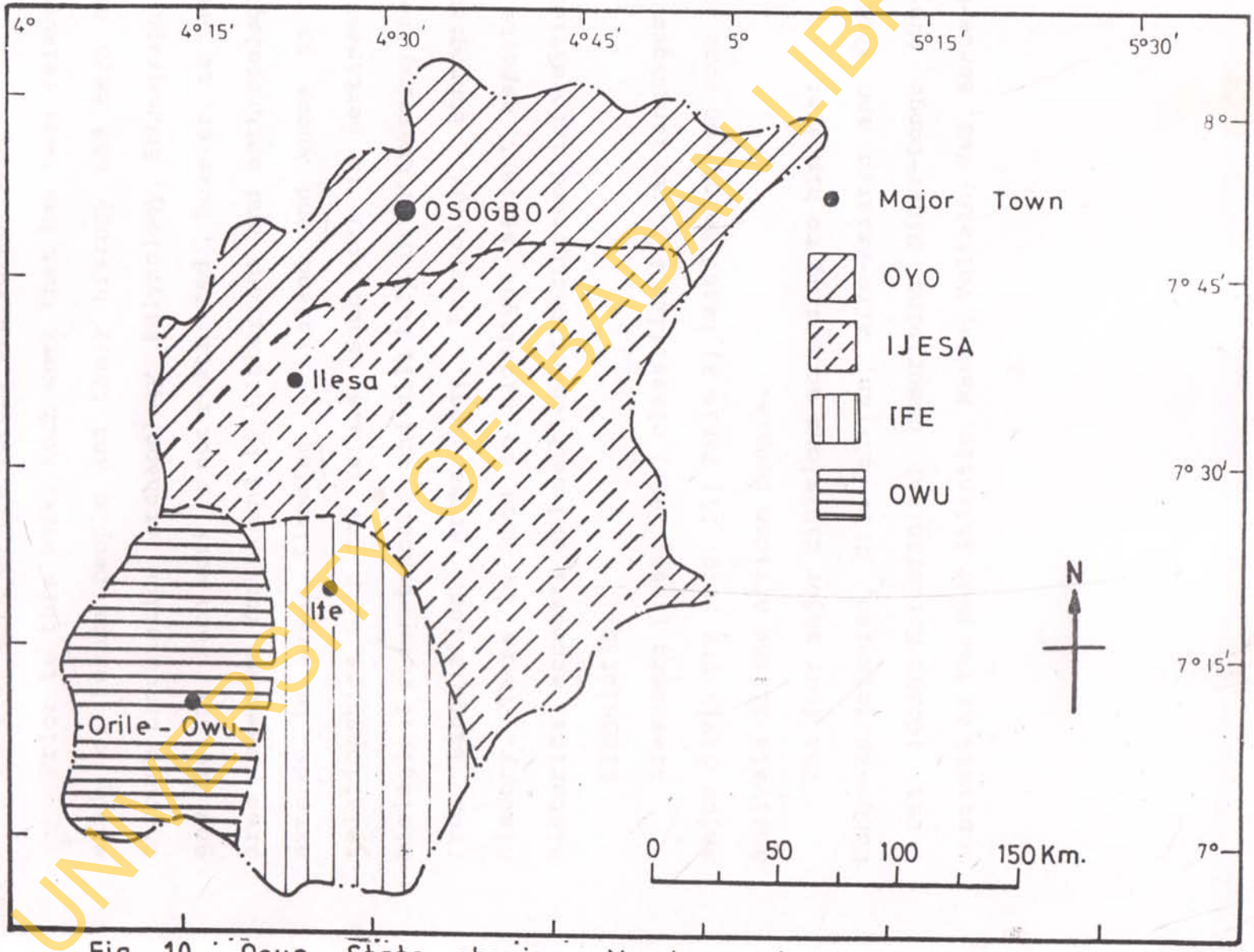


Fig. 10 : Osun State showing Yoruba sub-groups

CHAPTER TWO

LITERATURE REVIEW

Earlier Work on the Yoruba and Yorubaland:

Prior to this work, much work that has been relevant to the study of Yoruba people and their history had been carried on through Linguistics, Archaoelogy, Palynology, Ethnography, History and Biology. Such work is not restricted , however, to the Nigerian area taken as Yorubaland by historians and anthropologists; but extends to areas flanking Yorubaland and whose people share relationships with the Yoruba. Such work is pertinent for the biological reconstruction and will help in buttressing the evidence from Linguistics, Archaeology, Palynology, Ethnography, and History. There is need to highlight salient aspects of such historical accounts and settlement background information.

Linguistics:

Greenberg (1963; 1964) classified African languages into four major divisions (Fig. 13; Table 2) based mainly on some linguistic analysis of the African people.

The four major divisions according to him are: Congo-Kordofanian, Nilo-Saharan, Afro-Asiatic and Khoisan. The first (Congo-Kordofanian) comprising Niger-Congo sub-division consists of the West Atlantic, Mande, Voltaic, Kwa, Benue-Congo and

Adamawa-Eastern families. This sub-division covers West Africa and parts of Central Africa.

Gregerson (1977), conscious of some similarities between the Nilo-Saharan and the Congo-Kordofanian language divisions as classified by Greenberg (1963), has suggested their merger under the name Kongo-Saharan.

Andah (1987) has also observed that the two linguistic divisions, Nilo-Saharan and Congo Kordofanian may have been related.

Andah (1987) suggested that the proto-forms of the languages within the Niger-Congo sub-division have been spoken for a very long time by people of Negroid stock living in various parts of West Africa. Lexicostatistics and glotto-chronology, he said, take these back to at least, terminal Pleistocene times. He noted that the Chadic (Hausa, Kanuri, Bauchi) languages spoken today are in contrast, relatively recent arrivals there.

Among the Kwa-speaking people of the Niger-Congo language sub-division are the Akan, Yoruba, Edo, Igbo, Nupe, Igala and Bassa.

Armstrong (1964) maintains that it is not yet possible to translate the relationships between languages such as Fula and other Kwa languages including Twi, Yoruba, Igbo, and then the Bantu, into a chronological scheme.

He suggested a separation time of about 2000 years between the

Fig. 11: Oyo State Showing Yoruba Sub-Groups

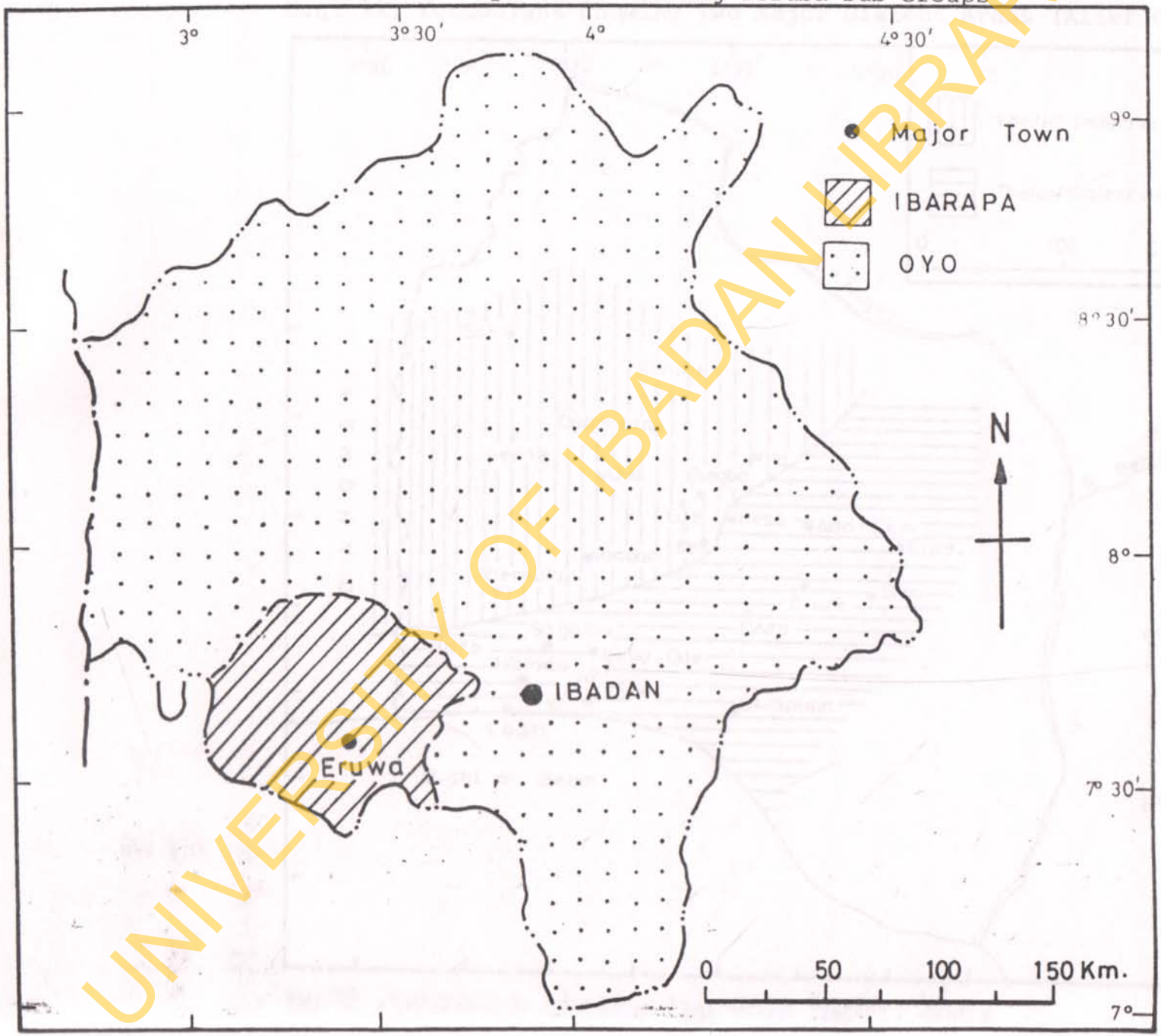


Fig. 11 'Oyo State' showing Yoruba Sub-groups

Fig. 12: Yorubalans Showing Two Major Dialect Areas (After Oduyoye)

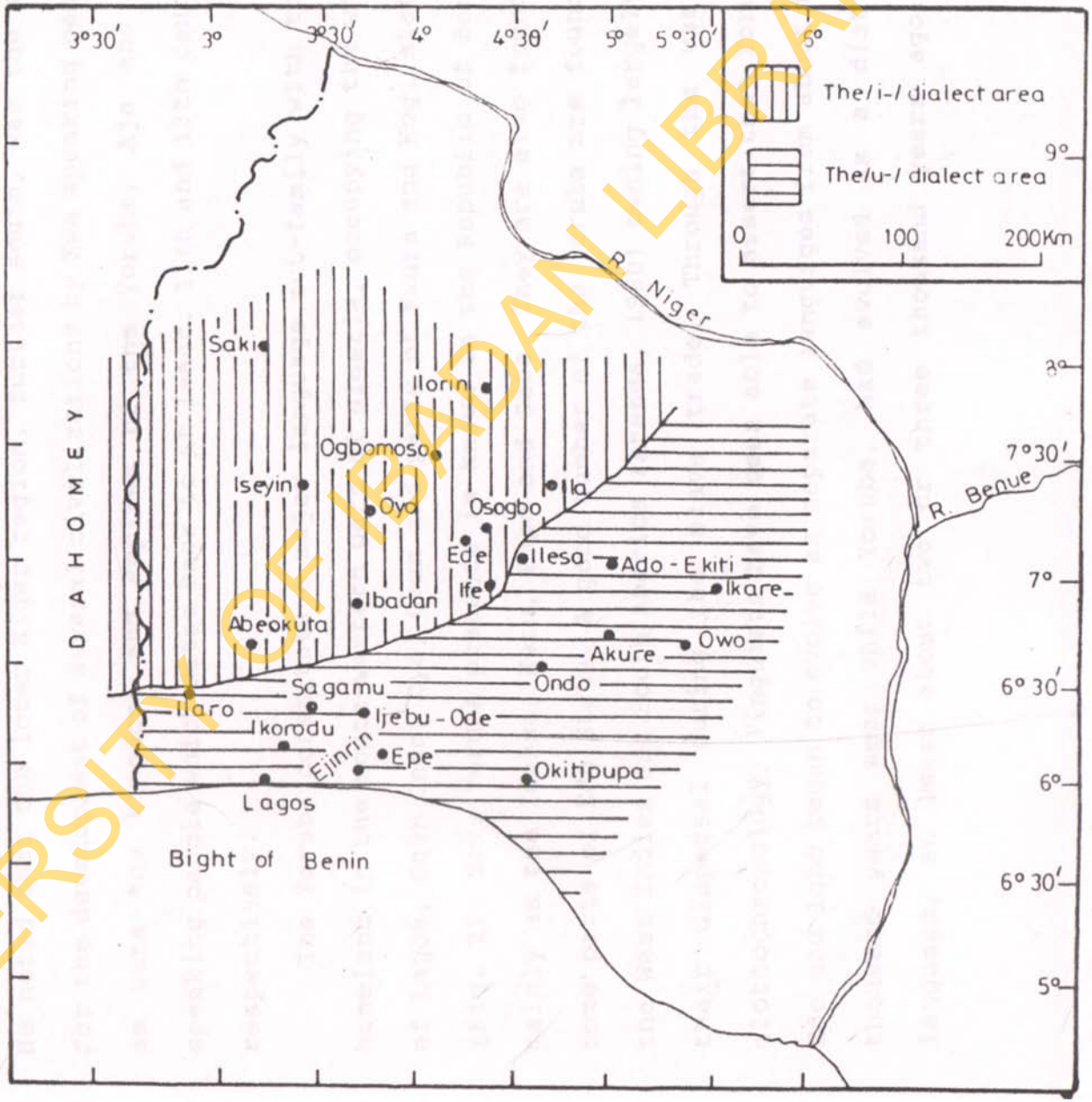


Fig. 12 : Yorubaland showing two major dialect areas
(After Oduyoye)

Oyo Yoruba and the Igala on the basis of a comparison of their basic vocabulary (Andah, 1987).

Andah (1987) has observed that it is not realy possible to study Yoruba cultural history meaningfully without reference to those of related neighbours like the Nupe, Bariba, Ebira and Igala. He noted that the lower Niger region, further south, was the seat for the development of several civilizations by Kwa speaking people as were the kingdoms and empires of the Yoruba, Aja and Edo speaking people which dates back to at least, 11th and 13th century respectively.

The Yoruba constitute a major language sub-family with their homeland in the south-western part of Nigeria, occupying the whole of Lagos, Ogun Ondo, Oyo, Osun and parts of Kwara and Kogi states, (Fig. 2). Some Yoruba presence is known in the Republic of Benin; mainly as the Idassa, Ketu, Popo and Sabe. They are also found in some parts of Edo State. A good number of the Yoruba are found in the West Indies and South America (Atanda, 1980) owning largely to their dispersal during the slave trade. Through the use of glottochronology, linguists have been able to assert that Yoruba, Edo and Igbo began to evolve as separate languages from about four thousand years ago; while Yoruba, had evolved as a distinct language, at least about two or three thousand years ago. It

TABLE 2

CLASSIFICATION OF AFRICAN LANGUAGES
(After Greenberg, 1963)

I	Congo-Kordofanian	I A Niger-Congo	I A 1 West-Atlantic
			I A 2 Mande
			I A 3 Voltanic
			I A 4 Kwa
			I A 5 Benue-Congo
			I A 6 Adamawa-Eastern
		I B Kordofanian	
II	Nilo-Saharan	II A Songhai	
		II B Saharan	
		II C Maban	
		II D Fur	
		II E Chari-Nile	II E 1 Eastern Sudanic
			II E 2 Central Sudanic
			II E 3 Berta
			II E 4 Kunama
		II F Koman	
III	Afroasiatic	III A Semitic	
		III B Egyptian	
		III C Berber	
		III D Cushitic	III D 1 Northern Cushitic
			III D 2 Central Cushitic
			III D 3 Eastern Cushitic
			III D 4 Western Cushitic
			III D 5 Southern Cushitic
		III E Chad	
IV	Khoisan	IV A South African	IV A 1 Northern
			IV A 2 Central
			IV A 3 Southern
		IV B Sandawe	
		IV C Hadza	

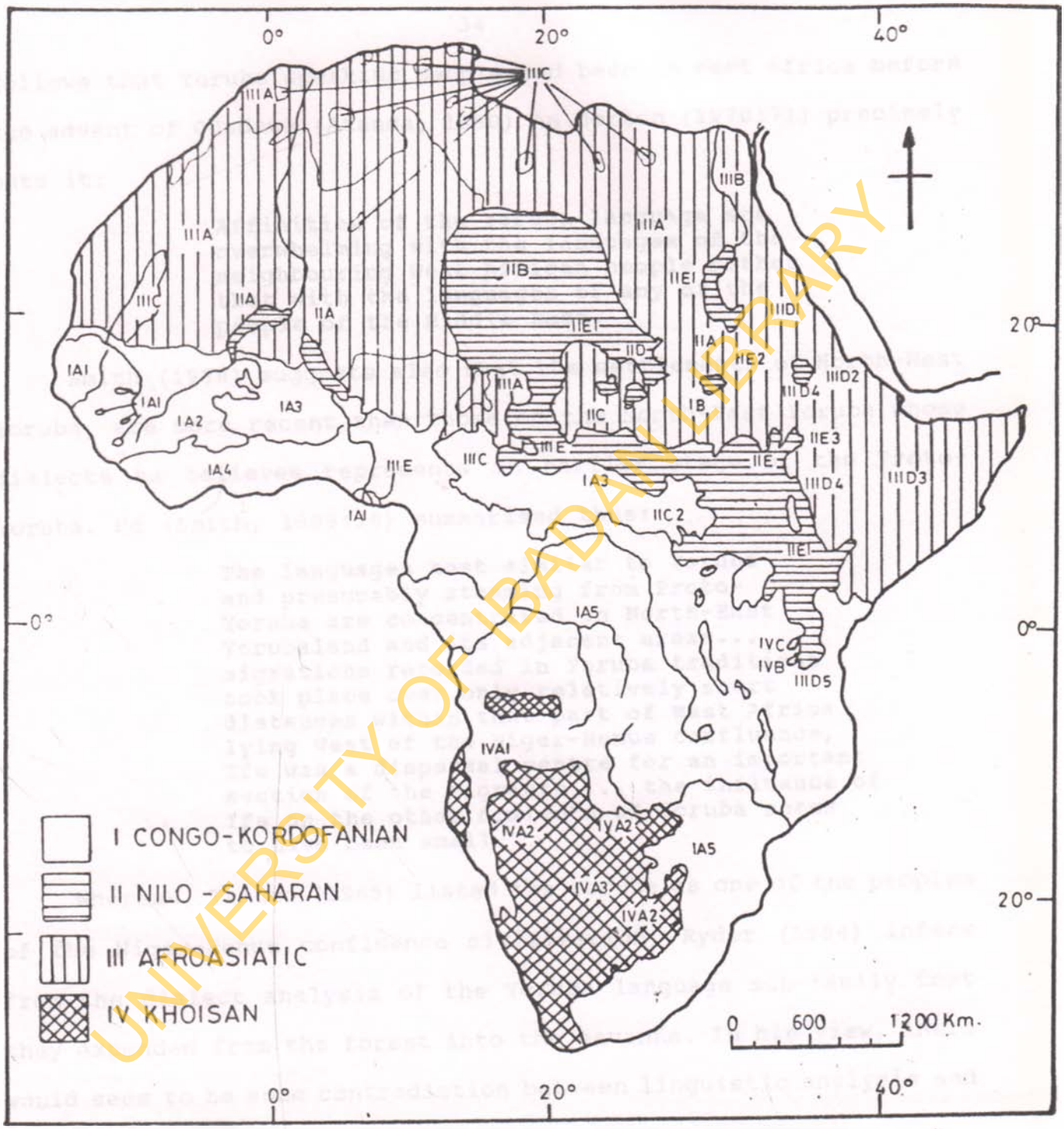


Fig.13: Linguistic map of Africa (After Greenberg)

follows that Yoruba speaking people had been in West Africa before the advent of Oduduwa (Atanda, 1980) As Horton (1970:71) precisely puts it:

> **Affinities of the Yoruba language are overwhelming with the languages of the neighbouring West African people rather that with the languages of any of the people of the Middle East.**

Smith (1988) suggests also that the settlements of North-West Yoruba, are more recent than those of the North-East Yoruba whose dialects he believes represents an earlier stage of the Proto-Yoruba. He (Smith, 1988:16) summarised thus:

> **The languages most similar to Yoruba and presumably stemming from Proto-Yoruba are concentrated in North-East Yorubaland and its adjacent areas... migrations recorded in Yoruba traditions took place over only relatively short distances within that part of West Africa lying West of the Niger-Benue confluence, Ife was a dispersal centre for an important section of the migrants ... the influence of Ife on the other dialects of Yoruba seems to have been small.**

Whereas, Tamuno (1965) listed the Yoruba as one of the peoples of the Niger-Benue confluence civilization, Ryder (1984) infers from the dialect analysis of the Yoruba language sub-family that they expanded from the forest into the savanna. In his view, there would seem to be some contradiction between linguistic analysis and

historical tradition; contradictions attributed by some to be due to movement of secondary population from the forest to the savanna and vice versa.

Oduyoye (1972) had partitioned the Yoruba language sub-family into two dialect groups: the "i" and "u" based on a shiboleth/siboleth dialect distinction. He thus, divided Yorubaland into two dialects areas (Fig.12). Adetugbo (1973) identified three main Yoruba dialect groups. Two of these which he believed were of greater antiquity, and hence of older settlement; are the central group (comprising Ife, Ilesha and Ekiti areas) and the South-Eastern group (the Ondo, Owo, Ikale and Ilaje and Ijebu areas.)

According to him, all the areas of these listed Yoruba sub-groups fell entirely within the forest zone in the twelfth century.

The third group of dialects embraces Oyo, Osun, Ibadan, and the northern Egba area; which he said, were historically associated with the Oyo empire and shows fewer traces of antiquity than the other two (Table 1; Fig.2).

Archaeology:

Research in Archaeology over the years has provided evidence regarding the early history of populations of early Yorubaland and areas westwards and eastwards and eastwards of it (Table 3).

To the West of Yorubaland in the Akan culture area, we have

information ranging from identified industrial complex at Kintampo dated to 915 ± 290 BC. (Davies, 1964) to late Stone Age levels at Bosumpra predating 3420 B.C. (Smith, 1975).

In the Edo and Igbo speaking areas, eastwards of Yorubaland, it would seem that the early city of Benin was in existence by 1305 ± 105 A.D. (Connah, 1972) while at Igbo-Ukwu, there was already in existence, a sophisticated Bronze-casting tradition in the 10th century (900 A.D.), Thurstan Shaw (1967). A late Stone Age complex dated between 5000-3000 Y.B.P. was reported for Afikpo by Andah and Anozie (1980): while at Ugwelle-Uturu, earlier Stone Age materials have been identified as pre-dating 11,000 Y.B.P., although precise dates are yet to be obtained (Anozie et al., 1978). Within Yorubaland, skeletal remains have been dated to 11, 000 Y.B.P. at Iwo-Eleru (Thursan Shaw and Daniels, 1984). At Mejiro cave, some late Stone Age artefact are dated to 5000 Y.B.P. (Willet, 1960), while excavations at the ancient settlement of Old Oyo indicate the existence of a town settlement at around 810 ±80 A.D. (Agbaje Williams, 1981) and levels containing potsherds have been dated to 1,100 + 110 A.D. (Diogun pottery); 1300 ± 80 A.D (Mejiro Pottery) (Soper and Darling, 1980). Charcoal dates of +560 and 980 A.D. were obtained from a pre-town occupation for Ile-Ife, while dates of two potsherd floors at Ita Yemoo have been dated to 960 A.D. and

TABLE 3

SUMMARY OF ARCHAEOLOGICAL DATES OF SITES RELATED TO YORUBALAND

	Archaeological Site(s) or Sample(s) Dates	Author(s)	Date(s)
1.	Kintampo	Davies (1964)	915 + 290 B.C.
2.	Bosumpra	Smith (1975)	Before 3420 B.C.
3.	Benin	Connah (1972)	1305 + 105 A.D.
4.	Igbo-Ukwu	Shaw (1967)	900 A.D.
5.	Afikpo	Andah & Anozie (1980)	5000 - 3000 Y.B.P.
6.	Ugwuele-Uturu	Anozie et al (1978)	Before 11,000 Y.B.P.
7.	Iwo-Eleru	Shaw & Daniels (1984)	11,000 Y.B.P.
8.	Mejiro Cave	Willet (1960)	5000 Y.B.P.
9.	Old Oyo	Agbaje-Williams (1981)	810 + 80 A.D.
10.	Diogun Pottery (Old Oyo)	Soper & Darling (1980)	1100 + 110 A.D.
11.	Mejiro Pottery (Old Oyo)	Soper & Darling (1980)	1300 + 80 A.D.
12.	Ile-Ife (Charcoal)	A.F.C. Ryder (1984)	+ 560; + 980 A.D.
13.	Ile-Ife (Ita Yemoo)	A.F.C. Ryder (1984)	960; 1060 A.D.
14.	Iffe-Ijumu (Kernel)	Oyelaran (1991)	2210 + 80 A.D.
15.	Niger Delta Cores	Sowunmi (1981)	2800 Y.B.P.

1060 A.D. (Ryder, 1984).

In North-East Yorubaland, an area referred to by Atanda (1980) and Smith (1988) as the home of the 'Proto Yoruba' Oyelaran (1991) obtained radio-carbon dates of 2210 ± 80 Y.B.P. for palm kernel fragments from Itaakpa. (Table 3)

Not much can be made of this until the associated pottery is studied in detail and we are in a position to ascertain what, if any affinities these have with known Yoruba traditions.

Pollen analysis of some Niger-Delta cores (Sowunmi, 1981) suggest that by 2800 Y.B.P. there was deforestation in Southern Nigeria probably as a result of farming activities. The rapid and significant increase in Elaeis guineensis (oil palm) pollen appears to corroborate this. (Table 3)

History

Most early historical accounts of the Yoruba concerning pre-Ife origins tend to be distinguished by the fact that they claim the North Eastern parts of Africa as the original home of the Yoruba. These parts include Egypt, Arabia, Nubia, Axum, Tigre, Punt, Sudan and the Quadai (or Waddai) (Fig. 19).

The tendency to derive the Yoruba people from the East has usually been based on supposed cultural similarities between the Yoruba and the people of Egypt. Examples of such are the works of

Johnson (1921) and Lucas (1948). This notion of Egyptian derivation has remarkable similarities with the historical accounts of some other West African groups (Aderibigbe, 1965). It is generally suggested that Arab-inspired military campaigns, thought to have assumed serious proportions between A.D. 632-1099, at the death of prophet Mohammed (Gibney, 1978; Hirsch 1993) was the cause of southerly migrations that could have given rise to movements into areas south of the Sahara.

However, trade routes into Africa were said to have emerged between 1500-1200 B.C. once the Arab domesticated the dromedary camel (Gibney, 1978).

Smith (1988) believes that the Arab conquest of North Africa in the seventh century might have resulted in movements which eventually completed the assimilation of some people by the Yoruba in their present homeland.

According to Aderibigbe (1965): "there is no longer the old tendency to accept the idea of Yoruba migration from Egypt without question." It is now generally agreed that, in actual fact, there have been no systematic attempts to derive genuine migrations for the Yoruba or other language sub-families. The idea of migration from the East is to be thus, approached cautiously. The basic concepts of rules for studying migratory movements based on

archaeological evidence have never been employed. There is there fore no basis of cultural facts to support the claims of such migrations. Islamic and Biblical affiliations are being used to fabricate history; a manner of "mythologizing history".

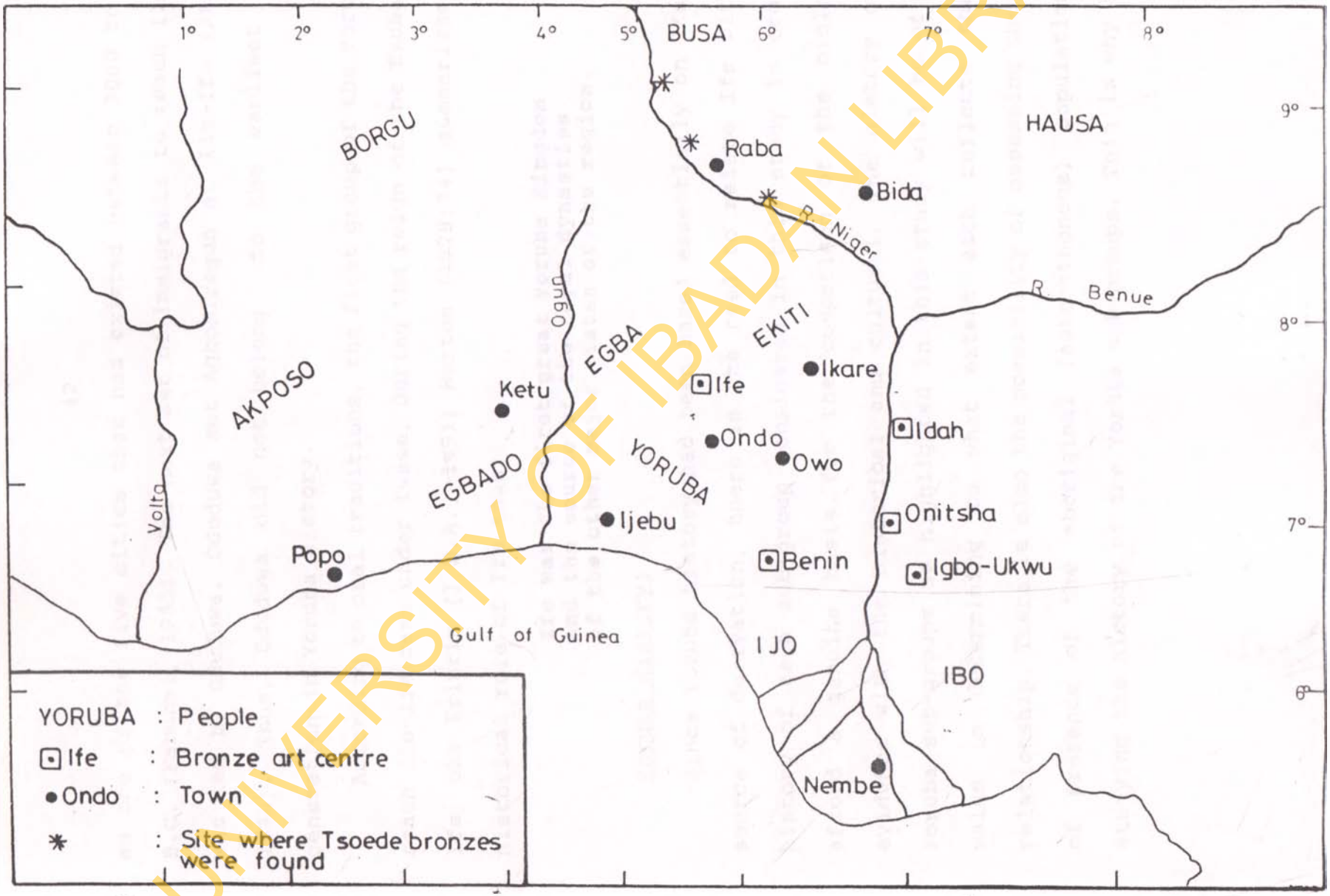
It is reasonable from the mythological historical accounts associating the Yoruba with peoples of the middle east of Africa to conclude that these are mere speculations! Ile-Ife represents the earliest identified stage in the development of Yoruba culture, which most probably took place towards the end of the first millennium, 1000 A.D. Ife is usually thought to be the first settlement of the Yoruba while other towns were formed by the different sub-groups that migrated northwards or southwards, absorbing or driving away the original settlers (Lucas, 1948).

It was from this base that the Yoruba extended their sway over the aboriginal inhabitants called the Ugbo (Atanda,1980) about whom little is known, creating other settlements as they advanced southwards (Aderibigbe, 1965).

From the stone, bronze and iron works as well as the remarkable terracottas retrieved from archaeological and historical contexts, it is clear that the Yoruba attained a high level of culture at Ife.

Ife was said to have been listed by Herodotus (484 - 424 B.C.)

Fig. 14: Peoples around the Niger Delta as at the 12th Century (After D. T. Niane)



as one of the five cities that had existed between 3000 to 1000 B.C. (Fabunmi, 1985). The next set of immigrants to reach Ile-Ife was led by Oduduwa. Oduduwa met Agbomiregun at Ile-Ife (Atanda, 1980). Thus, Oduduwa did not belong to the earliest known generation in Yoruba history.

According to oral traditions, the first group of the Yoruba to reach Ile-Ife came under Iwase, during the reign of the Esumare of Ife, Oba Erinrin (I.D.A., 1991) Horton (1979:74) summarisses the historical role of Ife thus:

> **Ife was the first great Yoruba Kingdom and the source of the royal dynasties of the other major states of the region.**

Yoruba History:

Since Yoruba history had been based essentially on Ife as a source of derivation, there is the need to relate Ife with the history of each sub-group considered in this study in order to afford a genuine basis for the comparison of the biological evidence with the historical and cultural. The history of the Yoruba sub-groups as highlighted in this study will be of great value in determining to what extent each reflects the Ife relationship. There is also the possibility of assessing the level of presence of the aboriginal (autochthonous) populations by studying the history of the Yoruba sub-groups. This is why it has

Fig. 15: Yoruba Territory Between 1100 - 1500 (After Ryder)

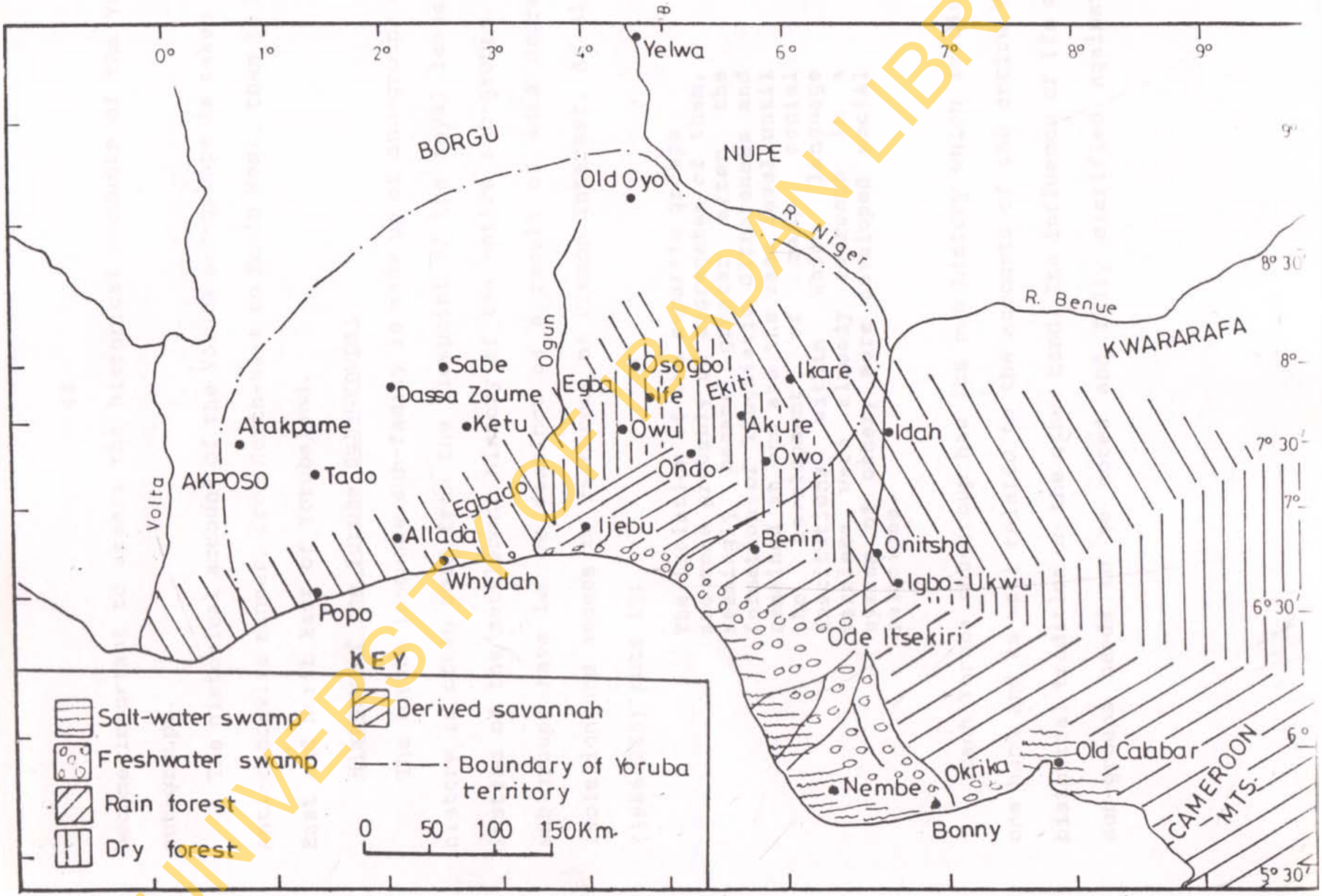


Fig. 15: Yoruba territory between 1100 - 1500 (After Ryder)

become important to assess the historical accounts of the Yoruba sub-groups.

The historical account of the Yoruba sub-groups is taken in an anti-clockwise manner, from North-West to South West, then to South East and North East of Yorubaland.

History of the Yoruba Sub-Groups:

The Yoruba language sub-family is made up of sub-groups whose history is often told from the viewpoint of the royal leadership instead of the settlement history of the entire sub-groups. Such sub-groups have become distinct as a result of some degree of isolation and access to resources of common interest. As Alexeev (1986:265) puts it:

> **The isolation of the separate groups and more probably of aggregates of them, seemingly became greater after the formation of linguistic differences and remained at one and the same level until the development of many social institutions within which language barriers were already overcome in a system of other, more developed social relations.**

Each Yoruba sub-group has its own history which is distinct one hand and as well related to the accounts of the entire Yoruba historical tradition on the other hand. The influence of Ife on the sub-groups needs to be noted and fully clarified against the

Fig. 16: Nigeria (Ancient States) in the 16th Century (After Lafene)

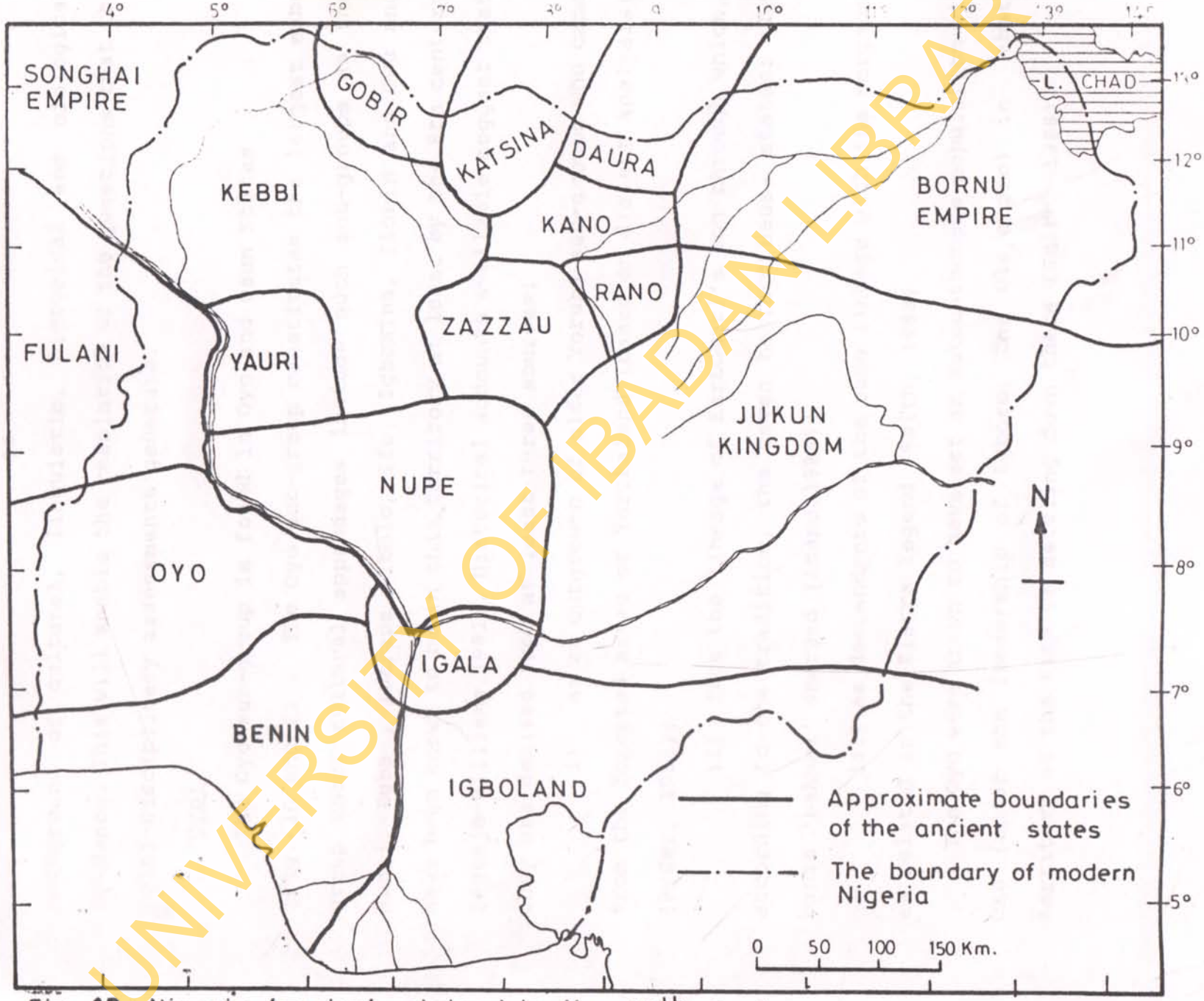


Fig. 16. Nigeria (ancient states) in the 16th Century

background of cultural, linguistic, historical and biological evidence. This will enable the resolution of the questions that the multi-disciplinary assessments generate.

Oyo:

The Oyo sub-group is found in Oyo and Osun States (Fig. 10 and 11). The Oyo sub-group constitutes the largest sub-group whose cultural appendages include such sub-groups as the Awori, Egba , Ibarapa, Ibolo, Ife, Igbomina, Ilorin and Owu and have been known to be in this territory at least by the 8th century (Agbaje-Williams,1981). Historical accounts available suggest that they are derived from at least three sources:

i) as an outgrowth of older Yoruba sub-groups who came from the forested areas of Yorubaland (based on dialect analysis) (Ryder, 1984);

ii) from the lineage of Karbogari's son through which, according to one tradition, the seven bastard Hausa states: the banza 'bakwai' emerged (Adamu,1984);

iii) as descendants of the same lineage with the Borgana as related in the Kistra legend (Smith, 1988)

The Oyo were known to have met an autochthonous population at Oko (under the leadership of Egboro, the Oloyokoro) in that territory at the time of settling down there (Smith, 1988).

Fig. 17: Nigeria (Ancient States) by the 17th - 18th Century (After Ajayi and Espire)

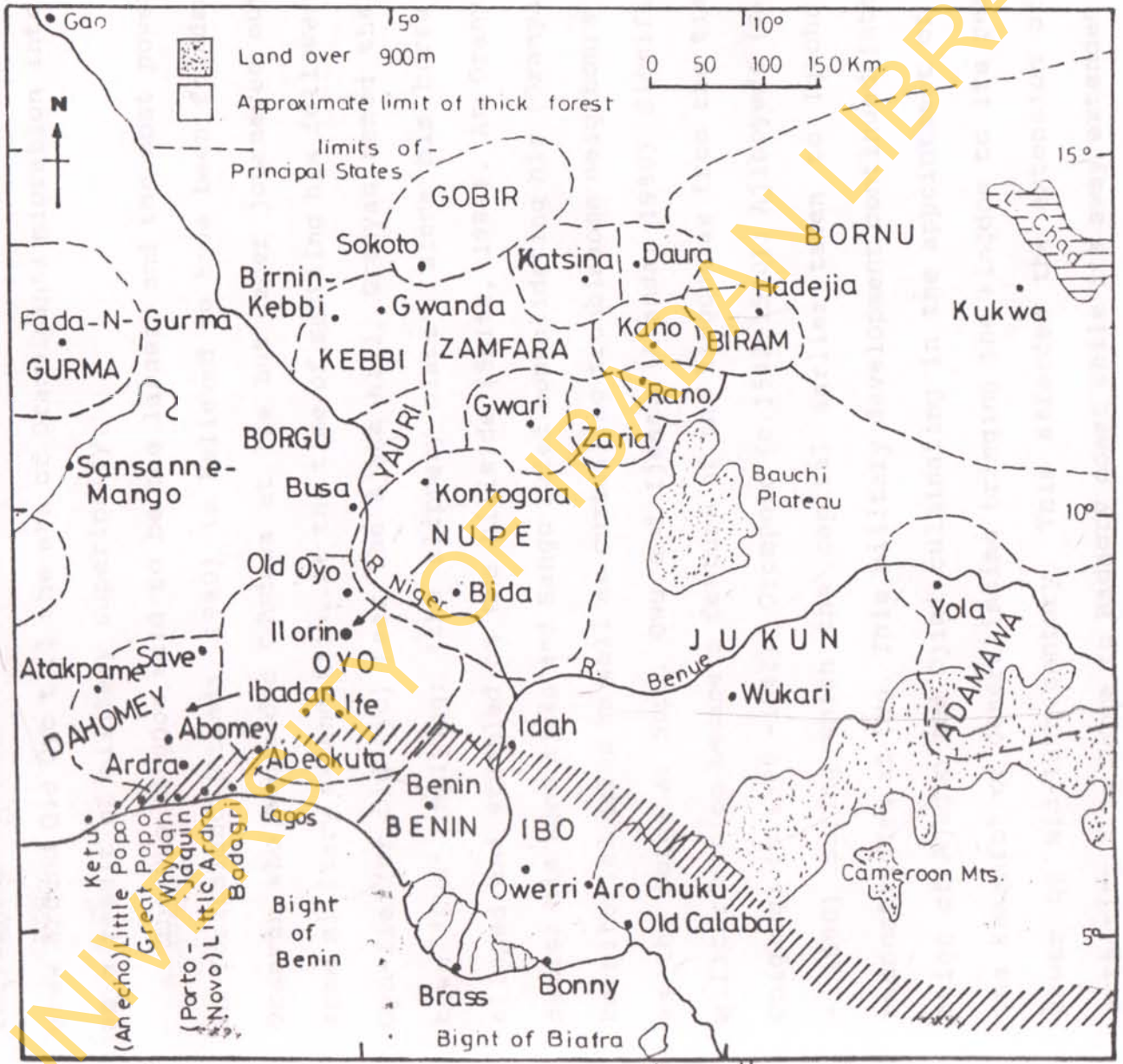


Fig. 17: Nigeria (ancient states) by 17th - 18th century

The Oyo, despite suggestions of far north or middle east influences would seem to have been derived from populations which grew around Old Oyo till the era of Oranmiyan's migration into Ife as a result of military superiority.

The Oyo kingdom said to be the largest and the most powerful in Yorubaland (Atanda, 1980) is believed to have been founded by Oranyan who succeeded Oduduwa at Ife but later journeyed out on some military expendition. At the time of settling his followers at Oyo-Ile (or Old Oyo) near the Ajaka hill, Oranyan named the new town 'Oyo' implying: 'the slippery place', since his horse has slipped and stumbled on the hillside (Smith, 1988). At Oranyan's demise his sons Ajaka and Sango ruled consolidating his (Oranyan's) territorial gains as well as curtailing troublesome neighbours such as the Borgana, Nupe, Owu and Ijesa. (Atanda, 1980) Significant militarisation became a feature of the kingdom as from the time of Onigbogi (c.1580 -1542); Orompoto (c.1542-1580); Ajiboyede (c.1580 - 1590) during which the capital earlier taken to Igboho was reconstituted at Oyo. This military development continued into the reign of Ajagbo and Ojigi culminating in the appointment of "Are Ona kakanfo" or Generalissimo bringing the kingdom to its peak of power by mid-18th century. This afforded the extension of Oyo authority from Jebba to Badagry coast while its sway extended over

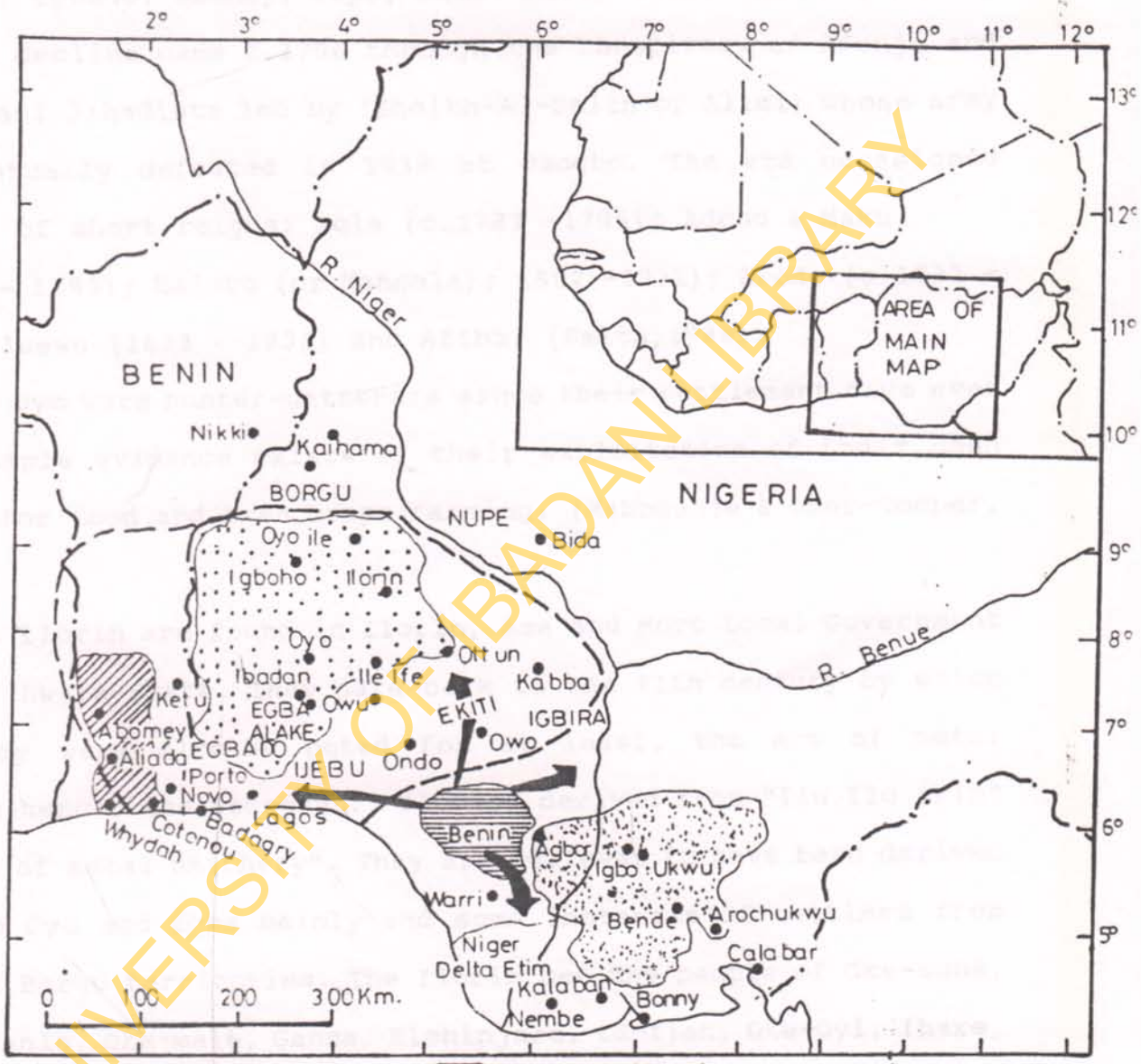


Fig. 18: Yorubaland and nearby states before 1800 A.D.

ADAPTED FROM WEST AFRICAN HISTORY A D 1000 TO THE PRESENT O.U.P. 1983

(AFTER ISICHEI)

the Egba, Egbado, Abomey, Popo, Sabe. Ketu, Idassa and the Awori.

Oyo decline came c.1796 through the conspiracy of Afonja and some Fulani Jihadists led by (Sheikh-Al-Salih or Alimi) whose army was eventually defeated in 1838 at Osogbo. The era occasioned Alafin's of short reigns: Aole (c.1789 -1796); Adebo & Maku (c.1796 - 1799); Majotu (or Mansola); 1802 -1831); Amodo (c.1831 - 1833); Oluewu (1833 - 1836) and Atiba. (Smith,1988).

The Oyo were hunter-gatherers since their settlement days even though ample evidence exists of their exploitation of their open terrain for food and tree crops farming. (Mabogunje & Omer-Cooper, 1971).

The Ilorin are found in Ilorin, Asa and Moro Local Government Areas of Kwara State. They date back to the 11th century by which time they were already noted for at least, the art of metal smithing hence, the ethnonym: "Ilorin" derived from "Ilu Ilo irin" or "town of metal smithery". They are believed to have been derived from the Oyo and Egba mainly and some instances of settlers from Nupe and Borgu territories. The Ilorin met the people of Oke-suna, Ogele, Kanla, Oke-male, Ganma, Elehinjare, Idofian, Oke-Oyi, Ibare, Igbon and Iresa there (Mabogunje and Omer-Cooper, 1971).

The Ilorin territory of a conglomerate of smaller settlements with Afonja, Solagberu, Ojo Isekuse as some of the leaders was part

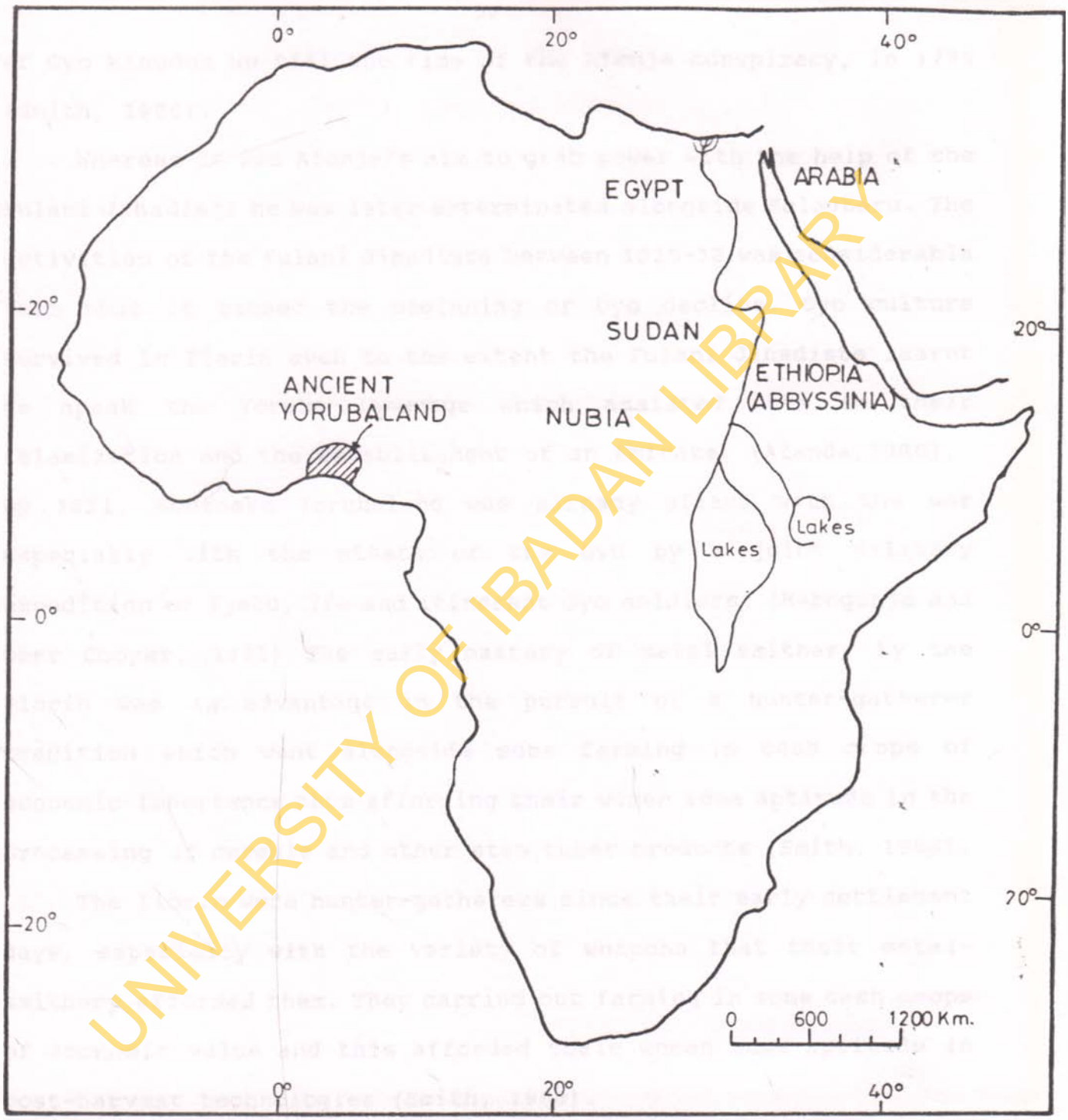


Fig. 19 : Map of Africa showing Egypt, Nubia and Arabia

of Oyo kingdom up till the time of the Afonja conspiracy, in 1796 (Smith, 1988).

Whereas it was Afonja's aim to grab power with the help of the Fulani Jihadists he was later exterminated alongside Solagberu. The activities of the Fulani Jihadists between 1820-38 was considerable such that it caused the beginning of Oyo decline. Oyo culture survived in Ilorin even to the extent the Fulani Jihadists learnt to speak the Yoruba language which assisted them in their islamization and the establishment of an Emirate. (Atanda,1980). By 1821, Southern Yorubaland was already aflame with the war especially with the attack of the Owu by a joint military expedition of Ijebu, Ife and itinerant Oyo soldiers. (Mabogunje and Omer Cooper, 1971) The early mastery of metal smithery by the Ilorin was an advantage in the pursuit of a hunter-gatherer tradition which went alongside some farming in cash crops of economic importance thus affording their women some aptitude in the processing of cereals and other stem tuber products (Smith, 1988).

The Ilorin were hunter-gatherers since their early settlement days, especially with the variety of weapons that their metal-smithery afforded them. They carried out farming in some cash crops of economic value and this afforded their women some aptitude in post-harvest technologies (Smith, 1988).

Ibolo:

The Ibolo (or Igbolo) are found today in Offa and Oyun local Government Areas of Kwara State. The major settlements of the Ibolo include: Offa, Ippe or (Ipe), Erin-ile, Ilemona or (Illemona), Igosun, Ira or (Irra), Ijagbo and Igbana. They are believed to have been in this territory by the 10th century, at least when the earliest settlers said to have been of Oyo extraction came even though some more recent settlers claim Ife derivation. This seems to be confirmed by the fact that the Ibolo still celebrate a "Moremi" festival annually in remembrance of the Ife episode with the Ugbo (or Ubo) forest dwellers.

The people of Offa and its immediate district are often called "Ibolo" (or Igbolo) meaning: "oil palm gatherers."

Oluwole, the founding father of the Ibolo kingdom as well as nine of his successors were said to be of Oyo extraction, hence their loyalty to the Alafin. The capital at Offa was subject of Nupe and Ilorin imperialism which was resisted. They are oil-palm processors in addition to having a hunter-gatherer tradition and a subsistent farming custom of food and cash crop cultivation (Smith, 1988)

Owu:

The Owu are today found mainly in Irewole local Government

Area of Osun State and elsewhere in Igbo-Owu (Kwara State), Abudu (Edo State), Owu-Ijebu and Owu-Egba (Ogun State), Ajebandele (Ogun/Ondo State boundary), Ago-Owu (Lagos State) and Owu-Orile near Oyo in Oyo State. The Owu in Osun State are indigenous to their territory while those in Kwara, Edo, Ogun, Ondo, Oyo and Lagos states are reported to have arrived there after the collapse of the Owu kingdom in 1821 (Mabogunje and Omer-Cooper, 1971) intermixing with Oyo, Ijebu, Ondo, Igbomina, Edo and the Egba. The Owu Kingdom is believed to be one of the earliest and oldest of Yoruba kingdoms (Mabogunje & Omer-Cooper, 1971; Atanda, 1980). The evidence that by the 15th century, Owu settlement in Osun State (Fig. 10) had become a military outpost of the Oyo empire is true.

The ethnonym "Owu" is said to have been derived from "one who sobs" in reference to the manner in which its patriarchal Asunkungbde (meaning: "one who cries to earn a crown") is said to have obtained his crown from Oduduwa, his maternal grandfather, thus implying a relationship (Mabogunje & Omer-Cooper, 1971). Owu as a military outpost was effective in fulfilling Alafin's military behests especially against the Ife. The combined attack by the Ijebu, Ife and free Oyo soldiers in 1821 led to its fall causing some widespread dispersal of its people into other territories of the Yoruba.

The Owu were effective hunter gatherers with a tradition of farming in economic crops while the produce were sold at the popular Apomu market under its control. (Mabogunje and Omer-Cooper, 1971).

Ibarapa:

The Ibarapa are found in Ibarapa and Ifeloju local government Areas of Oyo State where they probably have been by the 16th century at the peak of the Oyo Empire. The territory was originally made up of seven towns: Eruwa, Lanlate, Igbo-Ora, Igangan, Tapa, Aiyete and Idere. This sub-group derives its name from "Ibara-pa" - meaning "the melon splits" , referring to the people's prowess at planting melon as an economic crop. The Ibarapa still remain a farming people to this date and have acquired a distinctness in melon cultivation which sets them aside from the Oyo from which they are believed to have been largely derived. They farmed mainly in melon and other legumes such as cowpea, pigeon pea and some cash crops. Their hunting activities were limited to the forested patches of their largely open grassland territory. The earliest settlers were the people of Oniki whom subsequent settlers met there especially at the fall of Oyo empire (c.1800) and Owu (c.1821) (Mabogunje & Omer-Cooper, 1971).

Subsequent settelments in Ibarapa territory were also peopled by Nupe (especially at Tapa);Ijesa and Oyo migrants. They are

normally classified with the "Oke-Ogun" people, especially because they are settled northwards of the Ogun river from where they had to fight several survival wars against marauders especially the Nupe, Borgana, Abomey and Oyo.

Eruwa, one of its settlements grew as a centre for yam cultivation. Lanlate, another settlement was peopled by the migrants from "Ilanla", hence its name "Ibi Ilanla te do" - meaning: "the place the Ilanla found". Igbo-Ora was founded as a farmland settlement and was peopled mostly by farming migrants. Igangan was founded by the Oniki said to have come from Ife. Tapa was predominantly peopled by the Nupe migrants hence, its name. They, however, got absorbed language-wise into the autochthonous population. Aiyete was founded as a coglomeration of smaller settlements hence its name: "Ibi aiye te" -meaning, "where the world (people) found". Idere was founded by the Onidere, an Oyo migrant.

Ife:

The Ife are located today in Oranmiyan local government Area and its immediate districts in Osun State where they probably have been by the 5th century (Ryder, 1984) even though occupation there is reported as having taken place in at least two successions: the first up till about 1500 A.D. and the reorganisation subsequent to

this decline (Ryder, 1984).

The Ife are believed to have met the autochchonous Ugbo (or Ubo) dwellers in this territory on their arrival and the traditions of clashes related refer to the struggle for control that ensued between both groups over land and leadership.

Ile-Ife was said to have been the major spiritual and political centre of the Yoruba between the 9th and 12th century (Willet, 1967).

Ife would seem to have been subject to successive peopling from sources which seem to include: Ila, Oyo, and even Oba-Ile near Akure which probably antedated the last settlement (Smith, 1988).

Iwase who is said to have led the earliest migration to Ife met Oba Erinrin, Esumare of Ife there. (Odukoya, 1968). The Oduduwa leadership was said to have emerged after succeeding in the leadership tussle with the aboriginal people at Ife (Atanda, 1980). The Ife society of then was very organised as reflected in the considerable work of art: bronze figures and terracottas.

The Ife have been farmers of cash crops (cocoa, kolanut and cashew) and cereals, the patterns of which featured prominently on their pottery from archeological recoveries. Maize cob patterns were also a major feature of recoveries from the occupation phase of around the 15th century (Ryder, 1984).

Egba:

The Egba are found in Odeda, Owode/Obafemi, Ifo, Abeokuta North and Abeokuta South local governments of Ogun State. They are also found in parts of Agege Local Government of Lagos State. The Egba, whose territory once extended beyond Ibadan area (Mabogunje and Omer-Cooper, 1971) are known to have been in possession of that territory before at least, the 15th century when the earliest colonial visitors encountered them.

The Egba are usually said to have been derived from two sources: mainly the Egba Oke-Ona and Egba Gbagura from Oyo, the Egba Ake and Egba Owu from Ile-Ife and Orile-Owu respectively and are believed to be in the main to be offshoots of the Oyo (Biobaku, 1990) especially because they were part of the Oyo empire until its collapse in A.D. 1800. They probably were the earliest settlers of their present territory.

The term "Egba" is a contraction of the original name of "Egbalugbo" or "wanderers towards the forest" (Smith, 1988) with a territory stretching from Ijaiye, near Ibadan (northwards) around River Oba and to Ebute-Meta (southwards), then from Ijebu territory (eastwards) to Ipokia and River Yewa (westwards).

The Egba kingdom existed as a federation, made up of four provinces: Gbagura, Ake, Oke-Ona and Owu. Of these, Gbagura was the

largest with 144 towns, 72 of which was under the Onigun of Ilugun.

The Owu came to Egba territory at the destruction of Owu-Ipole in Oyo empire, around 1821 under the Olowu with towns such as Erunmu, Okolo, Owu (capital) and Mowo (Ajisafe, 1972).

Despite claims of Ile-Ife derivation, the Egba would seem to have been migrants from the nothern parts of Yoruba territory especially near Oyo. Oyo rule over the Egba was terminated by the Lisabi-led revolt between 1890 - 1897.

The Egba were hunter-gatherers during their early settler days as "wanderers in the forest " (Biobaku, 1957) since when they have advanced into farming in root crops which they process into food products such as "Lafun" (Cassava flour).

Egbado:

The Egbado are found in the Egbado division (which includes Egbado-North and Egbado-South Local Government Areas) in Ogun State and appear to have been here (Fig.2) before the 12th century (Atanda, 1980) by which time Benin influence reached this territory with a mixture of settlers said to include: the Anago, Popo, Sabe, Ketu, Ohori, Egun, Benin, Ife, Oyo, Mahin, Awori and the Idassa.

The term "Egbado" was originally used to describe the Yoruba sub-group settled near the River (Yewa) and it means: "Egba do" or "wanderers near the River (Yewa)" who were under Oyo rule up till

its demise in 1800 A.D. (Folayan, 1967) with Badagry becoming tributary to Lagos in 1830.

The Egbado were hunter-gatherers as well as farmers of distinction. The womenfolk process cereals and cassava while a few are engaged in fishing along the Yewa river and other major streams.

Awori:

The Awori presently inhabit Ado-Odo/Ota Local Government of Ogun State, the Lagos Island, and parts of Ojo and Badagry Local Government Areas of Lagos State. They have living in their midst, some Egun (another non-Yoruba subgroup).

They are believed to have come mainly from the norhtern parts of the Yoruba territory, especially Ile-Ife.

According to historical sources, the Awori, an itinerant people, were emissaries of Oduduwa who came annually to fulfil his spiritual behests of offerings on the Ogun River (Smith, 1988). Oral traditions has it that a clay plate of offerings normally terminated the annual rituals and that at one of such festivals, the plate which traditionally stays afloat the river suddenly sank hence the ethnonym: "Awori"meaning: "the plate sank" (Atanda, 1980; Fabunmi, 1985). Apparently, they were the earliest settlers in the sandy expanse that eventually became Lagos; settling first at Iseri

near the Ogun River bank under the leadership of their head hunter, Ogunfuminire, whose lineage is said to be from the royal house of Oduduwa at Ile-Ife.

The Awori would seem to have been migrants from Ile-Ife but seem to be contradicted by the fact that they owe their royal house largely to the invading Benin expedition of between 1603 and 1861 (Egbarevba, 1960) especially on Lagos island.

The Awori, possibly because of the nature of their habitat, are adept at fishing while they, practiced some subsistent farming on their sparse landed areas. Their fisherfolk population also engaged in trading, interacting with the Edo, Mahin (from Ilaje territory), the Ijebu, Egba, Egbado, Egun and Anago. They were said to have engaged in some hunting-gathering as their oral traditions revealed, but were limited by the swampy forest fringes of their territory.

Remo:

The Remo are located in Remo division made up of Sagamu and Ikenne Local Government Areas of Ogun State and parts of Ikorodu Local Government Area in Lagos State.

It seems that they have been in this territory somewhere between the 9th and 16th centuries at a time when Ikorodu migrants from Remo encampments arrived there (I.D.A., 1991). They (Remo)

apparently derive from three main sources:

i) Iremo quarters, Ile-Ife (Remo Mirror, 1987);

ii) Ijebu-Ode (Ogunkoya, 1956);

iii) Ugbo in Ilaje territory (I.D.A., 1991).

The migrant Remo (mainly Offin, Makun, Epe, and Soyindo) met the autochthonuos people of Ilara (under the leadership of Alara) in this territory, between the 15th-16th century. According to settlement historical sources, the earliest inhabitants in Remo territory were followers of Arisu (leader of a second migration into Ijebu-Ode) and a brother of the patriarchal Ijebu-king, Olu-Iwa believed to have arrived at about the 9th century (I.D.A., 1991).

They settled first at Ilara under the Alara of Ilara hence, the term: "Ijebu to Alara mo" later said to have been shortened to "Ijebu-Remo" meaning: "the Ijebu that Alara is moulding".

Another tradition says that the leaders of the Remo sub-group came from "iremo quarters of Ile-Ife (Remo Mirror, 1987) hence the name "Remo". The Remo constitutes the second largest group of the Old Ijebu kingdom and were subjects of the Akarigbo at Offin alongside with the Ewusi of Makun, Elepe and other Remo Obas. Sagamu developed as an important defence outpost which became a federation of 14 Remo settlements by 1872, although the pact was

supposed to include thirty three small towns. The 14 settlements included: Offin, Makun, Ado, Epe, Batoro, Oko, Raniken, Igbepa, Ibido, Ipoji, Ijagba, Latawa, Sonyindo, and Ijokun.

Whereas, the iremo claim seems to suggest that the Remo belonged to the pre-Obanta (12th-14th) century migrant group, the fact that the preceeding Alara (15th - 16th century) came earlier than their royal migrants in 1866 led by Oba Igimsoje seem to suggest that their royal leadership were probably of the later stream of migrants from Benin/Ondo territories of between the 15th - 16th centuries who sojourned in Ijebu-Ode before moving into this territory to dominate an autochthonous population.

The Remo traditionally engaged in farming, planting cash and food crops. Kola and Cocoa were major crops of economic value they cultivated. They also engaged in extensive processing in cassava (Gari) and cereal products with which they engaged in trading, initially through barter with water-faring travellers (including colonialists) around Ikorodu.

Ijebu:

The Ijebu are located today in the Ijebu division of Ogun State, and the Ibeju-Lekki, Eti-Osa, Ikeja, Somolu, Epe, and Ikorodu local government Areas of Lagos State. Oral traditions suggest that the leader of the Awujale dynasty, Olu-Iwa arrived in

Ijebu in the 9th century. This is questionable given that the same traditions report that Olu-Iwa has sojourned at Ife with Oduduwa on his way to Ijebu and the fact that Oduduwa's Ife does not predate the 10th century. The Olu-Iwa entourage met the Idoko, Idokunnusi and the people of Eredo in this territory on arrival whom they eventually came to control in a territory originally delimited by the historical ramparts: "Eredo" (Lloyd, 1959).

The term "Ijebu" is said to mean a "flourishing essence" according to popular folklore (I.D.A., 1991). One school of thought claims that the Ijebu are descendants of the Jebusites mentioned in the Holy Bible (Genesis 10:16; I Chronicle 11:14), according to Odukoya (1968:5)

The second migration was led by Ajogun Ogboroganda (otherwise called "Obanta") who is said in oral tradition to be the grandson of Olu-Iwa and son of Oduduwa and Gborowo (Olu-Iwa's daughter) from Ile-Ife. It was he (Obanta) whose military abilities opportuned him the chance to consolidate the Awujale dynasty (Ogunkoya,1956). Another migration from Benin territory (mainly Ijamo) was led by the 10th Awujale Obaruwa, alongside some lesser one from Ondo territory. These were said to have assured some solidarity which sustained the Ijebu during the 19th century Yoruba wars, especially with arms supplied by European traders with whom they were

acquainted (Ayandele,1992). Obanta's arrival in Ijebu between the 12th-14th century also contradict the notion that he could have been Olu-Iwa's grandson (Ogunkoya, 1956). His migration from the direction of the Benin/Ondo territories seems to support a probable Benin or Ondo (or Ilaje) relationship. The autochthonous population in Ijebu territory were hunter-gatherers with practices of some subsistent farming in cash and food crops. They traded extensively with early colonial visitors in textiles and other farm products at Ejirin, said to be West Africa's largest market at that time.(I.D.A., 1991).

Eko:

The Eko (or Eko-Yoruba) as well as the aboriginal Awori inhabit Lagos island, mainland and adjoining areas like Ikeja, Ebute-meta, Ido, Yaba, Isolo, Apapa, Mushin and Agege in Lagos State. The Eko comprise an amalgam of descendants from the Awori, Ijebu, Mahin, Benin, Nupe, Ife, Ijesa, Egun, Anago, Egbado, Ketu, Egba, Creoles of Sierra Leonean extraction and some Brazilians. The term "Eko" meaning:"camp" is a Benin (Bini) word, coined by the military expedition of Oba Orogba about 1603 A.D. (Egharevba, 1960) which established a war-camp on Lagos island to further its expansionist interests. The Benin remained in control up till 1861 when the British came in to establish colonial rule (Egharevba,

1960; Smith, 1988) The other migrants of the Eko possibly met the aboriginal Awori whom they subsequently outnumbered especially as a result of trade-influenced settlements in and around the Lagos island. The Eko would appear to have been present by at least, the 15th century when the earliest Portuguese visitors came in 1492. Lagos, derived from "Lago de Curamo" was first cited in a Portuguese map of 1845 and writing of Darte Pacheco (1931) in "Esmeraldo de situ orbis" (Smith, 1988).

The Eko, despite its Awori aboriginal derivation would seem to have been derived from various sub-group sources including Benin. The royal house of Ife claimed by the Awori would seem to have been probably more due to the Benin royal house of Oba Orogba (Egharevba, 1960). The fact that the Eko is variously derived would imply that an amalgam of such sources of derivation is now obtainable as against the possibility of an Awori aboriginal expression.

A primary occupation of the Eko is fishing, having acquired their skills from the Mahin, Awori, Egun, and Ijebu fishing communities. They engaged in farming where substantial land afforded it. Their position as intermediaries between colonial visitors and other people as from the 14th century predisposed them to engage in a trading culture yet unsurpassed by other Yoruba sub-

groups.

Ilaje:

The Ilaje, found today in the Ilaje division of Ondo State, are believed to have been there since the 8th century being one of the first settlers alongside the "Ifore" and "Idoko".

Their major towns include: Atijere, Igbokoda, Igbolomi, Igbo-egunrin, Okesiri, Mahin, Aiyetoro, Ugbonla, Ugbo, Idi-Ogba, Zion and Ereke. They have lived successfully with their neighbouring sub-groups: Ijo, (or Ijaw) Ondo, Ikale, Benin, Ijebu and the Itsekiri. With their homestead amongst the creeks, canals, lagoons, estuaries and the seashore, the Ilaje are mainly fisherfolk and water bound traders having become acquainted with the art of water exploration for centuries. Their settlements are divided into two categories: Mahin and Ugbo (Smith, 1988).

While the Ilaje, like other Yoruba sub-groups would claim Ife derivation their sources of derivation would seem to be relate to the "Okun Yoruba" and other related populations North-East of Yorubaland where the "proto-Yoruba" known to be acephalous (Smith, 1988) are said to have been derived. The fact that the Ilaje have no genuine royal traditions seem to contradict any strong Ife or Benin relationships.

The Ugbo category are administered under the Olugbo of Ugbo.

There is tendency to believe that the Ilaje (especially the Ugbo) are related to the earliest, pre-Oduduwa forest settlers at Ife with whom he had to struggle for the control of power and land subsequent to his domination at Ife.

Ikale:

The Ikale who presently live behind the creeks, lagoons and coast-line in the Okitipupa Local government area of Ondo State are said to have been there at least, by the 10th century. Apparently, they had relations with the Benin under Ewuare the great and may have been derived from Ife, Ondo and Benin sources. The Ikale have had centuries of trading relationships with their neighbouring sub-groups such as: Ondo, Ilaje, Benin, Ijebu and the Itsekiri.

They were supposed to have left Ile-Ife during a festival when drumming was prohibited, hence, the name: "Kale" which means "no drumming". This therefore, became the sub-group's name: "Ikale" (Fabunmi, 1985).

Their major towns include: Okitipupa, Ode-Aye, Ode-Irele, Igbotako, Akinfosile, Ilutitun, and Ebute-Irele.

The Abodi of Ikoya exercised supreme traditional authority on the Ikale in the pre-colonial era (Smith,1988). However, the fact that they are largely acephalous seem to contradict the strong Ife relationship suggested by Fabunmi (1985); the absence of strong

royal institutions would rather support probably the peopling by an autochthonous population related to the North-East 'Okun Yoruba' with later (15th-16th century) influence from Ife and Benin.

They farmed in cash and other crops while their women processed many food products. They have townships that were self-governing and independent, with some senior age-sets as the leadership.

Ondo:

Traditions of the Ondo who live presently in the Ondo Local Government Area of Ondo State suggest that they have been there since at least, the 10th century when the "Ifore" and "Idoko" arrived there.

They are believed to have been derived from Ife mainly, and then Benin (partially). According to settlement historical sources, the "Ifore" and "Idoko" were hunter/gatherers, who settled at Ededo or Ode-Ondo, the present site of Ondo. The term "Ondo" means "settlers" (Smith, 1988). The royal dynasty from Ife established by "Pupupu" came under the leadership of Uja and Akunnara, two of Oduduwa's warriors. Under Airo, the kingdom was put on a firm footing (Atanda,1980).

The royal house of Ondo that is said to be of Ife derivation shows greater Benin influence. The possibly that the settlement

pattern in Ondo territory has been greatly influenced by both Benin and Ife is not in doubt.

The Ondo are famed in all of Yorubaland for their hunting prowess which seems to derive principally from their experiences as one of the foremost sub-groups that invaded the forested areas as hunters and gatherers.

They farm cash and food crops presently and process palm-oil, cereals and cassava.

Akure:

The Akure are located in the Akure Local Government Area of Ondo State, Nigeria. They are probably one of the aboriginal settler sub-groups of the Yoruba. They are said to have been derived from Oba-Ile (the domain of the important excavation site of Iwo-Eleru) Atanda (1980) claims that Oba-Ile's peopling predated the settling at Ile-Ife, and it has been suggested on these grounds that they have been in their present abode since at least, before the 5th century, when they started to move out beyond the immediate forest environment of Oba-Ile for greater farmland and hunting/gathering access.

According to the people's oral tradition, farming, especially in food and cash crops; and hunting seem to have been very important activities of the early settler Akure populations largely

because they were endowed with fertile, forested arable lands upon which such crops could thrive. Hunting/gathering certainly grew from the early days of proliferation from Oba-Ile (a village domain near Iwo-Eleru rock shelter) and Epe.

The Akure are believed to have been derived from at least, four major sources: Oba-Ile, autochthonous Isikan and Isolo; then the Edo (or Benin); the latter are today found in Igiso, Eyinke and Oritagun quarters under the leadership of the Olotu-Ekiran or the Adowere (or Edowere). The Edo derived are styled the "Ado-Akure" or "Edo-Akure" to this day (Smith, 1988). The name "Akure" derives from "Akun-re" which means: "bead cut" and apparently resulted from the fact that the wrist beads (Akun" of Omoloju, son of Iyangede of Epe), cut at the spot when he was trying to clear a bush-path on a farm between Isikan and Oke-Aro junctions on Arakale road.

The first "Oba" of Akure was said to be the grandson of Oduduwa.

That the Akure are derived from some settlements that pre-dated Ile-Ife would seem to suggest that they are related to the "Proto-Yoruba" populations of the North-East of Yorubaland (Smith, 1988). The influence of Ife, Ijesa, Ekiti and Benin would seem to have arrived much later.

Owa Atakunmosa, seventh ruler of the Ijesa, while on a journey

to exile in Benin passed through Akure and gave his daughter in marriage to the Oba Ajanpada Oriya.

The son called Ogunja Olufadeji, on ascending the throne of Akure changed his title from Ajanpada to "Deji" of Akure which is the title in use up to the present day.

Owo:

The Owo who are believed to have been mainly derived from Ife and Benin sources probably came to their abode in Owo Local Government Area of Ondo State by the 11th century (Ashara, 1951). They met the "Efene" on their arrival there (Ryder, 1984) under the rulership of Elefene (M.O.I., Ondo State, n.d.)

According to historical sources, the founding father of today's Owo was Ojugbelu (or Ojugbolu) from Ife and his reign has been put in the begining of the eleventh century (Ashara, 1951). Ojugbolu was said to be the younger brother of an Oba of Benin, both of whom left Ile-Ife at the same time (M.O.I., Ondo State, n.d).

On leaving Ife, Ojugbelu halted at Uji (or Ujin) and then at Upafa (or Utapafa Hill); south of the present kingdom (Atanda, 1980; M.O.I., Ondo State, n.d.; Smith, 1988). from Utapafa, he moved his followers to Oke-Imade (Atanda, 1980), then to Igbo Ogurata (or Igbo Oguwata) now called Okiti Asegbo, centre town of

present Owo (Atanda, 1980). The group under the Olowo Imade is thought to have finally met the "Efene" at Okiti Asegbo on arrival there (M.O.I., Ondo State, n.d.), they initially lived amicably together but later had to settle the issue of supremacy by force of arms. Cultural similarities between Benin and Owo are evident in their brass-casting, wood sculptures, terracota and Ivory described as intermediate between Yoruba and Benin styles (Smith, 1988).

The fact that autochthonous Efene were met and dominated by royal groups (warlords) said to be of Ife and Benin sources mainly points to the fact that royal traditions came after the 10th century to most Yoruba sub-group territories. The autochthonous populations would seem to have been derived through migrations from local populations related to neighbouring sub-groups. The Owo particularly reflect substantial Benin influence in its royal house and art traditions.

The Owo are hunters, farmers and metalsmiths. They farm in arable and cash crops of economic value.

Ijesa:

The Ijesa are said to have been in their present abode (Ijesa division of Osun State) since about the 10th century.

Their traditions indicate that they are derived primarily from Ife although contacts with Benin is also well established during

the reign of Atakunmosa (7th ruler of the Ijesa) whose son also ruled in Akure as Deji (Smith, 1988). The Ijesa met an autochthonous population who were the people of Ilowa, Ilare and Onila whom the Ajaka migration met there (Smith, 1988).

The Ijesa kingdom was said to have been founded by Ajaka (or Ajibogun), a son of Oduduwa (Smith, 1988) who successfully got him (Oduduwa) sea-water to help treat his blindness. Whereas, Ajaka led his followers to a place called Igbadaye where he died (Atanda, 1980), his son, Owa Okile apparently extended control to a place called Ilowa, then Ilemure (re-named Ibokun) where he displaced Ita, a king he found already installed there. While at Ibokun, he also brought under his control the town of Ilare, whose ruler (Alare) claimed Ife descent. The next Owa, Owari moved to Ilaye (Atanda,1980) which came to be called Ipole-Ijesa after his death. The fifth reign, brought Owa Oge who chose Ilesa, whose original ruler he made second in rank and named Obanla. Other rulers around Ilesa were similarly subjugated, giving rise to what came to be called the Ijesa kingdom (Atanda,1980).

The Ijesa claim of derivation should include: Oyo (Ibadan), Benin and Akure apart from Ile-Ife since populations from these other Yoruba sub-groups have been known to settle within their territory. The Ijesa would therefore seen to have been derived from

these sources apart from the aboriginal population met in the territory.

The Ijesa had to resist pressures from Nupe, Benin and Old Oyo. They maintained their independence until they were overrun in the nineteenth century by the Ibadan who rose to power at the fall of the Oyo kingdom (Atanda, 1980).

The Ijesa have hunting/gathering traditions which they still maintain till today. They farm in cash crops such as Cocoa, Kola and Cashew and food crops, particularly "Okro" which is still a major feature of their farm-based rural economy. The women process food in pots which they make extensively hence the ethnonym: "Ijesa" meaning: "the pottery makers". Smith, (1988) contends that it may also mean "town of the gods".

Ekiti:

Ekiti traditions indicate that the autochthonous people in the Ekiti division of Ondo State and in the Ekiti Local Government (alongside the Igbomina) in Kwara State were living in their present homeland by the 14th century. They principally descended from the aboriginal Ilesun and then Benin (or Edo) settlers; from Ife and Benin sources.

The term "Ekiti" denotes: "a country of hills" being a good description of the territory's physical features.

Ekiti kingdoms were founded around towns with crowned Oba (Ilu Alade) and said to be city states limited by mountainous physical features, each claiming descent from Ife via Benin (Smith, 1988).

These were the sixteen (16) Ekiti principalities, which were economically linked but politically independent of one another.

They were: Owore led by Otun; Ijero under the Ajero; Ado under the Ewi (or Elewi);Ikole under the Elekole; Ara under the Alara; Efon Alaye under the Alaiye; Ido under the Olojudo; Ogotun under the Ologotun; Igbo-Odo (Imesi) under the Oloja-Oke; Oye under the Oloye; Omuo under the Olomuro; Ire under the Onire; Ise under the Arinjale; Ita under the Onitaji and Akure which later opted out, to be on its own.

Benin imperialism prevented Ekiti unity considerably before 1800 (Atanda, 1980). However, under Ibadan military pressures, the 16 states formed Ekiti parapo in the 19th century. The Ewi of Ado-Ekiti (formerly named "Awamaro" - restless one) came through Benin hence the term "Ado" (equivalent of Edo) is used as prefix.

The fact of Ilesun and Benin derivation sources of the Ekiti seem to suggest limited Ife influence. The royal house of Ado-Ekiti and even the patriarchal "Ewi" seem to have been principally of Benin influence; a fact that is reflected in today's royal ornaments and regalia of the Ewi of Ado-Ekiti.

The Ekiti have been hunters/gatherers within their hilly domain. They also farmed a lot of food and cash crops of considerable arable land available to them.

Akoko:

The Akoko are presently in the Akoko Local Government Area of Ondo State of Nigeria (Table 1; Fig.9). They live on the hilly outline of the North East Yorubaland fringes; a situation which provided them with immense security in the days of frequent warfare with neighbouring sub-groups.

They have been in this territory since at least, the ninth century, as a confederation of independent village settlements, each with a political administration and territory which was religiously guarded (Smith, 1988). The Akoko are believed to have been largely derived from three main courses: Yoruba (often including traditional Ife connection), Afenmai and Benin, (Smith, 1988/89); and to have become an independent entity circumscribed territorially (Atanda, 1980) due to subsequent interaction and negotiations between the different settler-village dependencies.

The Akoko seem to have been derived from the "Proto-Yoruba" (Smith, 1988) in addition to Afenmai and Benin sources. The fact that their territory was more accessible to populations around the North-East of Yorubaland appear to imply that they have had a

little Ife influence. The acephalous nature of the sub-group also seem to show that Ife and Benin influences came late to the sub-group's territories.

Ijumu:

The Ijumu (with sub-units of Gbede, Ikiri, Ayere and Ogidi) living in Oyi Local Government Area of Kogi State (Fig.5) are said to have been here from at least, 3000 Y.B.P. (Bolorunduro, 1990) and were descendants of the hill-living people around the North-East Yorubaland or the "Okun" Yoruba (Ijagbemi). They are said to be the autochthonous people indigenous to this area of the hill deities or "Ebora" (Oyelaran, 1991).

The Ijumu constitute one of the principal sub-groups of the North-East Yoruba found around the Niger-Benue confluence and very much related linguistically to the Itsekiri and Igala (Smith, 1988). The Ijumu, Yagba, Bunu and Kabba (or Owe) are part of the "Proto-Yoruba" of the North-East Yorubaland; the area of the archaeological work of Iffe-Ijumu where Oyelaran (1991) dated palm kernel fragments to 2210 + 80 Y.B.P. The Ijumu were said to be hunter gatherers in those early days and it seems that they first came to this area under the leadership of the Owa who first settled in Gbede area. Aiyetoro emerged as an active centre of the kingdom, controlling 17 villages. The other major towns in the territory

are: Aiyegunle, Odokoro, Iyah, Ogidi, Iyamoye and Aiyere. Iyara is the traditional capital of the Ijumu territory. They are farmers and metalsmiths presently and their women process palm-oil and kernel oil in addition to products from cereals and stem tubers.

Kabba:

The Kabba (or Owe) are found in present day Kabba town and its township districts in the Oyi Local Government Area (Fig. 5) of Kogi State, such as: Gbelenko, Aiyetoro-Egunbe, Okedayo, Onakiti and Egbeda. Like other "Okun", the Kabba were essentially acephalous (Ijagbemi, 1987) and the notion of an Ife migration is regarded as "charter myth". They are closely related to the Oworo who live alongside them in the area with other "Okun" Yoruba notably Bunu, Ijumu and Yagba (Ijagbemi, 1987) who are believed to have been there since at least, 3000 Y.B.P.. The Kabba are indigenous to this area among the autochthonous people termed "proto Yoruba" (Atanda, 1980; Smith, 1988).

The name Kabba is believed to have been derived from "Oke-Aba", the site of the original settlement.

Whereas the Kabba have been known to be indigenous to this area with little or no influence from Ife, the possibility of some derivation from neighbouring Ebira, Nupe Benin, Igala and other "Okun" Yoruba cannot be ruled out.

The Kabba are farmers, having established a tradition of hunting and gathering over the years alongside subsistence farming. The women process palm-oil, kernel oil and cereal products.

Bunu:

The Bunu (Abinu or Abunu) are of Oyi Local Government Area of Kogi State (Table 1; Fig.5). They claim to have been in this territory by at least, 3000 Y.B.P. and to have been derived principally from the hilly range of areas around the North-East portion of the Yoruba territory, around the Niger-benue confluence (Ijagbemi,1987). The Bunu are among the earliest settlers in the North-East portion of Yorubaland, an area said to be the home of "proto-Yoruba" (Atanda, 1980; Smith,1988). They are part of autochthonous people of this area and are essentially acephalous (Ijagbemi,1987). According to settlement historical sources, the people have always been there with hardly any link with Ife (Bolorunduro, personal communications, 1990), except for recent claims of relationship by some chiefs, possibly stemming from migrations said to have been from Ile-Ife and Oyo-Ile (Smith, 1988). Majority of the Bunu have been there before the advent of Oduduwa (Smith, 1988). There is ample linguistic relationship with some other neighbouring people such as Igala, Nupe and Bariba.

The Bunu are essentially farmers even though a tradition

of hunting/gathering had existed. The processing in food and cash crops is reasonably prevalent especially among their womenfolk. Palm-oil processing is a major occupation here.

Yagba:

The Yagba, in the Yagba Local Government Area of Kogi State (Fig. 5) constitute the largest of the "Okun" Yoruba said to be indigenous to the North-Eastern part of Yorubaland since at least 3000 Y.B.P. (Ijagbemi, 1987).

The major Yagba settlements include: Isanlu, Egbe, Odo-Ere, Igbakuru, Odo-Eri, Mopa, Amuro, Ijagbe, Okere, Ogga, Okunran Ejuku, Jege, Ilae, Ogbom, Ejigba, Akata and Ololoke. They were tributary to the Nupe who appointed a local administrator: "Ajele" or "Ogba" for the prompt collection of tributes (Ijagbemi, 1987).

The founder of the Yagba kingdom is reported to be a woman who was affectionately called "Iya-Agba" meaning: "elderly woman" by he people. The ethnonym: "Yagba" was derived from "Iya-Agba". She had settled her people at Akata at first (Bolorunduro: personal communications, 1990). The earliest leaders (priest and chiefs) of the Yagba were said to be the descendants of this great woman. They eventually dispersed into the territory to find other towns.

Though there is a considerable connection between the Yagba and other "Okun" Yoruba yet the influences of other neighbouring

peoples is likely to have been important in the settlement pattern. The fact of their being acephalous seem to suggest little or no Ife influence.

Kelae for instance, found Egbe as a centre of great agricultural activity hence the name: "E gbe" meaning: "cultivate".

The Yagba practiced hunting/gathering for centuries in the hilly range of the North-East confluence area of Yorubaland. They are presently farmers especially as evident in the name of one of their major towns: "E gbe!" The womenfolk engage in palm-oil and kernel oil processing alongside the preparation of cereal food products.

Igbomina:

The Igbomina (or Igbonna) who are at present in Irepodun and Ifelodun Local Government Areas of Kwara State, have apparently been living there since at least, the 11th century at the advent of the earliest settlers from Oyo. They comprise a mixture of Oyo settlers of successive migrations, and some claimants of Ife and Ila derivation.

The name Igbomina (or Igbonna) derives from "Ugbo mo ona" meaning: "the wand (or stump) knows the way" : an indication that the staff or wand used by their ancestral leader was useful in finding their way to their present domain. Their domain bestraddles

the forest and the savannah (Smith, 1988). The ancestor of the Olupo called Igwana was said to have come from Ife but paid tribute to Alafin. Igbomina/Oyo relations are said to have been long-standing. The Igbomina are interspersed by some Ekiti. They are regarded as being Oyo with Ekiti sympathies (Smith, 1988).

The major contradiction in the setting of the Igbomina would seem to be the fact of their royal traditio said to be of Ife derivation and paying tribute to Alafin. The suggestion that they are Oyo with Ekiti sympathies appear to show a mixture of Oyo migrants with neighbouring Ekitis who probably submit to Ife derivation because of common Ila descent of some of its migrant which they share with Ife.

As part of Ila kingdom, the Igbomina had towns such as: Oke-Ila, Ora, Oke-Ewu, Aran, Apa, Oro, Ajase, Isin, Igbaja. All these towns recognised Ila as their traditional headquarters (Atanda, 1980) and remained under the Orangun of Ila until the nineteenth century when their solidarity was shattered by Ilorin imperialism (Atanda, 1980).

The principal ruler of the Igbomina appears to be the Olomu of Omu-Aran who is today overshadowed by the Olupo of Ajase-ipo (Atanda, 1990) due largely to some powerful traditional oil in the possession of the latter.

The Igbomina were harrassed by Ijesa and Nupe raiders on their territory. Their position was maintained by dint of furious activities which they had consolidated with Oyo. The Igbomina are farmers with some hunting/gathering background. Their women processed many farm products into a variety of edible foods.

Linkages in Yoruba History

Available linguistic, archaeological, and historical evidence thus appear to suggest that the Yoruba have had close interactions with a number of its neighbouring language sub-families: Nupe, Bariba, Bassa, Benin, (Edo), Igala, Ebira (or Igbira), Ijo (or Ijaw), Itsekiri, and Urhobo. Horton 1979: 82) states in this regard as follows:

> **Ancestral Yoruba population was part of a larger dispersal, not from the Middle East, but from the general area of the Niger-Benue confluence.**

Smith (1988:11) on his part assesses the linkages and summarises thus:

> **If the broad conclusion from the linguistic evidence is accepted, then the traditions of origin which are preserved by the Yoruba seem to refer to movements over only comparatively short distances or less probably, to the advent of a small group of conquerors who quickly became assimilated with their new subjects. It seems likely that in either case movement was from the grassland,**

where cultivation was earlier advanced and where there might be some population pressure, into the forest, and the legend of Oduduwa and the royal progeny of Ife may be a distant memory of such a movement.

To speculate beyond this point is hazardous, since new myths are all too easily created. There has, for example, been a tendency in recent writing about African history to attribute the origin of most states to the conquest of the people of one culture by people of another, postulating a sharp distinction between the rulers and the ruled. Stereo typing of this kind usually results in over-simplication and other distortions, for while most states in the world developed under the stimulus of older states, their origins are many and diverse. Meanwhile, new materials on the subsequent history of the Yoruba is being uncovered and as more is established about what may be called their middle ages, this should in turn shed light on earlier times. But this kind of reconstruction has special dangers for the historians, whose study permits generalizations but has no laws and whose material is unpredictable humanity; extrapolation unsupported by evidence should usually be left to scientists and mathematicians. Early Yoruba history now waits, not over-hopefully, upon archaeology and its ancillary sciences.

CHAPTER THREE

BIOLOGICAL METHODS AND ANALYSIS

Biological Methods in Studying Human Groups

The Biological aspects of the data on a population, especially one that is known to have lived together for some time such as the Yoruba, serves to provide some information on the extent of interbreeding. Biological data are valuable especially where they are required to elaborate on the archaeological, historical, cultural and linguistic evidence available (Hiernaux, 1974). They will as well help to reveal the extent of expressivity of the influence of exotic populations which historical and cultural accounts are often found to suggest. Biological data are able to also show the extent of internal wandering (or active interbreeding) that has progressed within a population under study. The extent of biological diversity is also detectable in the assessment of the biological evidence with one or more populations (Hiernaux, 1974).

Biological Data in West Africa:

Biological data in terms of skeletal remains in West Africa and particularly in the area classified as Yorubaland by historians and anthropologists, are scanty and generally not often well

preserved for well-known environmental reasons such as high acidity and rapid oxidation. A few notable finds are available which can assist in the biological reconstruction of the past, generally in West Africa and Yorubaland in particular.

The Iwo-Eleru skull dated to 11,000 Y.B.P. and inferred to have belonged to a proto-negroid population (Brothwell and Shaw, 1971) is one of the few that may well give an insight into the antecedents of the Yoruba. Skeletal remains found may not necessarily relate in all cases to the present day population in the area as Huizinga et al (1967) found with the radiocarbon dating of Tellem cave skulls found in today's Dogon territory.

Whereas, anthropometric measurements are useful in assessing biological variation Hiernaux (1974) found that environment could also influence biological characters. This, he said, could be either through the expression of the genotype or through allelic changes or frequencies in populations. He stressed that human populations can evolve independently if they exhibit considerable endogamy with little or no barrier to internal mating.
Such endogamous population(s) he concluded present some suitable instances for describing human biological variation and attempting to explain such in terms of genetical evolution.

Hiernaux (1974) noted that biological evidence indicates that

the effects of exotic populations especially from Northern and Eastern Africa have been moderate based on biological evidence, especially as interbreeding has been highly active and the sub-saharan African populations present strong barriers to penetration. He said that recent exotic influences had played minor and localized roles in populations. He observed that other factors of genetic change; drift and selection may blur the impact of genetic admixture especially of older instances. Hiernaux (1974:55) therefore, cautions that biological characters must be relied on when trying to assess the importance of genetic mixture. This, he said, is because:

> **The proclaimed ancestors of a population may represent only a "glamorous" group whose contribution to the present gene pool was trifling ... the language of a small group of immigrants may be totally adopted by a large population; and be widely adopted with a minimum of corresponding gene flow, which may have been too modest to be detectable.**

Hiernaux (1974) also advised against unjustified pooling biases in the sampling of sub-saharan populations having noted that the level of genetic variation was very high and that only a minority of the units can be grouped.

Cavalli-Sforza (1966) for his part cautions on the population acceptance of conclusions made on population structure studies, as

according to him, there could always be some alternative explanations!

ABO Blood groups as marker in population studies.

The ABO blood group system has been found to be a very useful means of providing biological data for corroborating historical, archaeological, cultural and linguistic evidence. (Hiernaux, 1974) However, data on the ABO blood groups of many sub-saharan populations are either non-existent, scanty or unrepresentative of their distribution over known biotope.

Hiernaux (1974:65) in recognition of the importance of the ABO blood group as vital markers within such populations has summarized the point thus:

> **When we find two populations differing in the frequency of blood groups, we know for sure that the difference is genetical: blood groups are strictly determined by heredity and no circumstance in the life of an individual can change his blood group. This holds true for all systems of heredity variants of blood substances.**

ABO Blood group: Antigens and Antibodies

The discovery of the A, B and O blood groups by Landsteiner in 1901 and the fourth blood group AB, by Decastello and Sturli in 1902 helped to attain a great landmark in transfusion therapeutics (Race and Sanger, 1968). The four groups are determined by the presence

or absence in the red blood cells of the blood group antigens A and B (Table 4) and therefore, the blood group of the individual is A, B, AB or O (O denoting the absence of A and B) (Boorman and Dodd, 1970).

Landsteiner's (1901) discovery has also become an important milestone in the field of anthropology because the settlement history of a population could be correlated with blood group distribution gene frequencies (Watkin, 1966).
Alongside the antigenes A and B found in the red blood cells are also the antibodies anti-A and anti-B, which occur as agglutinins in the sera of individuals whose red cells lack the corresponding agglutinogen (or antigen) Boorman and Dodd (1970). The antigen and antibodies present in the four groups are as in Table 4.

Antigens present on a person's red cells are inherited. Each antigen is controlled by a gene which is a unit of inheritance. Variants of a gene are called alleles or allelomorphs for that trait (Bell et al, 1972). Human blood group inheritance is thus governed by multiple alleles. These alleles feature in ABO blood group inheritance.

TABLE 4

ABO BLOOD GROUP ANTIGENS AND ANTIBODIES

Blood Group	Antigens in Red Cells	Antibody in Serum
A	A	Anti - B
B	B	Anti - A
AB	A & B	-
O	-	Anti - A & Anti - B

According to Keele & Neil (1972:34), these substances are subject to Landsteiner's Law:

> **If an agglutinogen is present in the red cells of blood, the corresponding agglutinin must be absent from the plasma; if the agglutinogen is absent, the corresponding agglutinin must be present.**

A child's blood may not be set in its true ABO type until as late as one year after birth (Keele and Neil, 1972).

The Blood groups refer to the presence of certain antigens, the blood group substances on or in the red cell envelope (Bell et al, 1972). They are inherited characteristics which mostly belong to genetically independent blood group systems. Blood group antibodies are found in the globulin fraction of the serum, and may be immune or naturally-occurring antibodies, (Bell et al, 1972) .

A statistical association has occasionally been found between the ABO blood group and certain diseases. Group 'O' persons are much more susceptible to peptic ulcers than individuals of any other blood group while 'A' persons are more associated with cancer of the stomach (Bell, et al 1972). Blood groups are useful for indicating parentage as they are unchanged as inherited (Boorman and Dodd, 1970). They are thus useful for deriving biological relationships through the studies of their distribution in populations, expressed as phenotypic or genic frequencies.(Table 5)

TABLE 5

ABO BLOOD GROUP GENOTYPES

Blood Group	Genotypes	Antigen in Red Blood Cell	Antibody in Plasma	Can Donate to	Can Receive from
O	ii	-	a and b	O,A,B,A,B	O
A	iAiA;iAi	A	b	A,AB	O,A
B	iBiB;iBi	B	a	B,AB	O,B
AB	iAiB	AB	-	AB	O,A,B,AB

Note: iAiB produce antigens A and B hence, they are codominant. A and B are called group - specific substances and chemically are polysaccharridos (Fig. 3). They are antigens and in the presence of suitable antibody agglutination occurs (Keele and Neil, 1972).

Antigens are substances of large molecular size, usually protein, having a polysaccharide component (Fig.3) which determines the specificity, while the amino acid component determines the antigenicity; the ability to stimulate the production of antibodies (Boorman and Dodd, 1970). Antibodies are immunoglobulin and form part of the serum globulin. Antibodies to blood group antigens are not found in body fluids such as saliva and urine. However, blood group antigens may be found in body fluids.

ABO substances may be found in fluids such as the synovial joint fluid, saliva and semen of 80% of a population who are termed 'secretors'.

Agglutination of red blood cells is the clumping, granular appearance seen as a result of mixing cells containing the corresponding antibody (Boorman and Dodd, 1970). The agglutination of red cells takes place in two stages:

(i) sensitization; and

(ii) agglutination (Fig. 4).

During sensitization, serum agglutinins become attached to agglutinogen on the red cell surface. The actual clumping or agglutination of the sensitized cells occur during the second stage (Boorman and Dodd, 1970).

According to Boorman and Dodd (1970: 1):

> **An Antigen is any substance which, when introduced parentally into an individual who himself lacks the substance, stimulates the production of an antibody, and which, when mixed with the antibody, reacts specifically with it in some observable way.**

Substances, such as poly-saccharides which may be weakly antigenic with some amino-acids contributing in some way to specificity, are called HAPTENS, often in body fluids like saliva secretion (Boorman and Dodd, 1970).

Ever since the discoveries of Landsteiner (1901) and Decastello and Sturli (1902), knowledge of blood group distribution has been used as an important tool for studying human populations. Peculiarities in genic frequencies could help to relate groups with settlement history, particularly high frequency of one blood group within a population. (Dawson, 1964). Sometimes, some relationship could be drawn from the association of certain blood group frequencies in present populations and earlier ones (Brown, 1965). Groups that are anthropological appendages of others could be discovered through blood group investigation showing similar values of genic frequencies (Watkin, 1963). Garlick's (1962) maps of blood groups in Africa was a follow-up of the work of Mourant et al (1958) which he said could only be improved through detailed work that can strike out to cope with local fluctuations.

Hardy (1962) found a gradual diminution in the 'B' gene frequency passing from the Yoruba to Bini to the Onitsha-Ibo until the Eastern Ibo. She got the Yoruba 'O' blood group gene frequency to be 0.7011.

Watkin (1966) showed that no important anthropological divide exists between two populations showing no significant difference in the ABO blood group distribution. He also noted the influence of migrant groups on the inhabitants of an area and explained how the existence of a blood group associated with earlier human settlements could point to the survival of autochthonous people.

Lister et al (1966) found the frequency for the 'O' blood group of the Bedouin Arabs of Soccotra to be 0.6667. El Hassan et al (1968) found the frequency of the 'O' blood group of the Beja of Sudan to be 0.53 even though they believed that the result showed a mixing of Negroid and East Mediterranean Caucausoid components, thus suggesting the need for more detailed work on East Mediterranean people and Africans South of the Sahara.

Ikin et al (1969) obtained the 'O' blood group frequency of the Burmese to be 0.2892 with a genic frequency of 0.16667. Roberts et al (1972) obtained the genic frequency of the Sinhalese of Ceylon to be 0.123.

Worlledge et al (1974) worked on 26,027 donor samples of the

Yoruba to obtain an 'O' blood group percentage as 51.5 and genic frequency of 0.717. This value compared with those of some neighbouring language sub-families of the Yoruba (Table 7).

Abdullahi (1976) obtained the 'O' blood group genic frequency of Arabs in Basrah to be 0.621. He noted how the effect of the genetic isolation of a group due to social and geographical barriers could inhibit gene exchange with other region's population.

Mitchel and Sunderland (1978) showed how the effect of very large numbers of immigrant population in proportion to total population of the indegenous inhabitants of a territory, could be of considerable genetic influence on the ABO blood group frequencies, if these immigrants' frequencies reflect some dominance or dilution.

Attai et al (1985) showed that the blood group percentage of a subgroup could be influenced by other boundary groups. Some of such groups have been shown by other workers to exhibit the stated ABO blood group percentiles and gene frequencies (Table 6).

ABO Grouping Data of the Yoruba: Findings

Research by earlier workers on the ABO blood grouping of the Yoruba have so far been largely based on the assumption that there was considerable biological homogeneity within the Yoruba language

TABLE 6

VALUES OF ABO BLOOD GROUP DATA OF THE YORUBA

After Garlick (1962); Hardy (1962) and Worlledge et al (1974).

		A	B	AB	O
Percentile: (%)	I	10-15	10-15	-	70-75
	II	20.7	27.3	3.6	48.5
	III	21.3	23.3	3.9	51.5
Gene Frequencies	I	-	-	-	-
	II	0.1300	0.1687	-	0.7011
	III	0.136	0.147	-	0.717

Key: I Garlick
II Hardy
III Worlledge et al

Note: Percentiles are derived from Hardy's (1962) figures.

TABLE 7

ABO BLOOD GROUP DATA OF SOME NEIGHBOURING LANGUAGE SUB-FAMILIES

Ethnic Group	Blood Group Percentiles (%)				Blood Group Gene Frequencies		
	A	B	AB	O	p	q	r
*Bini	24.9	14.5	2.8	57.7	0.149	0.090	0.760
**Bini	-	-	-	-	0.1291	0.1020	0.7689
*Igbirra	18.5	23.7	4.4	53.4	0.118	0.148	0.734
*Urhobo/ Itsekiri	-	-	-	-	0.1477	0.1177	0.7345

* = Data from Worlledge et al (1974)

** = Data from Hardy (1962)

sub-family. The values obtained by Garlick (1962) and Worlledge et al (1974) reveal such assumptions (Table 6).

The range of blood group O values (70% -75%) obtained for the Yoruba by Garlick (1962) is rather high due to the fact that the major discriminant of territory was used for identifying the Yoruba individuals considered in the preparation of ABO blood group maps. Hardy's (1962) blood group O value of 48.5% is an indication of dilution compared to the more widely accepted value of 51.5% due to Worlledge et al (1974) possibly because Southern Nigerians in Yoruba territory were considered.

The work of Worlledge et al (1974) has been the most representative and thorough ABO blood grouping analysis of the Yoruba hitherto undertaken. Its limitation, however was in the its assumption of the homogeneity of the Yoruba hence its inability to detect possible biological partitions.

Methods of Analysis:

Following the proper identification of twenty five Yoruba sub-groups in Nigeria (Table 1) based on similar anthropological features such as: territory, language (dialect) descent, cultural and economic ties (Barth, 1969; Lewis, 1978), six towns in the territory of each Yoruba sub-group were randomly chosen as sampling sites (Appendix 1). For most sub-groups, the average number of

townships per territory is 10. The sampling average of 6 replicates is then assumed as being sufficiently representative. The 3,000 samples considered are taken as conveniently representative; made up of 500 blood samples per batch (or replicates) of 6 for each of the sub-groups. Blood bank donor sources make the sampling extremely ramdomised and useful for undisturbed sampling.

Blood samples were obtained from individual donors of these identified Yoruba sub-groups, based on: surnames, claim of membership of sub-group by such donors, native place and parental history of about two generations ago claimed by donor in accordance with the method adopted by Hardy (1962). The blood banks of hospitals in the selected towns were used for the convenience of meeting donor-patients who form the bulk of the blood group sampling exercise. The limitation of the blood bank records is that donors could only provide needed information based on structured questionnaires assisting the blood sampling.

Blood sample records of identifiable donor-patients of each sub-group were also used in line with the method of Worlledge et al (1974). These blood bank-based records and the field samples afforded the 3000 individuals from each Yoruba sub-group considered in this study.

The collection of blood samples, blood grouping analysis and

blood group records took place between April, 1988 and October 1990; then February to July, 1991. The statistical analysis was carried out between August 1991 and April 1992.

ABO Blood grouping: Principles and Procedures

The ABO blood group system makes it possible to divide a population into four groups: A, B, AB and O (O denoting the absence of A and B) Blood group antigens A and B present or absent in the red blood cells make the determination of the four ABO blood groups possible. Boorman and Dodd, (1970). Corresponding to the antigens A and B are antibodies anti-A (α) and anti-B (β) which occur in the sera of individuals whose red blood cells lack the corresponding antigen. It is through agglutination reaction of the red cells that the blood group of an individual is determined. The individuals cells are either tested with standard Anti-A and Anti-B sera (reagent) or by testing the serum (blood fluid) with standard red cells of groups A and B. The methods are used in blood grouping as a check and to assure reliability. (Boorman and Dood, 1970).

Genuine agglutination differs from rouleax formation (or blood cell piling) which can be due to:

i) a disturbance of the albumin - globulin balance especially in patients with acute infection.

ii) drying up of blood smear.

iii) high concentration of cell suspension (Boorman and Dodd, 1970).

The materials used in the blood grouping analysis included: stainless steel lancets, porcelain tiles, Physiological saline (0.85 - 0.90%), Dropper pipettes, Walgreen's 91% alcohol, cotton wool, cold flask, Anti A, Anti B and Anti A+B grouping sera, Stainless steel tray, Stainless steel cup, wooden swab, glass bottles and glass beakers.

All the materials listed above were carried in a clean bag, with the exception of the blood grouping sera (Anti-A, Anti-Band Anti A+B) which were always put into the cold flask to avoid deterioration which can encourage bacterial growth and hence 'bacteriogenic agglutination' (Dacie & Lewis, 1984) which is false.

At the sampling centres, all these materials were kept on the stainless steel tray. The stainless steel cup was always used to contain alcohol-soaked cotton swab. Blood samples taken were introduced into the glasses bottles with the aid of the dropper pipette.

Before the grouping sera were used, they were first of all tested with blood samples of known ABO groups mixed with physiological saline (2 -5% of blood in saline). These were set aside as control to ascertain the potency of the sera which had

been carried in the cold flask to avoid deterioration.

Each blood sampling procedure was then carried out as follows: Cotton swab soaked in 91% alcohol is used to clean an uprightly-held thumb of donor. The thumb was then pricked with a stainless lancet until blood drops emerged.

The blood drops were pipetted off and dropped carefully into a sample bottle. The pipette was then used to withdraw aliquot parts of blood (2 - 5% by volume) into sample bottles containing saline solution of known volume. For instance, 0.2ml of blood sample was introduced into a sample bottle containing 9.8ml of saline solution.

A drop each of this blood/saline mixture was then pipette out and placed onto a clean side of a white tile at three points marked: Anti-A; Anti-B; and Anti A+B to ensure the addition of correct grouping sera. One drop of anti sera was added to each drop of blood/saline mixture. Mixing was then done with a separate wooden spatula in each case to hasten reaction.

The blood/saline drops were observed for agglutination reactions within 5 minutes (Table 8). Beyond this, any agglutination is disregarded since false positive reaction(s) may then be noticed afterwards, especially due to drying up. This procedure ensures that the cells in the blood sample are used to

TABLE 8

ABO GROUPING PATTERNS

Equation 1:		Cell Grouping		
Samples:	1	2	3	4
Anti-A	H	-	-	H
Anti-B	-	H	-	H
Anti-A+B	H	H	-	H
Remarks:	A Cells	B Cells	O Cells	AB Cells

Equation 2:		Serum Grouping		
Samples:	1	2	3	4
A Cells	-	H	H	-
B Cells	H	-	H	-
O Cells	-	-	-	-
Remarks:	Anti-B	Anti-A	Anti-A+B	Nil

H = Haemolysis

obtain the ABO blood groups.

If the blood sample taken earlier is to be stored for subsequent analysis by the next day, it is preserved in a refrigerator at 4°C. When the blood is to be used, it is suspended or washed in saline (2 -5% of blood to known volume of saline) and then centrifuged till the blood cells pack below the sample bottle. The supernatant (heamolysed portion) is decanted . This procedure is repeated three times or until the ensuing supernatant is clear, when heamolysis is no longer evident. The haemolysis of some blood cells causes their breakdown and consequently the release of haemoglobin. This can interfere with blood grouping. In order to obtain the best result possible, the blood sample of the donor is alternatively subjected to serum grouping during which standard red cells of blood groups A and B are used to test the blood fluid or serum.

Standard cells from donors with confirmed blood groups A and B were suspended in saline. One drop of this was added on a tile to one drop of the neat serum sample of the donor under consideration. This was done for the standard cells from A, B and AB groups. Three spots were therefore marked and used on the tile. Each of the spots was mixed with separate wooden spatula to promote prompt reaction

of the constituents. Agglutination reaction was observed during the first five minutes of this serum grouping. The interpretation of this result was based on the fact that blood group 'A' persons carry anti-B in their sera while blood group 'B' persons carry anti-A; blood group 'O' persons carry anti A+B, and blood group AB individuals carry neither. The ABO blood grouping pattern is as elucidated in Table 8

The samples 1,2,3 and 4 considered in both equations (Table 8) can be thus interpreted as in Table 9.

Used glassware, especially pipettes, sample bottles, tiles were washed thoroughly in alcohol to afford adequate sterilization before re-use.

Statistical Analysis:

Blood group records obtained for each Yoruba sub-group were recorded, then subjected to the calculation of percentiles and gene frequencies (Table 10) after the methods of Race and Sanger (1968); Boorman and Dodd (1970); and Worlledge et al (1974). (For details, see Appendices 6 - 15).

The replicates obtained for blood group records (appendices 4 -6) were subjected to analysis of variance (Anova) tests to detect the levels of significant differences, interactions (or overlaps) within the Yoruba sub-groups (Appendices 6 -15). (Bailey, 1959);

TABLE 9

ABO BLOOD GROUPING (INTERPRETATIONS)

Samples	Cell Group	Serum Group	Blood Group
1	A	Anti-B	A
2	B	Anti-A	B
3	O	Anti-A+B	O
4	A+B	Nil	AB

Table 10. **Yoruba Subgroups, Blood Groups, Percentiles and Gene Frequencies**

Yoruba Subgroups	Sample Size	Blood Groups in Sample				Percentiles of Blood Groups				Gene Frequencies			
		A	B	AB	O	A	B	AB	O	A	B	AB	O
AKOKO	3000	570	717	84	1629	19	23.9	2.8	54.3	0.1157	0.1438	0.028	0.7369
AKURE	3000	582	711	81	1626	19.4	23.7	2.7	54.2	0.1174	0.1421	0.027	0.7362
AWORI	3000	678	693	78	1551	22.6	23.1	2.6	51.7	0.1351	0.138	0.026	0.719
BUNU	3000	561	720	78	1641	18.7	24	2.6	54.7	0.1129	0.1433	0.026	0.7396
EGBA	3000	693	687	81	1539	23.1	22.9	2.7	51.3	0.1386	0.1374	0.027	0.7162
EGBADO	3000	557	690	78	1675	18.567	23	2.6	55.833	0.1121	0.1374	0.026	0.7472
EKITI	3000	569	705	81	1645	18.967	23.5	2.7	54.833	0.1149	0.1409	0.027	0.7405
EKO	3000	577	699	81	1643	19.233	23.3	2.7	54.767	0.1164	0.1398	0.027	0.74
IBARAPA	3000	687	684	72	1557	22.9	22.8	2.4	51.9	0.1357	0.1351	0.024	0.7204
IBOLO	3000	687	687	78	1548	22.9	22.9	2.6	51.6	0.1369	0.1369	0.026	0.7183
IFE	3000	684	690	78	1548	22.8	23	2.6	51.6	0.1363	0.1374	0.026	0.7183
IGBOMINA	3000	678	696	78	1548	22.6	23.2	2.6	51.6	0.1351	0.1386	0.026	0.7183
IJEBU	3000	533	702	96	1669	17.767	23.4	3.2	55.633	0.111	0.1433	0.032	0.7459
IJESA	3000	573	702	90	1635	19.1	23.4	3	54.5	0.1174	0.1421	0.03	0.7382
IJUMU	3000	548	708	81	1663	18.267	23.6	2.7	55.433	0.111	0.1415	0.027	0.7445
IKALE	3000	565	702	93	1640	18.833	23.4	3.1	54.667	0.1164	0.1427	0.031	0.7394
ILAJE	3000	527	708	99	1666	17.567	23.6	3.3	55.533	0.1104	0.145	0.033	0.7452
ILORIN	3000	689	690	75	1546	22.967	23	2.5	51.533	0.1367	0.1369	0.025	0.7179
KABBA	3000	540	708	87	1665	18	23.6	2.9	55.5	0.1106	0.1427	0.029	0.745
ONDO	3000	566	714	81	1639	18.867	23.8	2.7	54.633	0.1144	0.1427	0.027	0.7391
OWO	3000	573	705	78	1644	19.1	23.5	2.6	54.8	0.1151	0.1403	0.026	0.7403
OWU	3000	675	690	81	1554	22.5	23	2.7	51.8	0.1351	0.138	0.027	0.7197
OYO	3000	684	693	78	1545	22.8	23.1	2.6	51.5	0.1363	0.138	0.026	0.7176
REMO	3000	549	696	90	1665	18.3	23.2	3	55.5	0.1129	0.1409	0.03	0.745
YAGBA	3000	553	708	84	1655	18.433	23.6	2.8	55.167	0.1125	0.1421	0.028	0.7427

Clarke, 1980, 1980; Parker, 1979; Walpole, 1974).

The blood group records (Table 9) were finally subjected to X^2 test (Table 10) to derive the X^2 values in Table 11 after the example of Worlledge et al (1974). The details of the calculations of chi-square X^2 values are as in Appendix 4.

This last statistical treatment was thus used to conclusively show the extent of significant differences between the Yoruba sub-groups ABO blood group values in addition to affording partitioning (Table 11).

The values so far obtained from all the blood group records and statistical analyses were then used to derive bar charts (Figs. 20-35), Blood group maps (Fig. 40 -47) and dialect groups (Fig. 48).

Duncan multiple range tests which is part of the Anova (Analysis of variance) package were used to elucidate interactions (or overlaps) and partitions within the Yoruba sub-groups analysed.

Table 11.Values of chi-square for the significance of difference in ABO Blood Group distribution in the Yoruba sub-groups

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	AKOKO		0.21	11.89	0.34	15.23	1.53	0.23	0.39	14.22	13.82	13.17	11.95	2.68	0.38	0.90	0.68	3.39	14.45	1.31	0.11	0.60	11.20	13.22	1.31	0.52
2	AKURE			9.37	0.57	12.47	1.65	0.28	0.21	11.24	11.07	10.51	9.45	4.04	0.63	1.45	1.20	5.02	11.57	2.25	0.28	0.38	8.83	10.57	2.06	1.06
3	AWORI				14.10	0.29	16.63	12.45	10.86	0.37	0.09	0.04	0.01	23.61	11.94	17.90	14.13	25.69	0.16	20.33	12.88	11.76	0.07	0.04	18.47	16.45
4	BUNU					18.00	1.00	0.28	0.59	16.09	16.21	15.50	14.17	3.04	1.22	0.46	1.56	3.84	16.64	1.17	0.11	0.32	13.58	15.56	1.57	0.44
5	EGBA						20.61	15.95	14.10	0.67	0.11	0.15	0.31	27.58	14.91	22.06	17.22	29.74	0.26	24.47	16.48	15.36	0.32	0.15	22.18	20.31
6	EGBADO							0.62	0.78	18.16	18.60	18.00	16.89	2.50	1.67	0.40	1.85	3.58	19.21	1.02	0.93	0.67	15.89	18.25	0.97	0.59
7	EKITI								0.08	14.35	14.32	13.72	12.59	2.63	0.52	0.50	0.86	3.55	14.91	1.10	0.08	0.17	11.78	13.85	1.01	0.32
8	EKO									12.58	12.56	12.02	11.02	3.23	0.51	0.93	0.96	4.28	13.15	1.64	0.27	0.20	10.21	12.17	1.32	0.67
9	IBARAPA										0.27	0.30	0.43	26.99	14.45	20.08	16.95	29.45	0.13	23.06	14.96	13.21	0.66	0.35	21.13	18.81
10	IBOLO											0.01	0.12	26.01	13.71	20.14	16.02	28.23	0.07	22.68	14.86	13.58	0.18	0.04	20.58	18.59
11	IFE												0.05	25.25	13.14	19.42	15.41	27.41	0.08	21.92	14.20	13.00	0.13	0.01	19.92	17.90
12	IGBOMINA													23.80	12.07	18.06	14.27	25.85	0.17	20.49	12.97	11.90	0.10	0.04	18.68	16.59
13	IJEBU														1.99	1.52	1.23	0.11	27.30	0.52	2.64	3.94	22.17	25.44	0.46	1.25
14	IJESA															1.29	0.11	2.67	14.62	1.33	0.62	1.22	10.97	13.26	0.81	0.71
15	IJUMU																1.27	2.21	20.80	0.27	0.49	0.81	17.11	19.57	0.58	0.10
16	IKALE																	1.74	17.07	0.98	0.93	1.78	13.00	15.55	0.49	0.68
17	ILAJE																		29.61	0.93	3.44	5.07	24.15	27.57	0.98	1.89
18	ILORIN																			23.60	15.41	13.96	0.40	0.08	21.63	19.34
19	KABBA																				1.06	1.84	19.27	22.08	0.23	0.24
20	ONDO																					0.27	12.25	14.28	1.17	0.31
21	OWO																						11.30	13.13	1.86	0.79
22	OWU																							0.15	17.30	15.59
23	OYO																								20.13	18.04
24	REMO																									0.015
25	YAGBA																									

N.B Sig. @ 0.01 if chi-sqaure value is equal to or greater than 11.341
Sig. @ 0.05 if chi-square value is equal to or greater than 7.815

CHAPTER FOUR

RESULTS OF THE ABO BLOOD GROUP ANALYSIS OF THE YORUBA SUB-GROUPS.

Blood Groups: Distribution, Percentiles and Gene Frequencies:

The ABO blood group distribution values obtained for the Yoruba sub-groups considered in this study are illustrated in Figures 20-35. Figures 21; 22 and 23 specifically illustrate the ABO blood group distribution, percentiles and gene frequencies of the dialect groups within the Yoruba language sub-family respectively. Each of the ABO blood groups values are illustrated in figures 24-35 A comparative illustration of the ABO blood group values within Yoruba dialect groups is given in Figures 36 - 39.

Blood Group Maps

Blood group values of the Yoruba sub-groups obtained in this study are illustrated in maps: Figures 40 -47. The values so obtained for the blood groups of the Yoruba which were subsequently subjected to statistical analysis (Table 10; Appendices 8 -15) are finally used to illustrate the biological partition of the Yoruba territory (Fig. 48).

Blood groups in Samples of Yoruba Sub-Groups:

Most of the individual donors sampled for each of the Yoruba sub-groups belonged to the blood group 'O' (in Table 10; Appendices

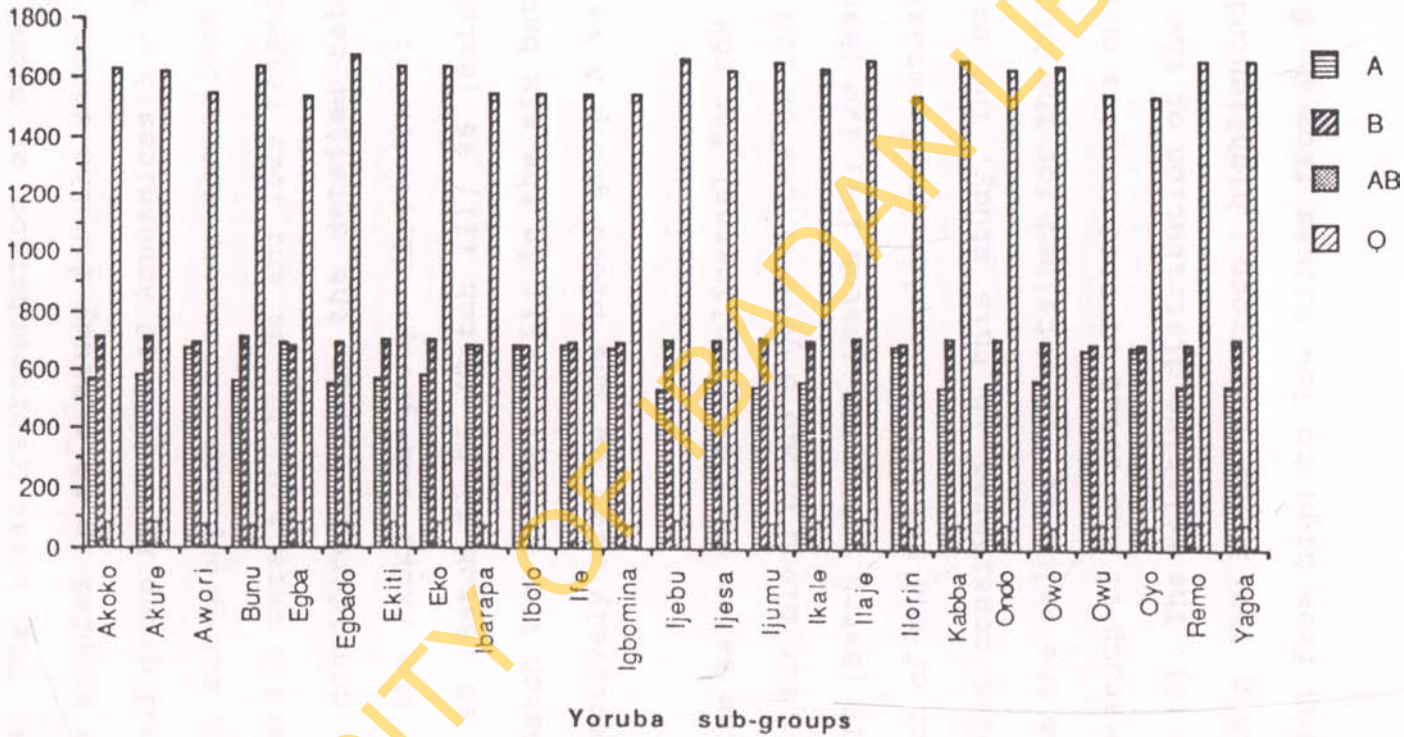
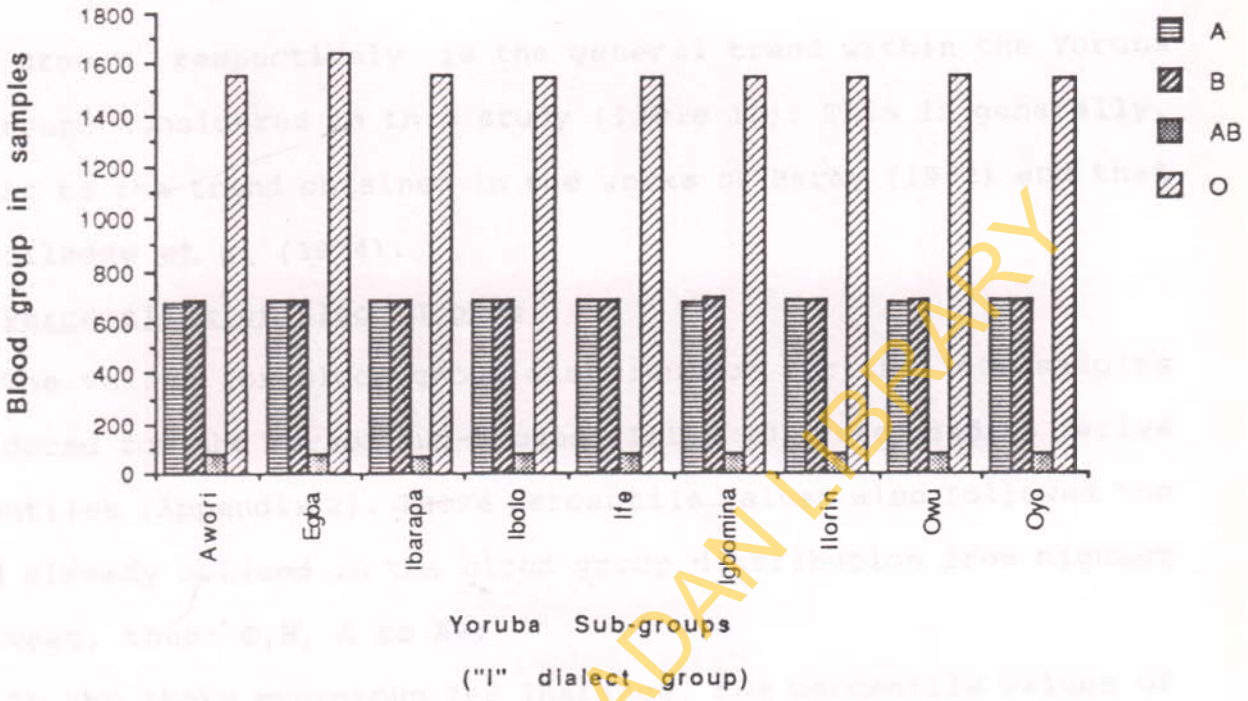


Fig. 20: Multiple bar chart of ABO Blood Group distribution in Yoruba sub-groups.

5 - 7). This is followed by individual donors belonging to blood groups B, then A. The least representation of blood groups of individual donors sampled in this study for the Yoruba sub-groups belong to the blood group AB (Table 10 Appendices 5 - 7).

In the Akoko sub-group for instance, the values for blood groups A, B, AB and O were 570,717, 84 and 1629 respectively, of the 3000 samples considered. Within the detailed batch samples (replicates) for the Akoko sub-groups (Appendix 5), the blood groups A values: 95 (Batch I) 95 (Batch II); 96 (Batch III); 95 (Batch IV); 94 (Batch V); 95 (Batch VI); in the six batch samples of 500 each collectively made up the blood group A value of 570 (Table 10).

Similarly, the batch samples (replicates) for the Akoko sub-group (Appendix 5) for blood group B gave values of 120 (Batch I); 119 (Batch II); 118 (Batch III); 121 (Batch IV); 120 (Batch V); 119 (Batch VI) for each of the 500 batch samples (replicates) that made up the 3000 samples considered in this study. The batch sample values added up to the value of 717 obtained for the blood group B for the Akoko sub-group of the total of 3000 samples considered in this study (Table 10). The relative distribution of the individual blood donors within the Akoko sub-group, highlighted here and showing a gradation from high to low values from O, B, A, to AB



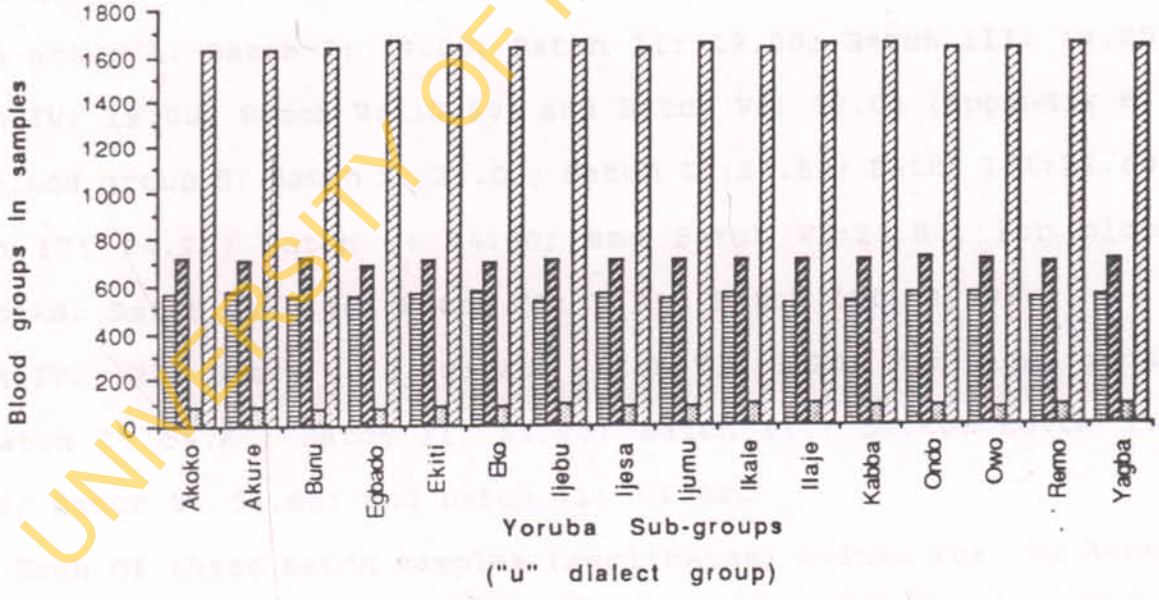


Fig. 21: Multiple bar charts of ABO Blood Group distribution in dialect groups.

blood groups, respectively is the general trend within the Yoruba sub-groups considered in this study (Table 10). This is generally, similar to the trend obtained in the works of Hardy (1962) and that of Worlledge et al (1974).

Percentiles of Blood Groups

The values for blood group distribution for the 3000 samples considered for the Yoruba sub-groups (Table 10) were used to derive percentiles (Appendix 2). These percentile values also followed the trend already noticed in the blood group distribution from highest to lowest, thus: O,B, A to AB.

In the Akoko sub-group for instance, the percentile values of blood groups in batch samples (replicates) were as follows: For blood group A: Batch I: 19.00; Batch II: 19.00; Batch III: 19.20; Batch IV: 19.00; Batch V: 18.80; and Batch VI: 19.00 (Appendix 6). For blood group B: Batch I: 24.00; Batch II:23.80; Batch III:23.60; Batch IV: 24.20; Batch V: 24.00; and Batch VI:23.80. For blood group AB: Batch I: 2.40; Batch II: 2.80; Batch III: 2.60; Batch IV:3.20; Batch V: 2.60; and Batch VI: 3.20. For blood group O: Batch I: 54.60; Batch II: 54.40; Batch III: 54.60; Batch IV: 53.60; Batch V: 54.60; and batch VI: 54.00.

Each of these batch samples (replicates) values for the Akoko group samples of the four ABO blood groups highlighted above

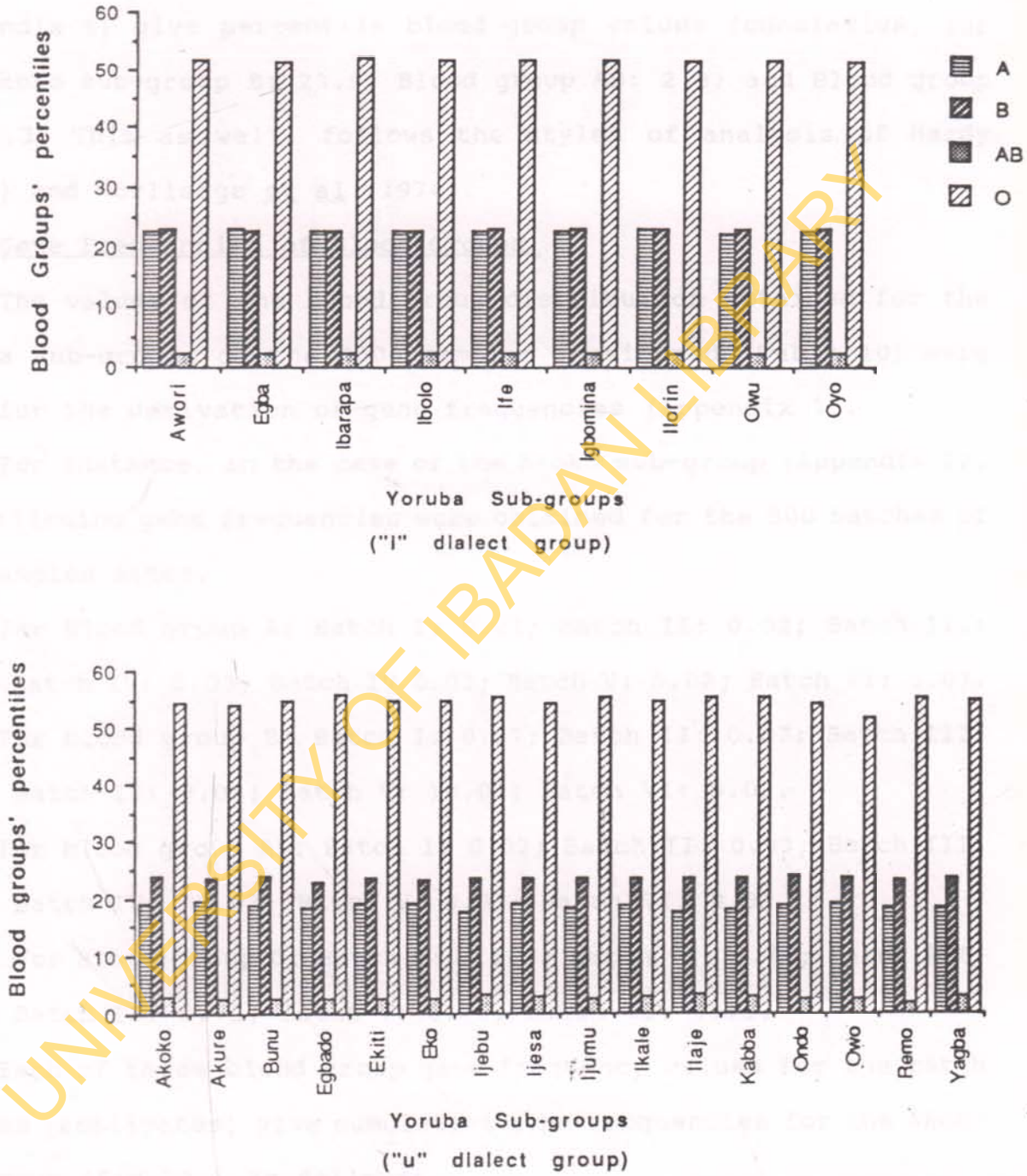


Fig. 22: Multiple bar charts of ABO Blood Group Percentiles: in dialect groups

(Appendix 6) give percentile blood group values (cumulative) for the Akoko sub-group B: 23.9; Blood group AB: 2.8; and Blood group O: 54.3. This as well, follows the styles of analysis of Hardy (1962) and Worlledge et al (1974).

4.5 Gene Frequencies of Blood Groups:

The values of the blood group distribution obtained for the Yoruba sub-groups of the 3000 samples considered (Table 10) were used for the derivation of gene frequencies (Appendix 3).

For instance, in the case of the Akoko sub-group (Appendix 7), the following gene frequencies were obtained for the 500 batches of six samples sites.

For Blood group A: Batch I: 0.02; Batch II: 0.02; Batch III: 0.03; Batch IV: 0.03; Batch IV 0.03; Batch V: 0.02; Batch VI: 0.03.

For blood group B: Batch I: 0.07; Batch II: 0.07; Batch III: 0.07; Batch IV: 0.08; Batch V:)0.07; Batch VI: 0.08.

For blood group AB: Batch I: 0.02; Batch II: 0.03; Batch III: 0.03; Batch IV:)0.03; Batch V: 0.03; Batch VI: 0.03.

For Blood group O: Batch I: 0.074; Batch II: 0.74; Batch III: 0.74; Batch IV: 0.73; Batch V: 0.74; Batch VI: 0.73.

Each of these blood group gene frequency values for the batch samples (replicates) give cumulative gene frequencies for the Akoko sub-group (Fig.23) as follows:

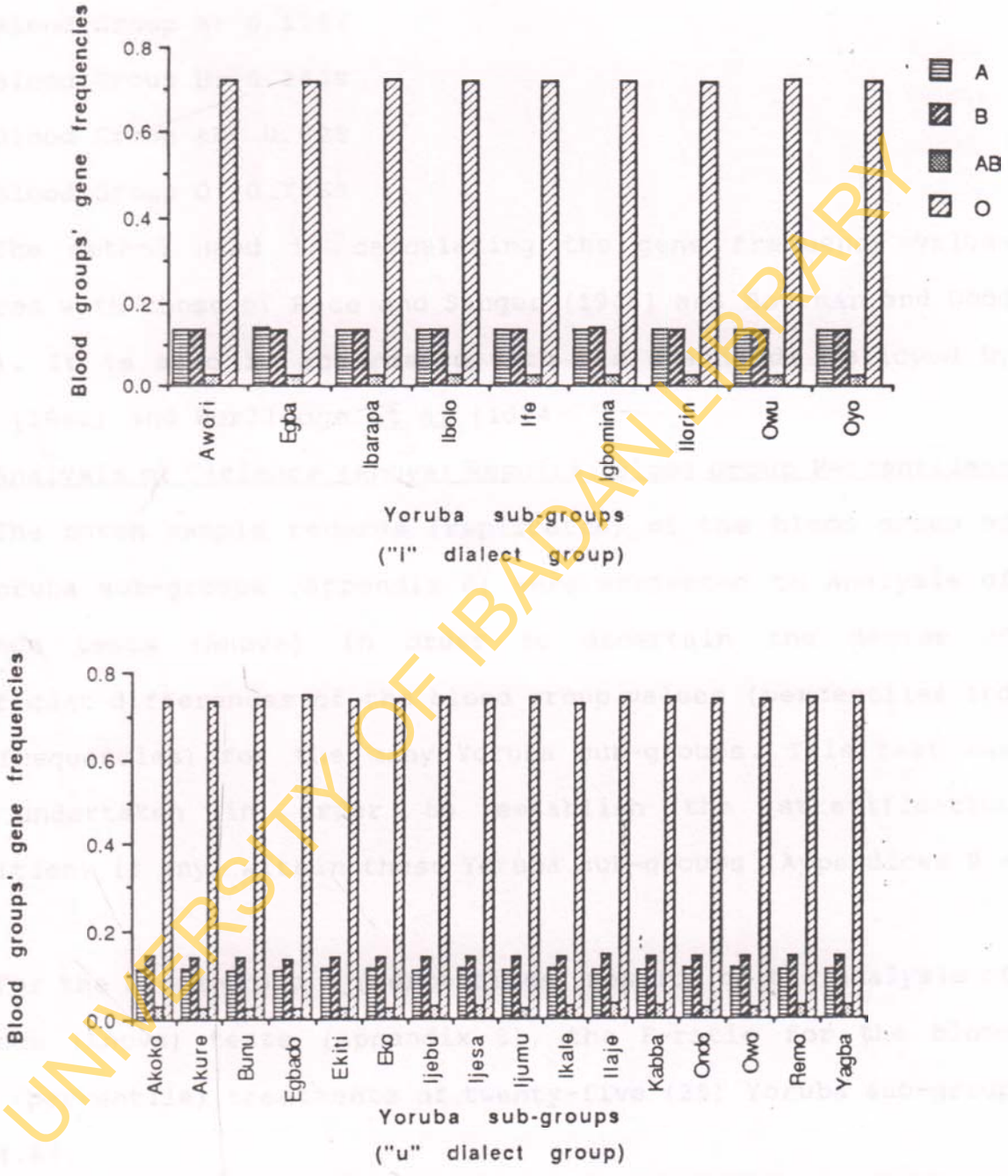


Fig. 23: Bar charts of ABO Blood Group gene frequencies: in dialect groups

Blood Group A: 0.1157

Blood Group B: 0.1438

Blood Group AB: 0.028

Blood Group O: 0.7369

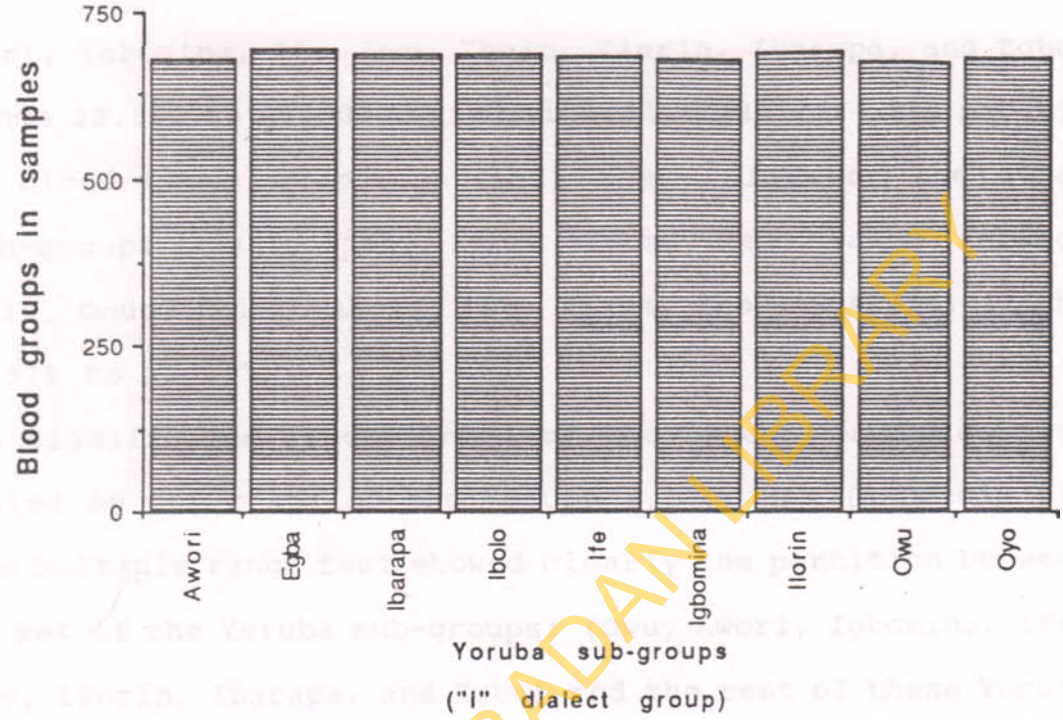
The method used in calculating the gene frequency values compares with those of Race and Sanger (1968) and Boorman and Dodd (1970). It is also in accordance with the standards followed by Hardy (1962) and Worlledge et al (1974).

Analysis of Variance (Anova) Results: Blood Group Percentiles:

The batch sample records (replicates) of the blood group of the Yoruba sub-groups (Appendix 6) were subjected to Analysis of variance tests (Anova) in order to ascertain the degree of significant differences of the blood group values (percentiles and gene frequencies) for the many Yoruba sub-groups. This test was also undertaken in order to establish the stratification (partition) if any, within these Yoruba sub-groups (Appendices 9 - 15).

For the blood group A (percentiles) results of the analysis of variance (Anova) tests (Appendix 8), the F-ratio for the blood group (percentile) treatments of twenty-five (25) Yoruba sub-group is 334.68.

The Blood Group A (percentiles) mean values of these sub-groups:



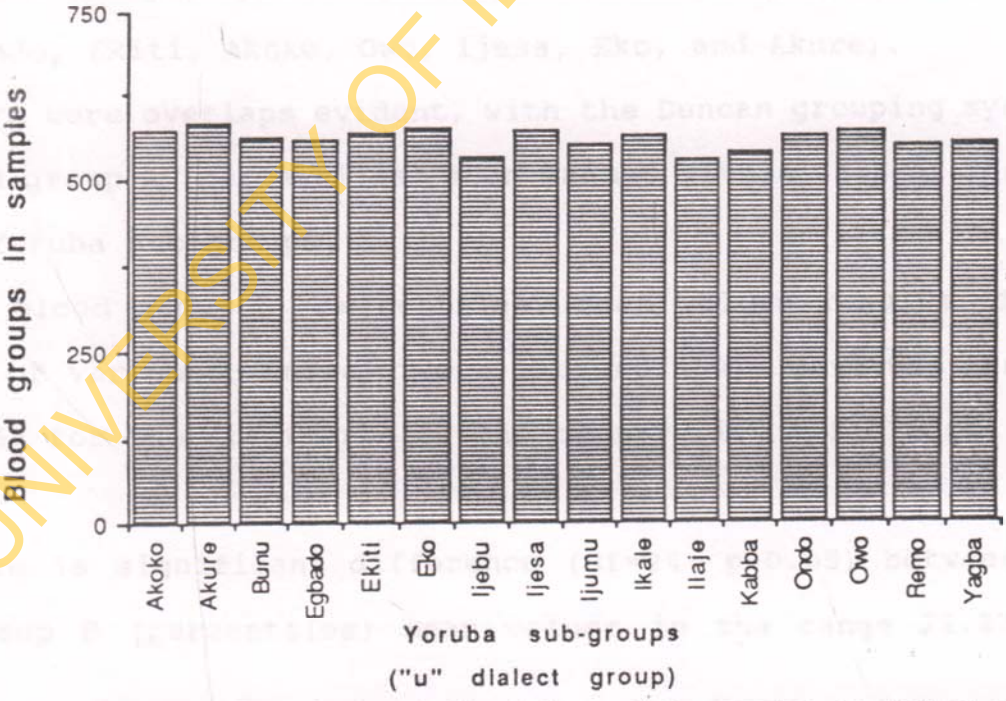


Fig 24 : Bar charts of Blood Group-A in samples in dialect groups.

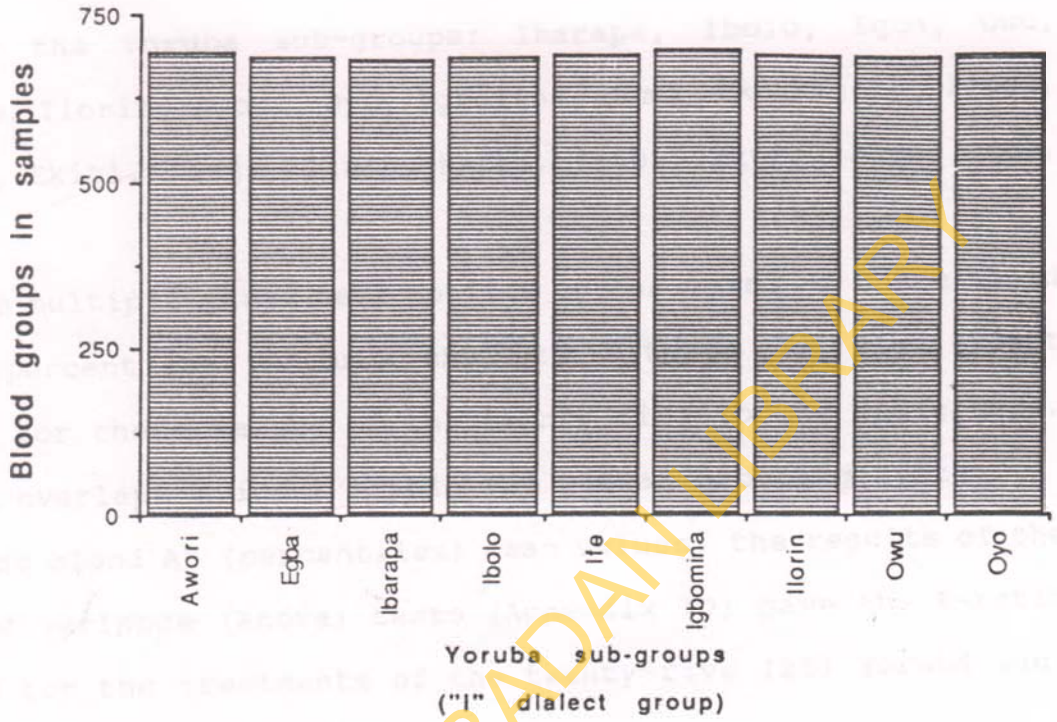
(Owu, Awori, Igbomina, Ife, Oyo, Ibolo, Ilorin, Ibarapa, and Egba) in the range 22.50% to 23.10% varied significantly (df= 24; p>0.05) from the blood group A (percentiles) mean values of the other Yoruba sub-groups (Ilaje, Ijebu, Kabba, Ijumu, Remo, Yagba, Egbado, Bunu, Ikale, Ondo, Ekiti, Akoko, Owo, Ijesa, Eko and Akure) in the range 17.57% to 19.40%.

This significance is confirmed by the Duncan multiple range test applied on the means of the Yoruba sub-groups (Appendix 8). The Duncan multiple range test showed clearly the partition between the first set of the Yoruba sub-groups: (Owu, Awori, Igbomina. Ife, Oyo, Ibolo, Ilorin, Ibarapa, and Egba) and the rest of these Yoruba sub-groups: (Ilaje, Ijebu, Kabba, Ijumu, Remo, Yagba, Egbado, Bunu, Ikale, Ondo, Ekiti, Akoko, Owo, Ijesa, Eko, and Akure).

There were overlaps evident, with the Duncan grouping system, for blood group A (percentiles) mean values within each of the two sets of Yoruba sub-groups.

For blood group B (percentiles) mean values results of the Analysis of variance (Anova) tests (Appendix 9), gave the F-ratio to be 5.67 for the treatments of the twenty-five (25) Yourba sub-groups.

There is significant difference (df=24: p>0.05) between the blood group B (percentiles) mean values in the range 22.87% to



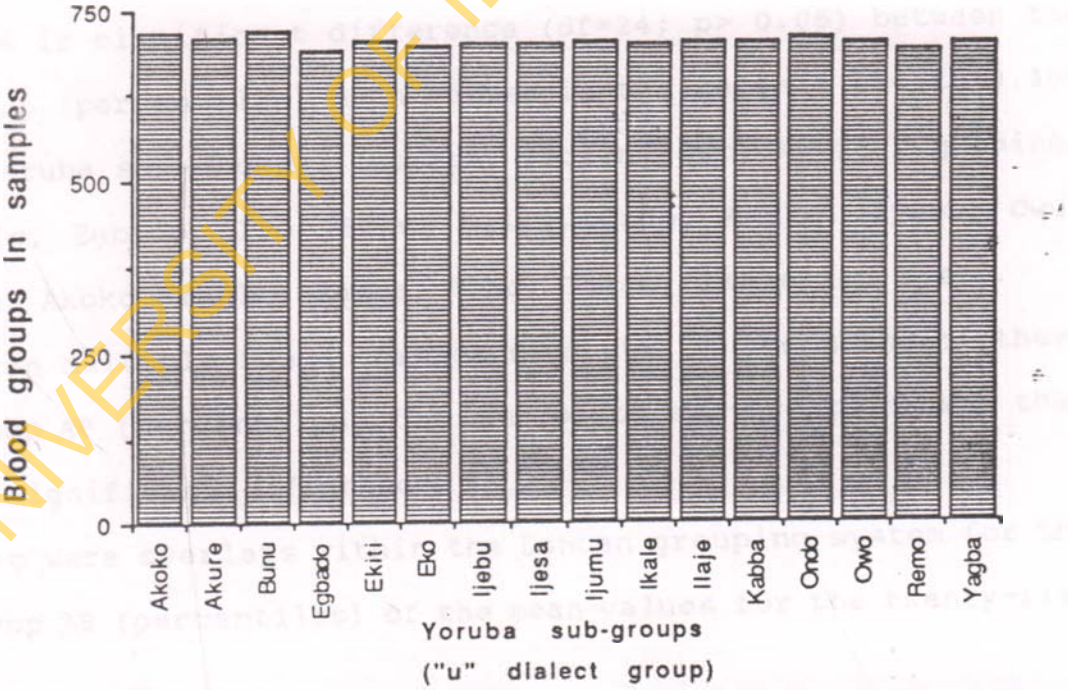


Fig 25 : Bar charts of Blood Group-B in samples in dialect groups.

23.90% for the Yoruba sub-groups: Ibarapa, Ibolo, Egba, Owu, Egbado, Ife, Ilorin, Awori, Oyo, Igbomina, Remo, Eko, Ijebu, Ijesa, Ikale, Owo, Ekiti, Ilaje, Ijumu, Kabba, Yagba, Akure, Bunu, Ondo, and Akoko.

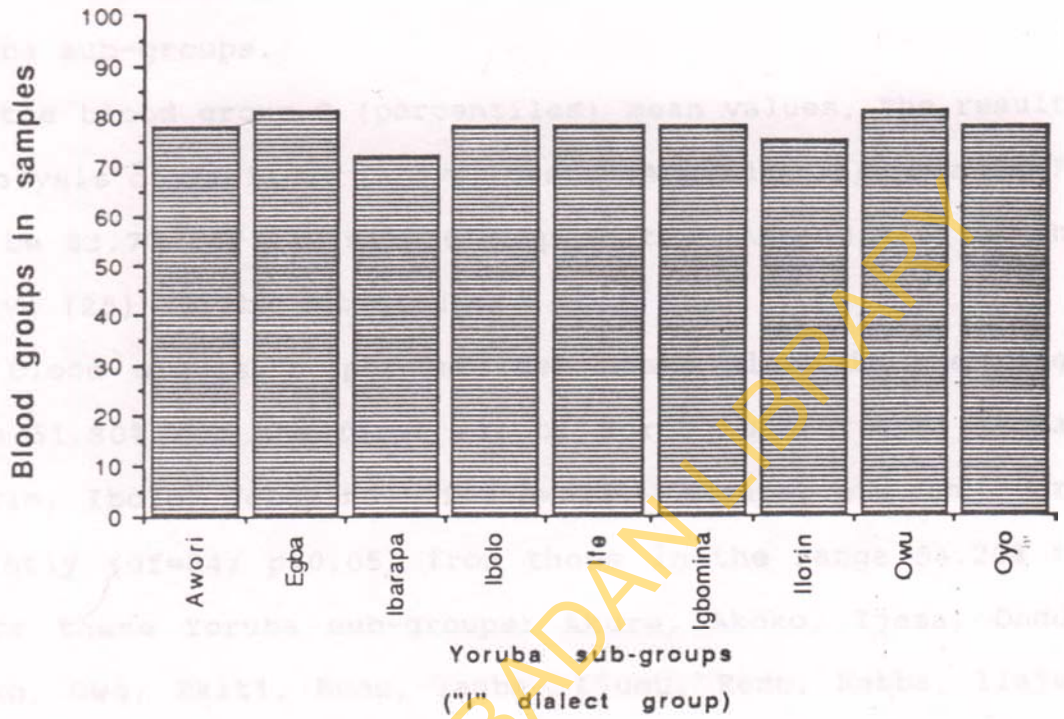
Duncan multiple range test applied on the means of these blood group B (percentiles) values show that there is significant difference for these values of the twenty-five Yoruba sub-groups. There were overlaps evident within the Duncan grouping system.

For the blood AB (percentiles) mean values, the results of the Analysis of variance (Anova) tests (Appendix 10) gave the F-ratio to be 4.00 for the treatments of the twenty-five (25) Yoruba sub-groups.

There is significant difference (df=24; p> 0.05) between the blood group (percentiles) mean values in the range 2.41% to 3.30% for the Yoruba sub-groups: Ibarapa, Ilorin, Owo, Awori, Igbomina, Oyo, Ibolo, Egbado, Ife, Bunu, Ekiti, Ondo, Akure, Ijumu, Owu, Egba, Eko, Akoko, Yagba, Kabba, Remo, Ijesa, Ikale and Ijebu.

Duncan multiple range test carried out on the means of these blood group AB (percentiles) for the Yoruba sub-groups showed that there is significant difference.

There were overlaps within the Duncan grouping system for the blood group AB (percentiles) of the mean values for the twenty-five



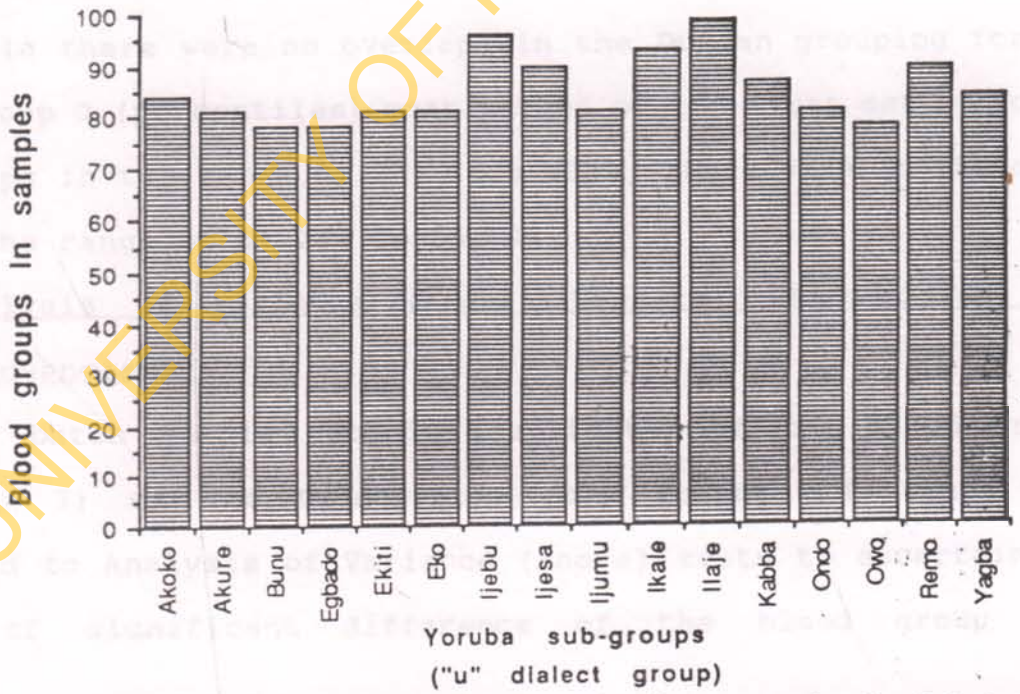


Fig 26 : Bar charts of Blood Group-AB in samples in dialect groups.

(25) Yoruba sub-groups.

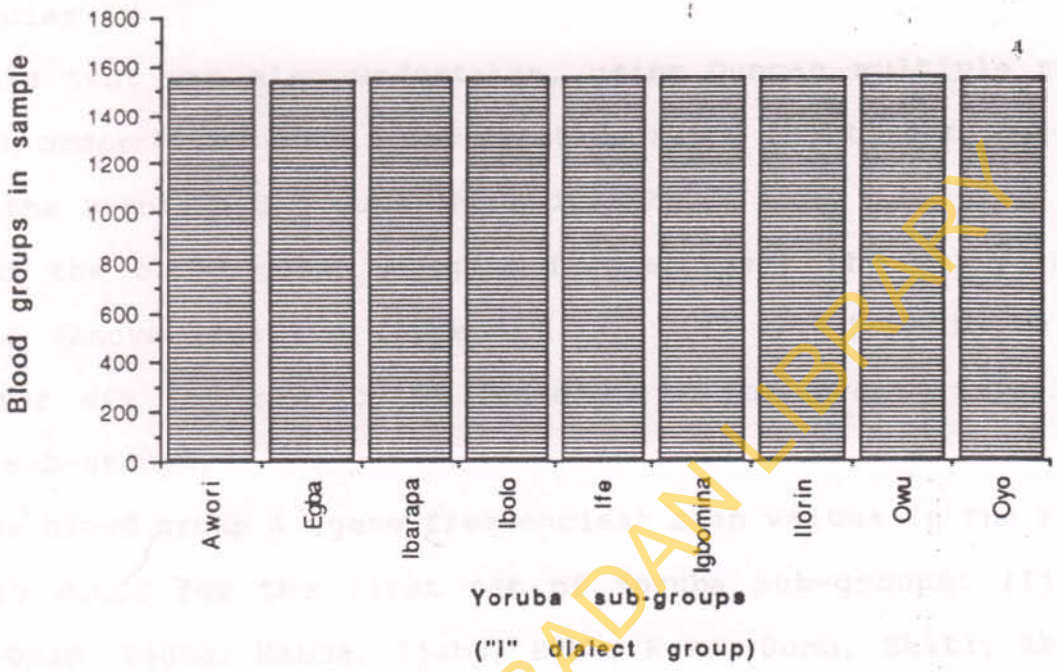
For the blood group O (percentiles) mean values, the results of the analysis of variance (Anova) tests (Appendix 11) gave the F-ratio to be 83.77 for the six (6) replicates (Appendix 6) of the twenty-five (25) Yoruba sub-groups.

The blood groups O (percentiles) mean values in the range 51.30% to 51.80% for the first set of Yoruba sub-groups: (Egba, Oyo, Ilorin, Ibolo, Igbomina, Ife, Awori, Ibarapa, and Owu) vary significantly ($df=24$; $p<0.05$) from those in the range 54.20% to 55.33% for these Yoruba sub-groups: Akure, Akoko, Ijesa, Ondo, Ikale, Eko, Owo, Ekiti, Bunu, Yagba, Ijumu, Remo, Kabba, Ilaje, Ijebu, and Egbado. (see Fig. 31.)

While there were no overlaps in the Duncan grouping for the blood group O (percentiles) mean values of the first set of Yoruba sub-groups in the range 51.30% to 51.80%, there were in the other set in the range of 54.20% to 55.83%.

Analysis of Variance (Anova) Results: Blood Group Gene Frequencies:

The batch sample records (replicate) of the blood groups (Appendix 7) of the twenty-five (25) Yoruba sub-groups were subjected to Analysis of Variance (Anova) tests to ascertain the degree of significant difference of the blood group gene



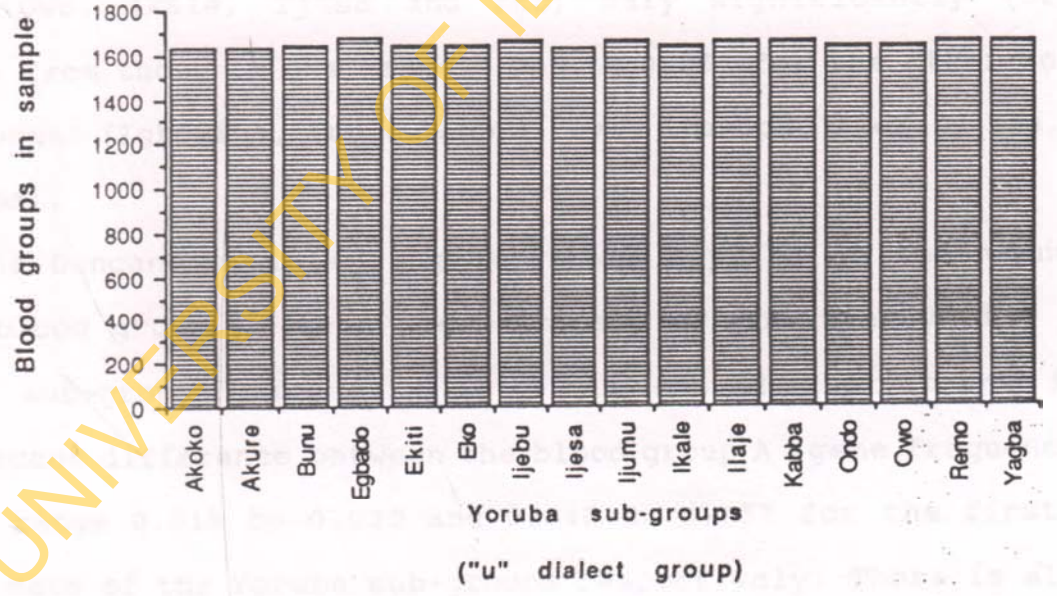


Fig. 27: Bar charts of Blood Group-O samples: in dialect groups.

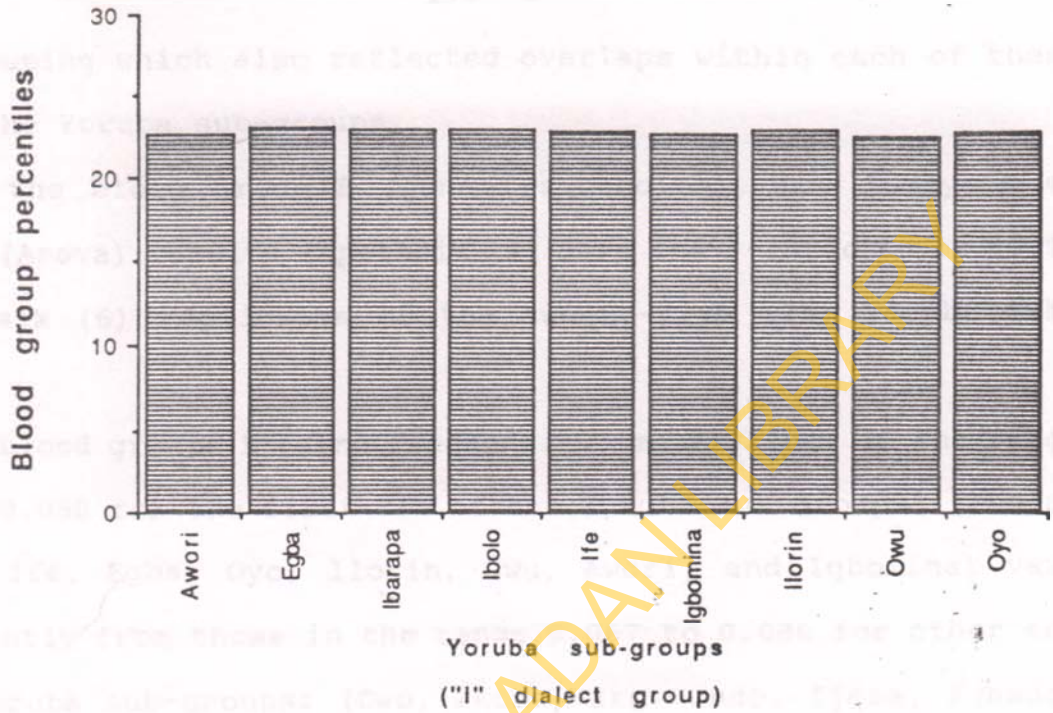
frequencies.

This test was also undertaken, using Duncan multiple range test, in order to ascertain the stratification (partition) if any, within the Yoruba sub-groups (Appendix 12).

For the blood group A (gene frequencies), the analysis of Variance (Anova) results (Appendix 12) gave the F-ratio to be: 66.76 for six (6) replicates (Appendix 7) of twenty-five (25) Yoruba sub-groups.

The blood group A (gene frequencies) mean values in the range 0.018 to 0.030 for the first set of Yoruba sub-groups: (Ijumu, Ilaje, Ondo, Yagba, Kabba, Ijebu, Egba, Remo, Bunu, Ekiti, Akoko, Akure, Owo, Ikale, Ijesa and Eko) vary significantly ($df=24$; $p<0.05$) from those in the range 0.048 to 0.057 for the other Yoruba sub-groups: (Igbomina, Ibolo, Awori, Oyo, Ibarapa, Ilorin, Ife, Owu and Egba).

The Duncan multiple range test was applied on the means of these blood group A (gene frequencies) for the twenty-five (25) Yoruba sub-groups (Appendix 12), and showed that there is a significant difference between the blood group A (gene frequencies) in the range 0.018 to 0.030 and 0.048 to 0.057 for the first and second sets of the Yoruba sub-groups respectively. There is also a partition of these sets of Yoruba sub-groups in the Duncan multiple



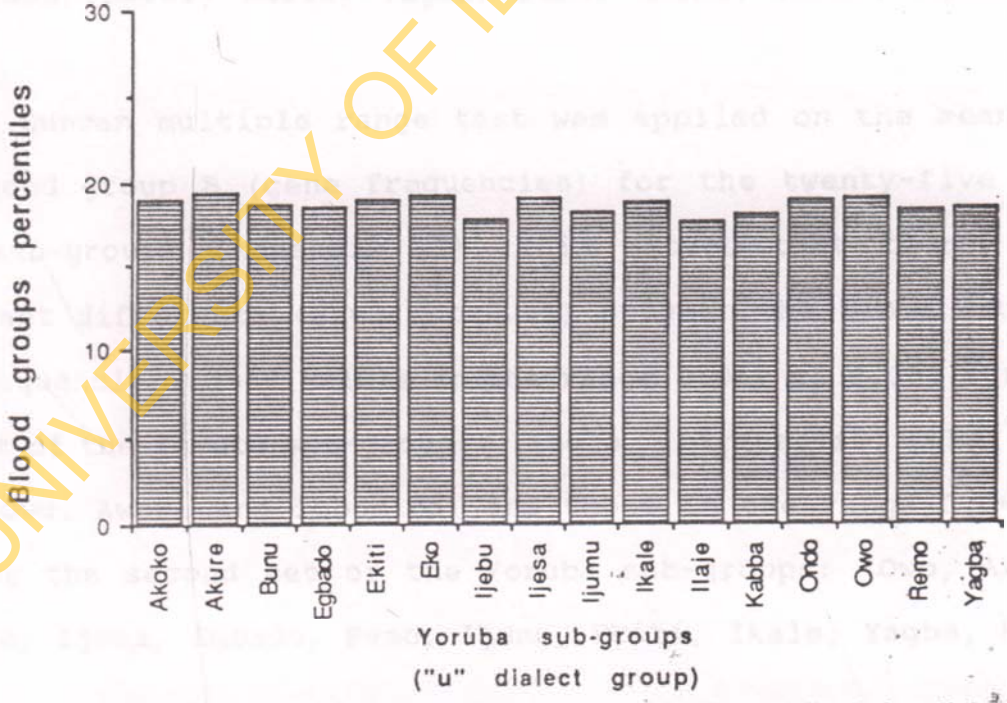


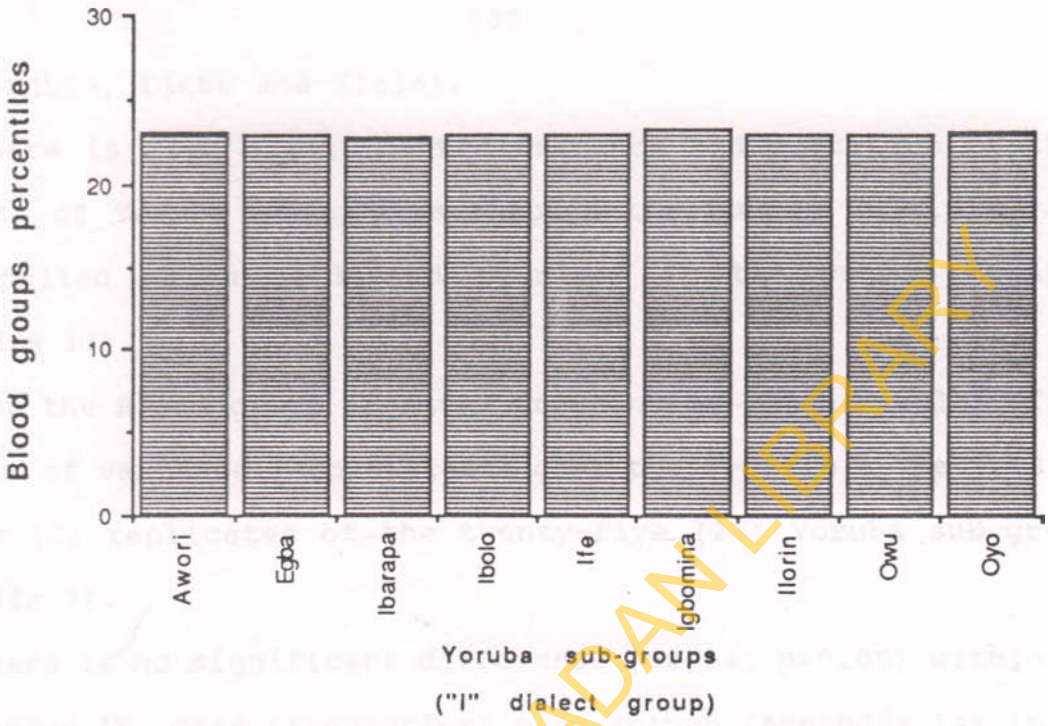
Fig 28 : Bar charts of Blood Group-A (Percentiles) in dialect groups.

range grouping which also reflected overlaps within each of these sets of the Yoruba sub-groups.

For the blood group B (gene frequencies), the Analysis of Variance (Anova) results (Appendix 13) gave the F-ratio to be 30.93 for the six (6) replicates of the twenty-five (25) Yoruba sub-groups.

The blood groups B (gene frequencies) mean values in the range 0.050 to 0.058 for the first set of the Yoruba sub-groups: (Ibolo, Ibarapa, Ife, Egba, Oyo, Ilorin, Owu, Awori, and Igbomina) vary significantly from those in the range 0.067 to 0.080 for other set of the Yoruba sub-groups: (Owo, Akure, Eko, Ondo, Ijesa, Egbado, Remo, Ijumu, Ekiti, Ikale, Yagba, Bunu, Akoko, Kabba, Ijebu and Ilaje).

The Duncan multiple range test was applied on the means of these blood group B (gene frequencies) for the twenty-five (25) Yoruba sub-groups (Appendix 13). This showed that there is a significant difference ($df=24$; $p<0.05$) between the blood group B (gene frequencies) mean values in the range 0.050 to 0.058 for the first set of the Yoruba sub-groups: (Ibolo, Ibarapa,Ife, Egba, Oyo, Ilorin, Owu, Awori and Igbomina) and those in the range 0.067 to 0.080 for the second set of the Yoruba sub-groups: (Owo, Akure, Eko, Ondo, Ijesa, Egbado, Remo, Ijumu, Ekiti, Ikale, Yagba, Bunu,



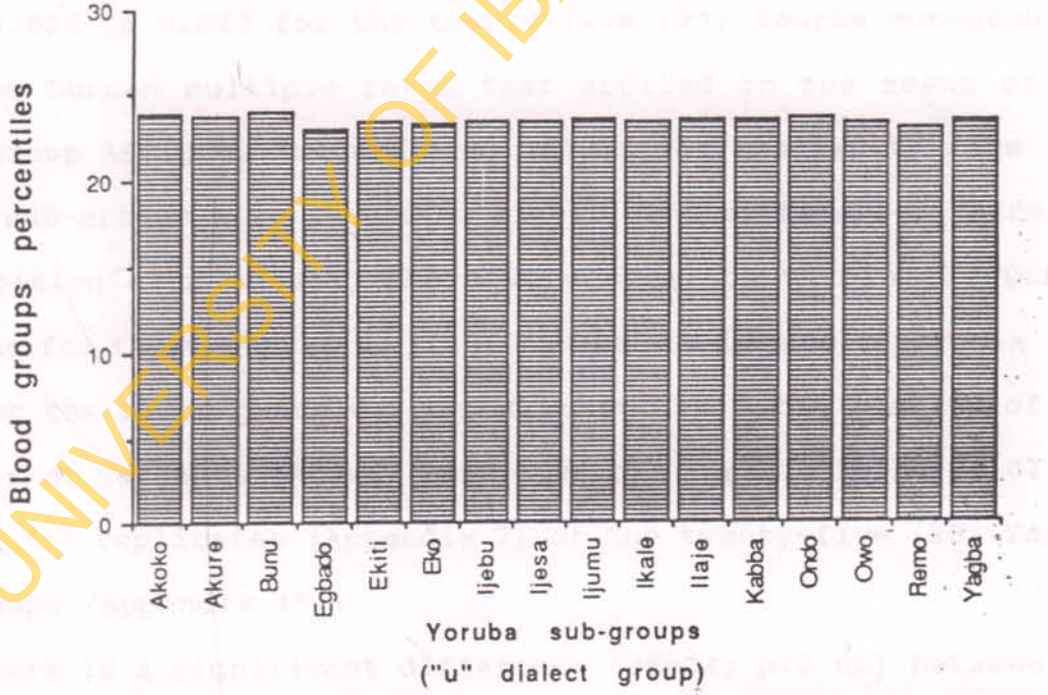


Fig 29 : Bar charts of Blood Group-B (Percentiles) in dialect groups.

Akoko, Kabba, Ijebu and Ilaje).

There is also significant difference and partition of these two sets of Yoruba sub-groups through the Duncan multiple range test applied which reflected overlaps in the Duncan grouping (Appendix 13).

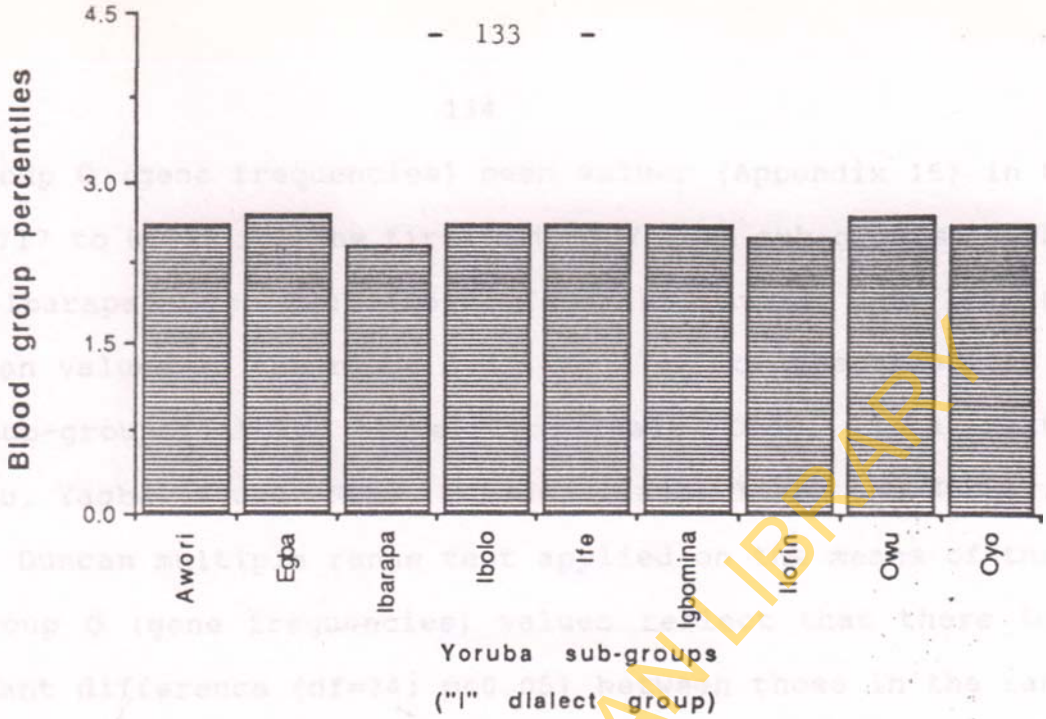
For the Blood group AB (gene frequencies), the results of the analysis of variance (Anova) tests gave the F-ratio to be 2.32 for the six (6) replicates of the twenty-five (25) Yoruba sub-groups (Appendix 7).

There is no significant difference ($df=24$; $p>0.05$) within the blood group AB (gene frequencies) mean values (Appendix 14) in the range 0.020 to 0.033 for the twenty-five (25) Yourba sub-groups.

The Duncan multiple range test applied on the means of the blood group AB (gene frequencies) values for the twenty-five (25) Yoruba sub-groups also showed no significant difference. There was no partition even though, there were overlaps within the Duncan grouping for the twenty-five (25) Yoruba sub-groups (Appendix 14).

For the blood group O (gene frequencies), the results of the Analysis of variance (Anova) test gave the F-ratio to be 38.01 for the six (6) replicates (Appendix 7) of the twenty-five (25) Yoruba sub-groups (Appendix 15).

There is a significant difference ($df=24$; $p<0.05$) between the



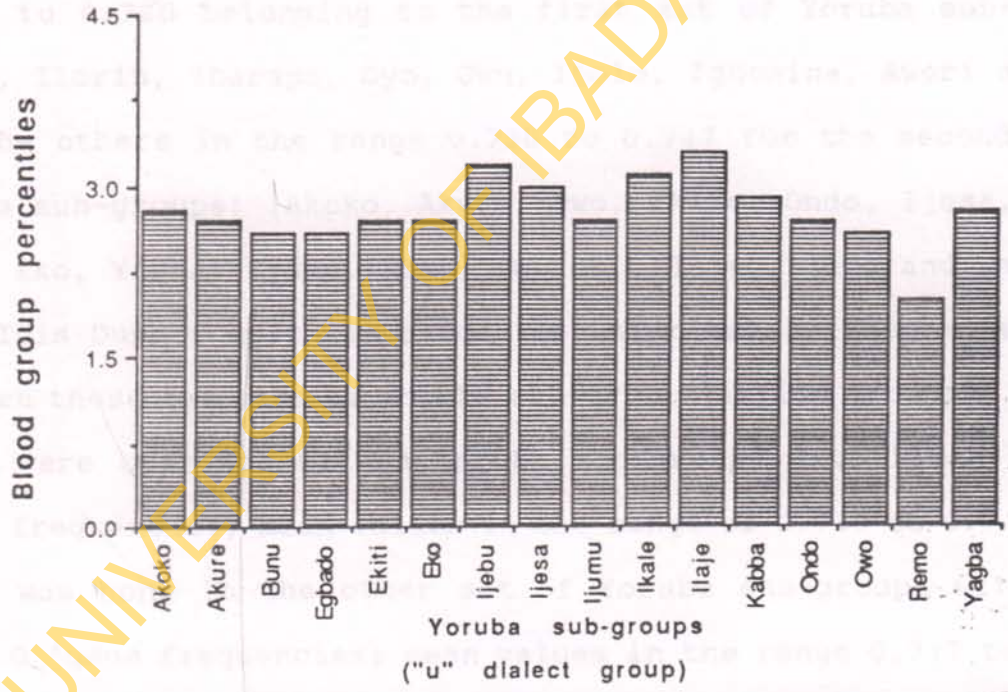
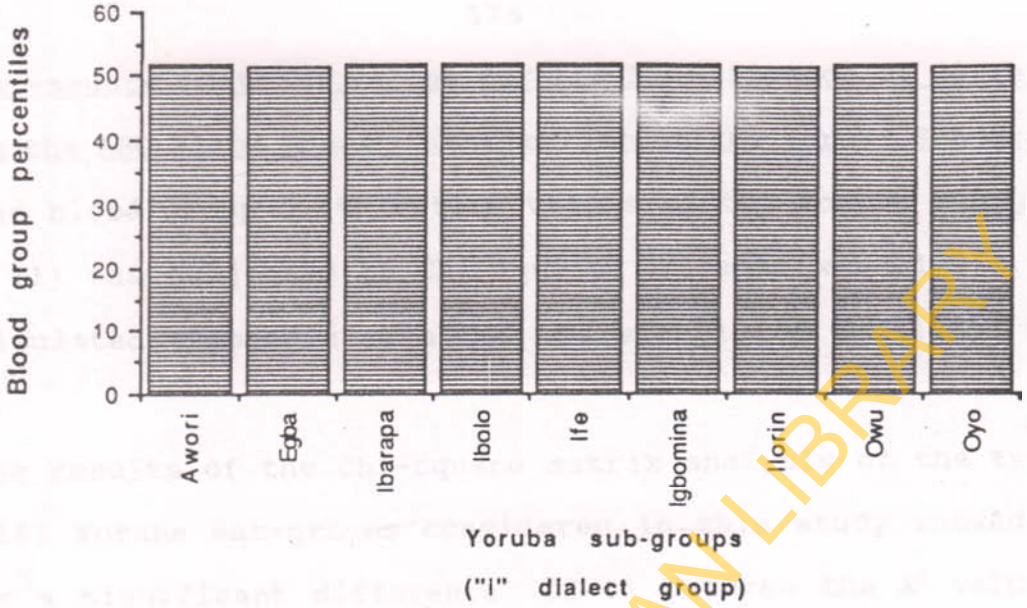


Fig 30 : Bar charts of Blood Group-AB (Percentiles) in dialect groups.

blood group O (gene frequencies) mean values (Appendix 15) in the range 0.717 to 0.720 for the first set of Yoruba sub-groups: (Egba, Ilorin, Ibarapa, Oyo, Owu, Ibolo, Igbomina, Awori, and Ife) and those mean values in the range 0.738 to 0747 for the other set of Yoruba sub-groups (Akoko, Akure, Owo, Ikale, Ondo, Ijesa, Ekiti, Bunu, Eko, Yagba, Ijumu, Remo, Egbado, Ilaje, Ijebu and Kabba).

The Duncan multiple range test applied on the means of these blood group O (gene frequencies) values reflect that there is a significant difference ($df=24$; $p<0.05$) between those in the range 0.717 to 0.720 belonging to the first set of Yoruba sub-groups: (Egba, Ilorin, Ibarapa, Oyo, Owu, Ibolo, Igbomina, Awori and Ife) and the others in the range 0.738 to 0.747 for the second set of Yoruba sub-groups: (Akoko, Akure, Owo, Ikale, Ondo, Ijesa, Ekiti, Bunu, Eko, Yagba, Ijumu, Remo, Egbado, Ilaje, Ijebu and Kabba).

This Duncan multiple range test also established a partition between these two sets of Yoruba sub-groups in its grouping system. There were overlaps within Yoruba sub-groups with blood group O (gene frequencies) mean values in the range of 0.738 to 0.747 while there was none in the other set of Yoruba sub-groups with blood group O (gene frequencies) mean values in the range 0.717 to 0.720.



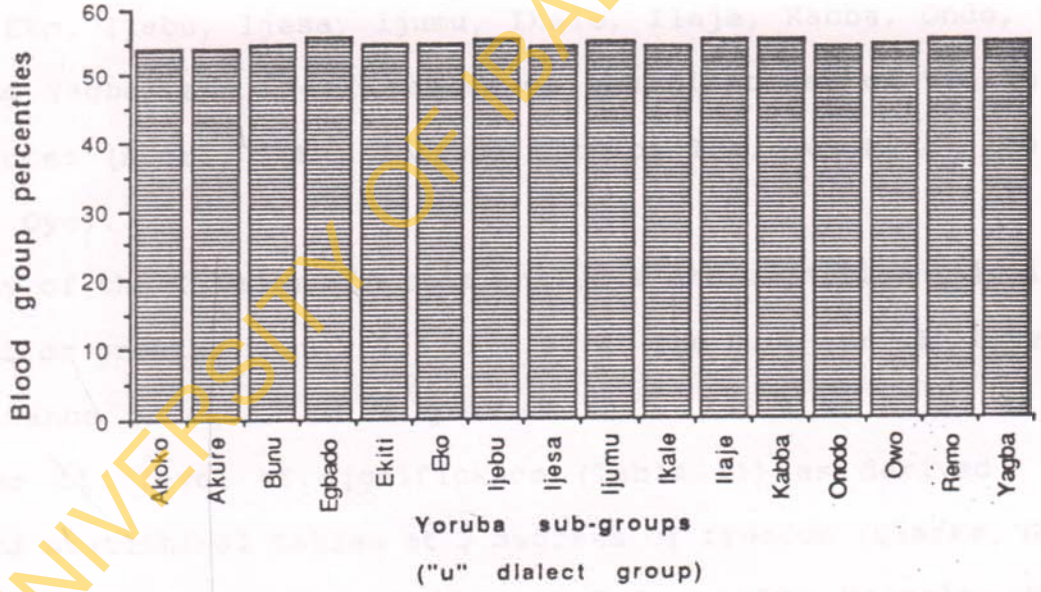


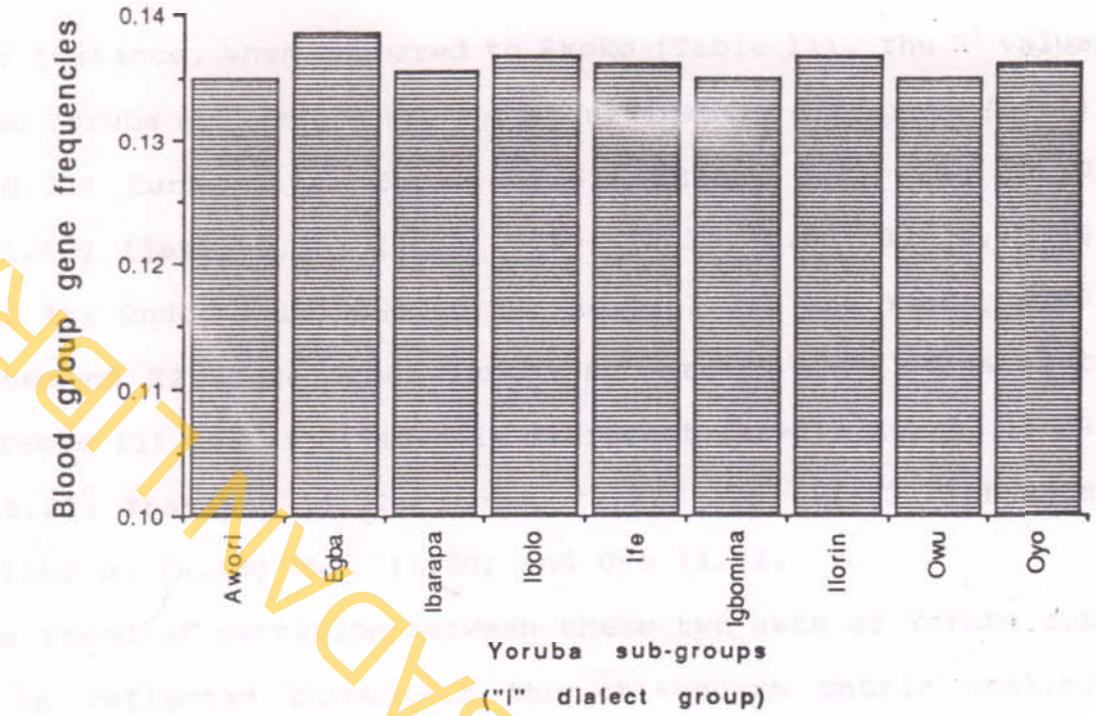
Fig. 31: Bar charts of Blood Group-O (percentiles) in dialect groups.

Chi-square (Matrix) Values for the Significance of Difference in the ABO Blood Group Distribution in the Yoruba Sub-groups:

The blood group distribution values of the Yoruba sub-groups (Table 11) was subjected to Chi-square (X^2) matrix analysis. This was calculated (Appendix 4) after the example of Worlledge et al (1974).

The results of the Chi-square matrix analysis of the twenty-five (25) Yoruba sub-groups considered in this study showed that there s a significant difference (df=3) between the X^2 values of second set of Yoruba sub-groups: (Akoko, Akure, Bunu, Egbado, Ekiti, Eko, Ijebu, Ijesa, Ijumu, Ikale, Ilaje, Kabba, Ondo, Owo, Remo and Yagba) and the X^2 values of the first set of the Yoruba sub-groups: (Awori, Egba, Ibarapa, Ibolo, Ife, Igbomina, Ilorin, Owu and Oyo).

Any of the X^2 values in this analysis are significant if it is equal to or greater than 7.815 or 7.82 at the 0.05 (or 5%) level of significance or equal to or greater than 11.341 or 11.34 at the 0.01 (or 1%) level of significance (Table 11) as derived from standard statistical tables at 3 degrees of freedom (Clarke, G.M., 1980; Parker, R.E, 1979; Bailey, N.T.J., 1959; Walpole, R.E., 1974).



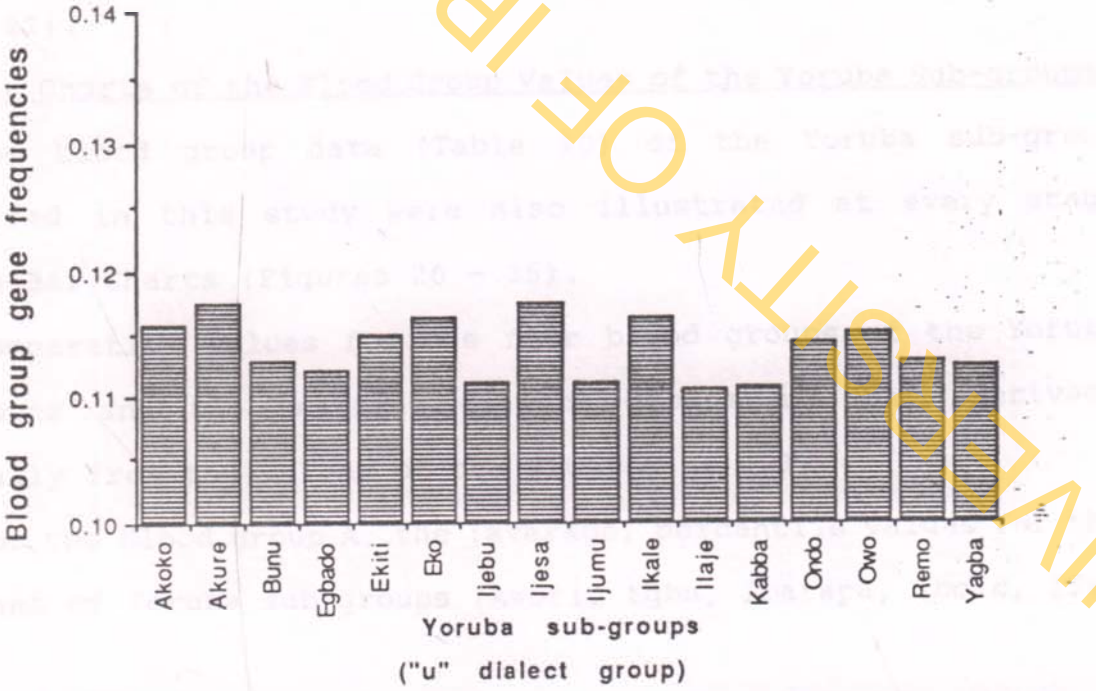


Fig 32 : Bar charts of Blood Group-A (Gene Frequencies) in dialect group.

For instance, when compared to Akoko (Table 11), the X^2 values for these Yoruba sub-groups are not significantly different (df=3): Akure, 0.21; Bunu, 0.34; Egbado, 1.53; Ekiti, 0.23; Eko, 0.39; Ijebu, 2.68; Ijesa, 0.38; Ijumu, 0.90; Ikale, 0.68; Ilaje, 3.39; Kabba, 1.31; Ondo, 0.11; Owo, 0.50; Remo, 1.31; and Yagba, 0.52. The values of X2 these other Yoruba sub-groups when compared to Akoko (Table 11) are significantly different (df=3): Awori, 11.89; Egba, 15.23; Ibarapa, 14.22; Ibolo, 13.82; Ife, 13.17; Igbomina, 11.95; Ilorin, 14.45; Owu, 11.20; and Oyo 13.22.

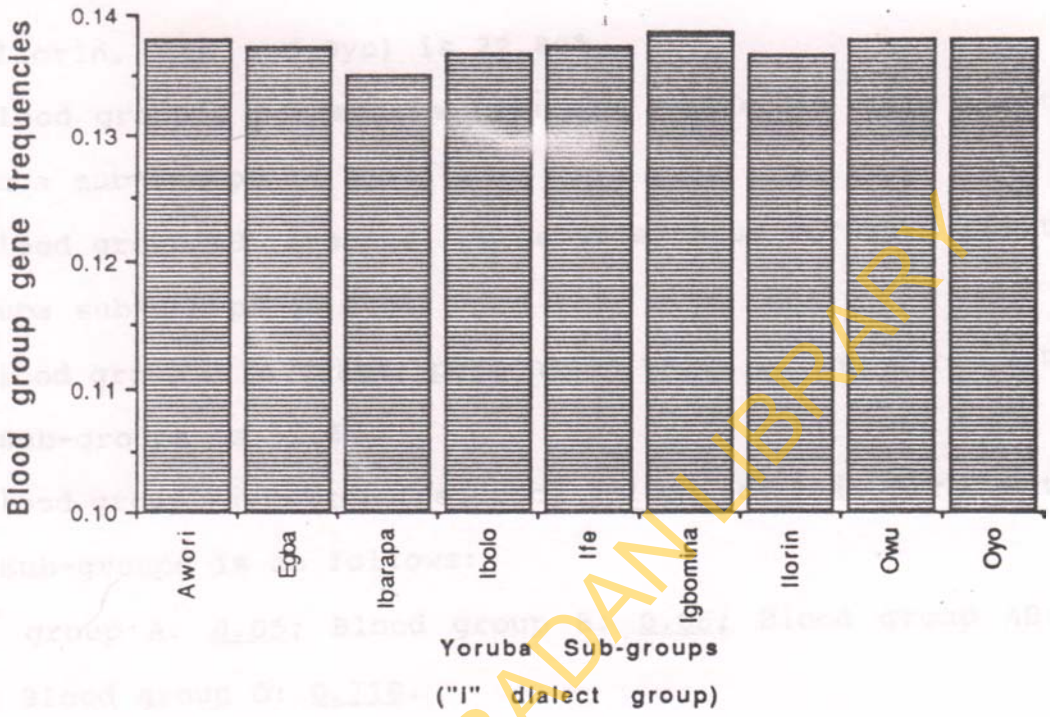
The trend of partition between these two sets of Yoruba sub-groups is reflected throughout the chi-square matrix analysis (Table 11).

Bar Charts of the Blood Group Values of the Yoruba Sub-groups:

The blood group data (Table 10) of the Yoruba sub-group considered in this study were also illustrated at every stage through Bar Charts (Figures 20 - 35).

Comparative values for the four blood groups of the Yoruba sub-groups and two emerging dialect groups are thus derived, especially from the values of the Figures 36 - 39.

For the blood group A, the (average) percentile values for the first set of Yoruba sub-groups (Awori, Egba, Ibarapa, Ibolo, Ife,



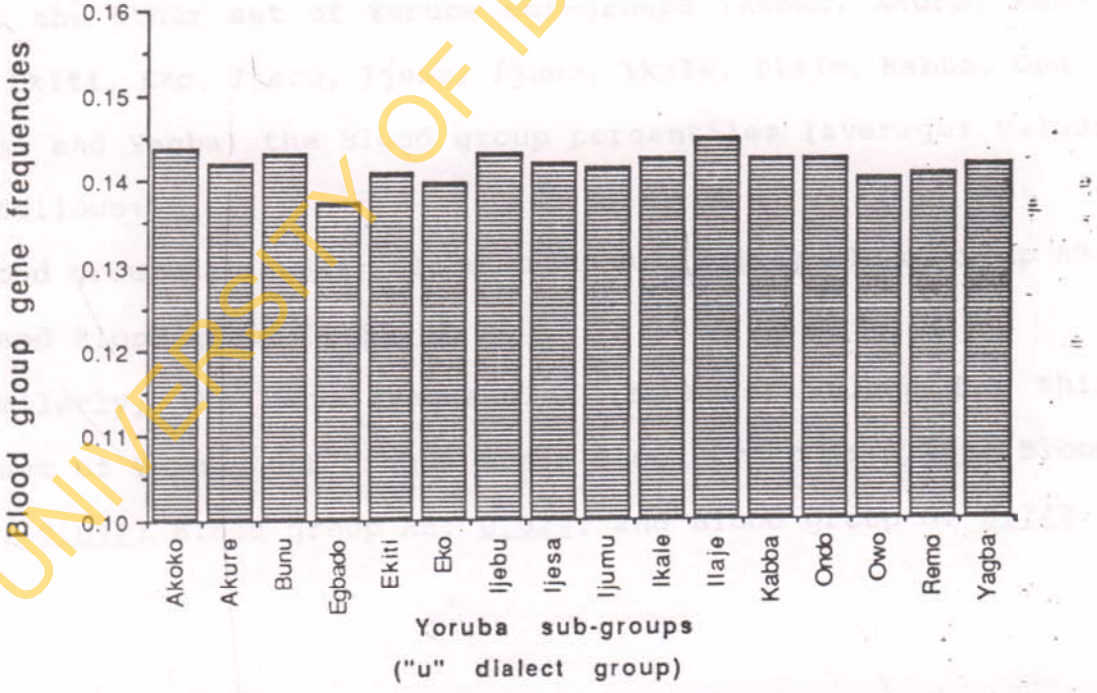


Fig 33 : Bar charts of Blood Group-B (Gene Frequencies) in dialect group.

Igbomina, Ilorin, Owu, and Oyo) is 22.80%.

The blood group B percentile (average) value for this first set of Yoruba sub-groups is 23.23%.

The blood group AB (average) percentile value for this first set of Yoruba sub-groups is 2.5%.

The blood group O (average) percentile value of the first set of Yoruba sub-groups is 51.6%.

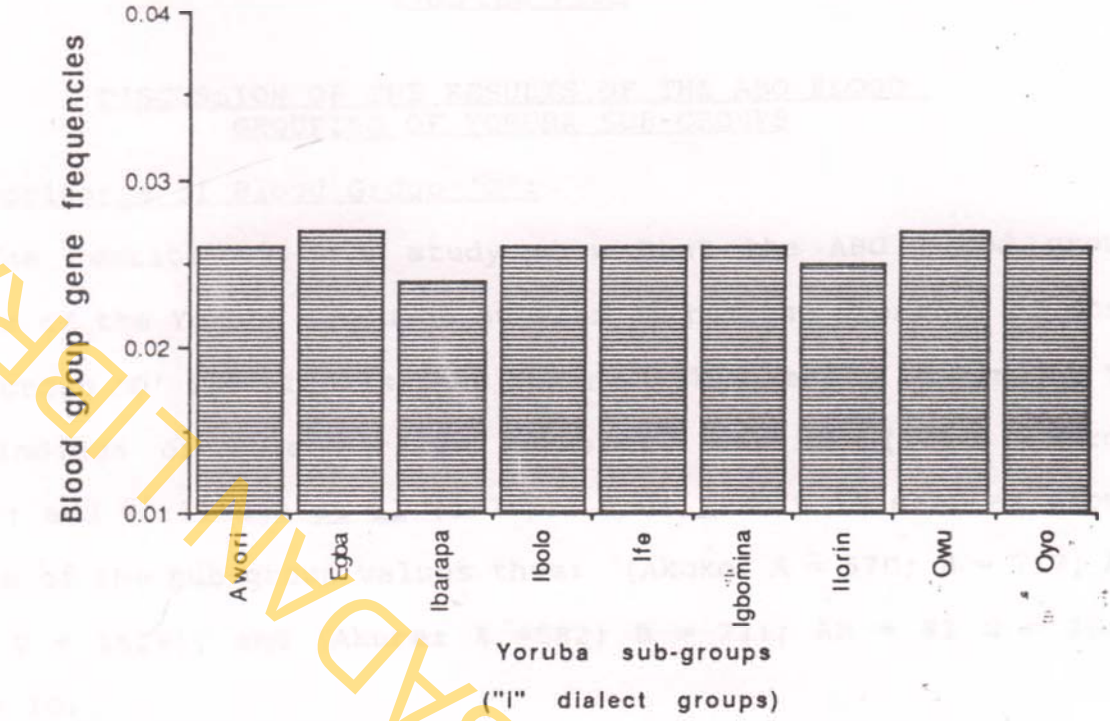
The blood group (average) frequency values for this first set of Yoruba sub-groups is as follows:

Blood group A: 0.05; Blood group B: 0.06; Blood group AB: 0.026; and Blood group O: 0.718.

For the other set of Yoruba sub-groups (Akoko, Akure, Bunu, Egbado, Ekiti, Eko, Ijebu, Ijesa, Ijumu, Ikale, Ilaje, Kabba, Ondo, Owo, Remo and Yagba) the Blood group percentiles (average) values are as follows:

Blood group A: 18.64%; Blood group B: 23.52%; Blood group AB: 2.84%; and Blood group O: 55.0%.

Similarly, the gene frequencies (average) values for this latter set of Yoruba sub-groups are : Blood group A: 0.823; Blood group B: 0.072; Blood group AB: 0.029; and Blood group O: 0.742.



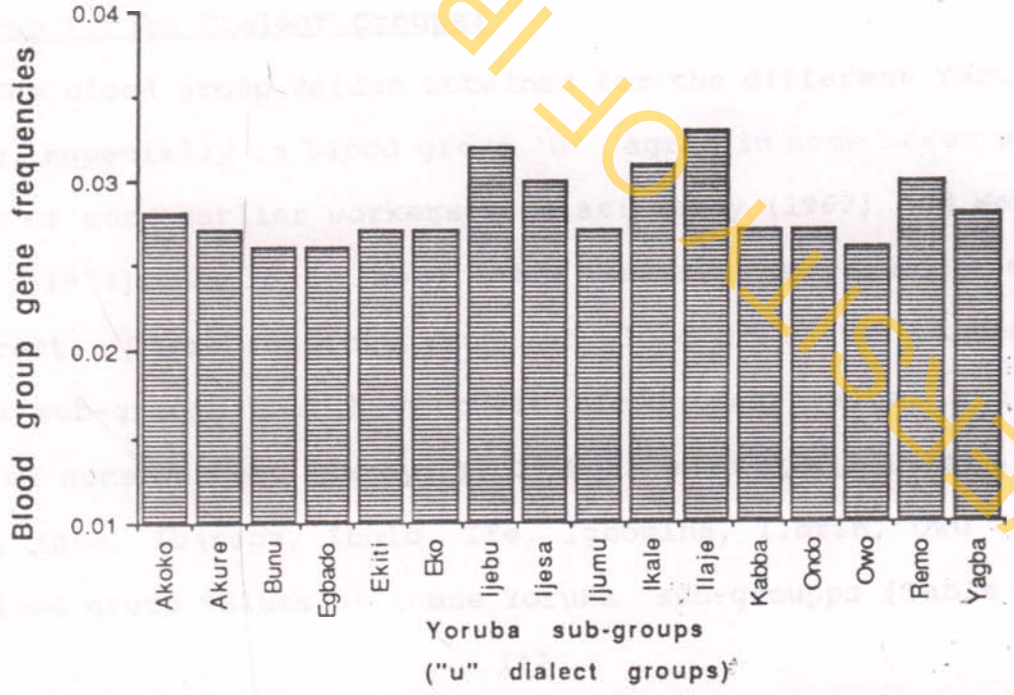


Fig 34 : Bar charts of Blood Group-AB (Gene Frequencies) in dialect groups.

CHAPTER FIVE

DISCUSSION OF THE RESULTS OF THE ABO BLOOD GROUPING OF YORUBA SUB-GROUPS

Dominance of Blood Group 'O':

The results of this study show that the ABO blood group samples of the Yoruba language sub-family has the presence of more blood group 'O' individuals than others. This result is similar to the findings of some earlier workers: Garlick (1962); Hardy (1962); and Worlledge et al (1974). This result is seen as shown in some of the sub-group values thus: (Akoko: A = 570; B = 717; AB = 84; 0 = 1629); and (Akure: A =582; B = 711; AB = 81 0 = 1626 (Table 10).

Two Yoruba Dialect Groups:

The blood group values obtained for the different Yoruba sub-groups, especially in blood group 'O', agree in some cases with the values of some earlier workers such as: Hardy (1962) and Worlledge et al (1974), while in some other cases, the values are quite different. There is a new range of blood group 'O' values. The Yoruba sub-groups that have their blood group values similar to those of some workers (Hardy: 1962; Worlledge et al: 1974) include: Awori, Egba, Ibarapa, Ibolo, Ife, Igbomina, Ilorin, Owu and Oyo. The blood group values of these Yoruba sub-groupps (Table 10) are

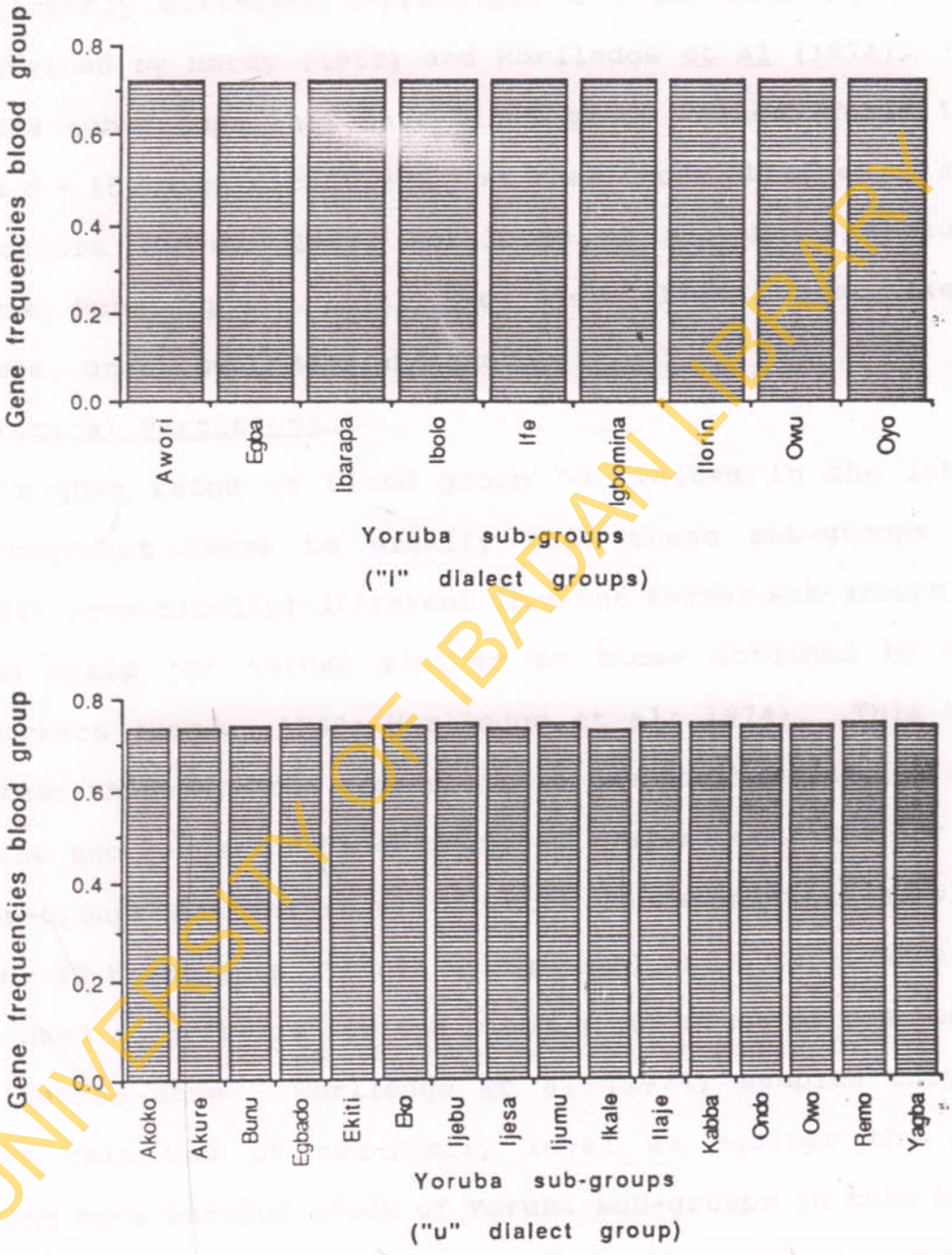


Fig. 35: Bar charts of Blood Group-O (gene frequencies) in dialect groups.

not significantly different (Appendices 8 - 15) from the values earlier obtained by Hardy (1962) and Worlledge et al (1974). The other Yoruba sub-groups that have blood group values (Table 10), Appendices 8 - 15) significantly higher than those obtained by some earlier workers (Hardy: 1962; Worlledge et al: 1974) include: Akoko, Akure, Bunu, Egbado, Ekiti, Eko, Ijebu, Ijesa, Ijumu, Ikale, Ilaje, Kabba, Ondo, Owo, Remo and Yagba.

Bilological Partition:

This higher range of blood group 'O' values in the latter Yoruba sub-groups seems to signify that these sub-groups are biologically (genetically) different from the former sub-groups who have blood group 'O' values similar to those obtained by some earlier workers (Hardy: 1962; Worlledge et al: 1974). This thus suggests that there are two groups within the Yoruba language sub-family. The two ranges of blood group 'O' values obtained for the Yoruba sub-groups are the result of more representative sampling through the 25 treatments (Yoruba sub-groups) and 6 replicates per sub-group used as criteria for the blood group study of the Yoruba as not hitherto done. Worlledge et al (1974) sampled only in Ibadan and this was at sub-family level as against the more complete and more careful study of Yoruba sub-groups in this work.

Correlation of Biological and Linguistic Evidence:

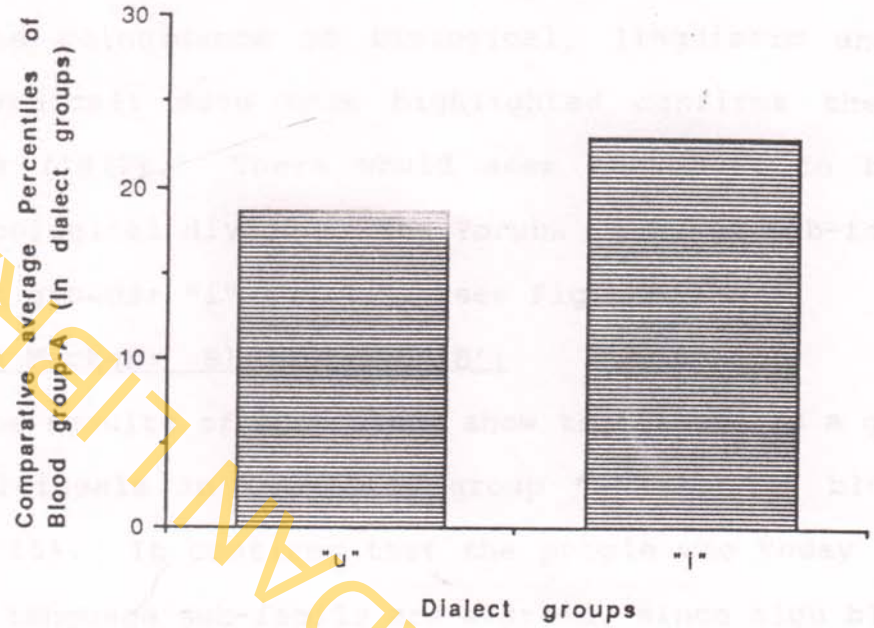
The two groups of the Yoruba sub-groups set apart through their blood group values, especially the blood group 'O', significantly enough, would appear to coincide with the two dialect areas: -i, and -u of Yorubaland (Fig. 12) proposed by Oduyoye (1972). This thus, shows that there is a biological divide within the Yoruba language sub-family obtained through the blood group values (Table 10); which coincides with the dialect areas ("i" and "u") proposed by Oduyoye (1972) based on linguistic distinction. There thus seems to be remarkable correlation between the biological divide and the cultural (language) grouping. This constitutes a very significant illustration of a possible link between culture and biology as the coincidence of the two groupings, based on two different parameters, is likely to be more than fortuitous.

Anthropological Divide of the Yoruba Language Sub-Family:

These two dialect groups of the Yoruba language sub-family are located as follows:

"i-" dialect group (North-West and part of South-West Yorubaland).

"u-" dialect group (North-East, South, East and part of South-West Yorubaland). (see Fig. 12)



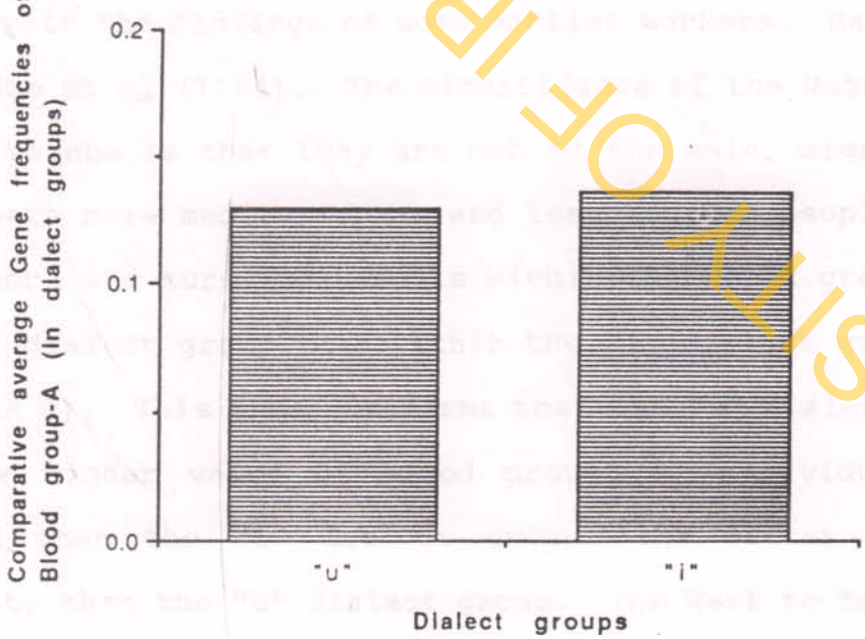


Fig. 36 : Comparative average percentiles and frequencies of Blood Group-A in dialect groups.

The coincidence of biological, linguistic and territorial (geographical) data thus highlighted confirms the proposal of Oduyoye (1972). There would seem therefore to be a definite anthropological divide of the Yoruba language sub-family into two dialect groups: "i" and "u". (see Fig. 48,)

Negroid Marker: Blood Group 'B':

The results of this study show that there is a greater number of individuals in the blood group 'B' than in blood group 'A' (Table 10). It confirms that the people who today belong to the Yoruba language sub-family are Negroid, since high blood group 'B' value is a feature of Negroid populations. (Hardy 1962). This thus agrees with the findings of some earlier workers. Hardy (1962) and Worlledge et al (1974). The significance of the Negroid character of the Yoruba is that they are not in the main, migrants from the East where more mediterranean and less Negroid peoples abound.

There are more individuals within the blood group 'B' within the "u" dialect group than within the "i" dialect group (Fig. 25; Appendix 5). This thus, confirms that the "u" dialect group which has the higher value of blood group 'B' individuals, is more Negroid than the "i" dialect group; the latter is of lesser antiquity than the "u" dialect group. The West to East diminution of blood group 'B' values from the Yoruba to the Bini (or Edo),

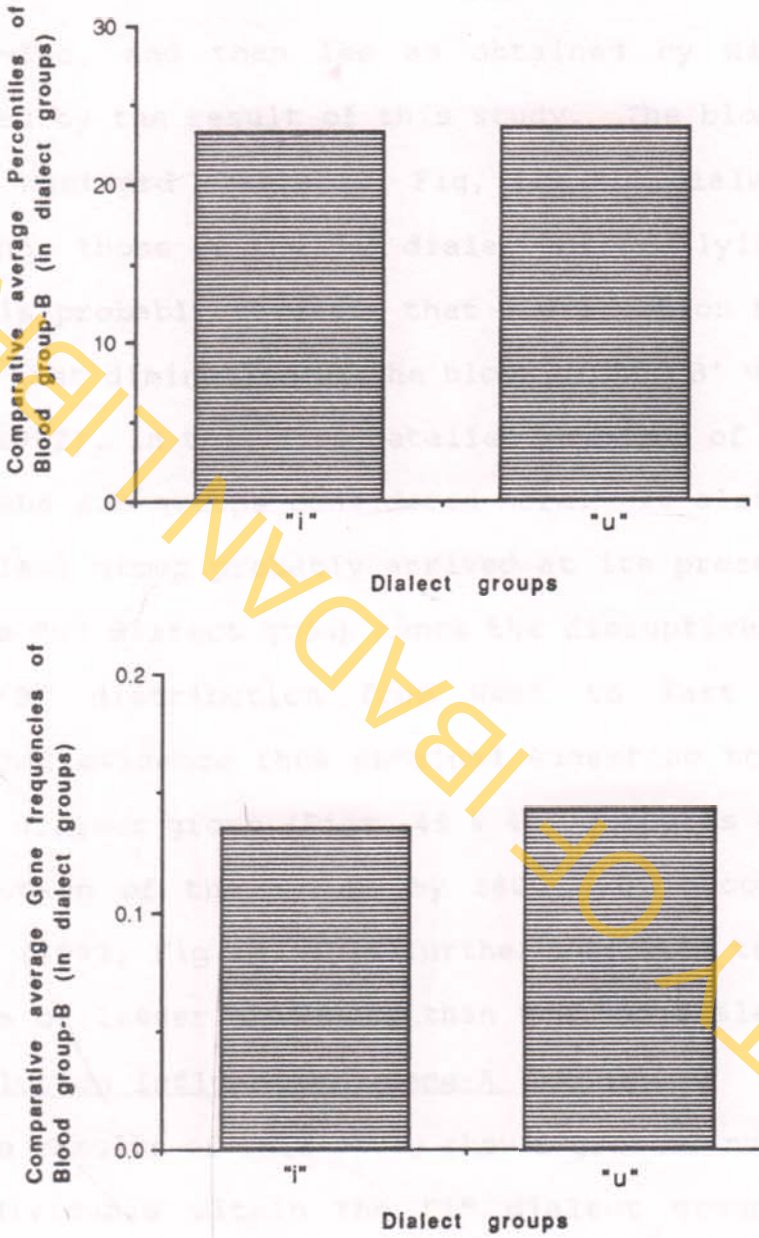


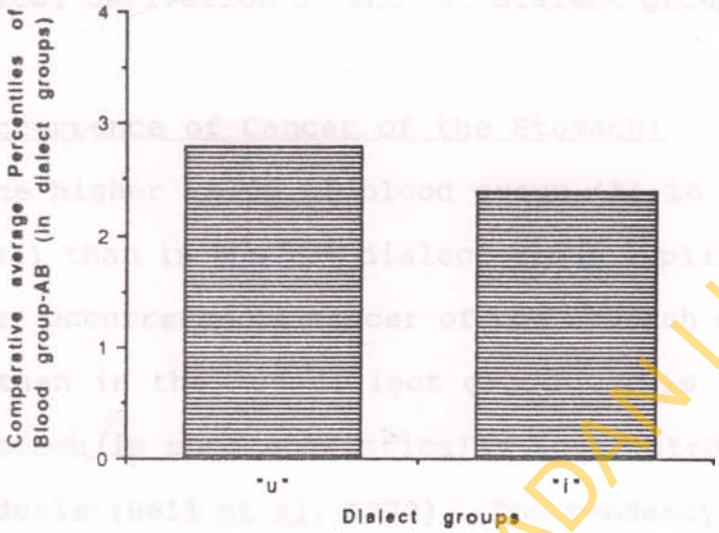
Fig. 37 : Comparative average percentiles and gene frequencies of Blood Group-B in dialect groups.

Onitsha-Ibo, and then Ibo as obtained by Hardy (1962) it not supported by the result of this study. The blood group 'B' values for the Westward (Table 10; Fig. 41) "i" dialect group is rather lower than those of the "u" dialect group, lying Eastwards.

This probably suggests that a disruption has occurred in the West to East diminution of the blood group 'B' values as noticed by Hardy (1962), in this more detailed sampling of the blood groups of the Yoruba sub-groups considered here. It also suggests that the "i" dialect group probably arrived at its present territory later than the "u" dialect group hence the disruptive trend in the blood group 'B' distribution from West to East now evident. The biological evidence thus obtained sugesting the later arrival of the "i" dialect group (Figs. 45 & 48) compares favourably with the distribution of the Yoruba by 1800 A.D. according to Elizabeth Isichei (1983) Fig.18. This further suggests that the "i" dialect group is of lesser antiquity than the "u" dialect group.

Dilution Influences: Gene-A Trends:

The results of this study show a greater number of blood group 'A' individuals within the "i" dialect group than in the "u" dialect group. This possibly is evidence of greater dilution of the "i" dialect group from its source of derivation; corroborated by its lower blood group 'O' value. It is especially in agreement



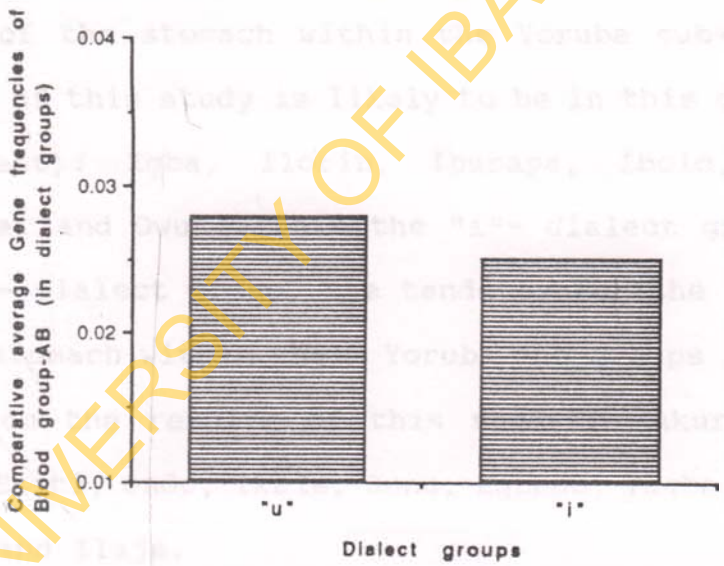


Fig. 38 : Comparative average percentiles and gene frequencies of Blood Group-AB in dialect groups.

with similar finding by El-Hassan et al (1968) on the Beja of Sudan. This suggests the possibility of a different source of biological derivation of the "i" dialect group from the "u" dialect group.

Occurrence of Cancer of the Stomach:

The higher value of blood group 'A' in the "i" dialect group (Fig. 44) than in the "u" dialect group implies that there could be a higher occurrence of cancer of the stomach within the "i" dialect group than in the "u" dialect group. This is so since cancer of the stomach is more statistically associated with blood group 'A' individuals (Bell et al, 1972). The tendency for the occurrence of cancer of the stomach within the Yoruba sub-groups based on the results of this study is likely to be in this order: (from highest to lowest): Egba, Ilorin, Ibarapa, Ibolo, Ife, Oyo, Awori, Igbomina, and Owu (within the "i"- dialect group). Then, within the "u"- dialect group, the tendency for the occurrence of cancer of the stomach within these Yoruba sub-groups is likely to be thus: (based on the results of this study). Akure, Eko, Ijesa, Owo, Akoko, Ekiti, Ondo, Ikale, Bunu, Egbado, Yagba, Remo, Ijumu, Kabba, Ijebu, and Ilaje.

Apart from the statistical association of the blood group 'A' with cancer of the stomach, there is its generally higher values

(Table 10) in the "i" dialect Yoruba sub-groups occuring alongside the lower values of the blood groups 'B' and 'O'. This possibly implies more marked dilution and intrusion influences within the Yoruba sub-groups in the "i" dialect group as well as lower degrees of negritude based on the lower blood group 'B' values as well as lower degrees of antiquity as their lower blood group 'O' values shown.

These higher values of blood group 'A' within the "i" dialect Yoruba sub-groups is in this decreasing order: Egba, Ilorin, Ibarapa, Ibolo, Ife, Oyo, Awori, Igbomina, and Owu. Within the "u" dialect Yoruba sub-groups, there are generally lower blood group "A" values (Table 10) occuring alongside higher values of blood groups 'B' and 'O' suggesting that there were less marked dilution and intrusion influences in the Yoruba sub-groups of this dialect group. The higher blood groups 'B' and 'O' values as well imply that there are higher degrees of negritude (often associated with high blood group 'B' gene frequencies) and antiquity (shown by higher 'O' blood group values) within the 'u' dialect Yoruba sub-groups in this decreasing order: Akure, Eko, Ijesa, Owo, Akoko, Ekiti, Ondo, Ikale, Bunu, Egbado, Yagba, Remo, Ijumu, Kabba, Ijebu and Ilaje.

Influences on Boundary Yoruba sub-groups:

The results of this study show that there has been some influence on the boundary sub-groups of the two Yoruba dialect groups. The tendency for higher numbers in the blood group 'O' values is evident in such boundary Yoruba sub-groups as: Ibarapa (51.9%); Owu (51.8%); Awori (51.7%); Ife (51.6%); Igbomina (51.6%). This tendency is due possibly to the influences of the "u" dialect Yoruba sub-groups on these stated "i" dialect sub-groups with blood values a bit higher than the value of 51.5% obtained for Yoruba by Worlledge et al (1974) and shown comparatively by Ilorin (51.533%); Oyo (51.5%); and Egba (51.3%). The possibility for the antiquity or remoteness of time of settlement of these "i" dialect Yoruba is likely to be thus: (in order of greater antiquity to lesser): Ibarapa, Owu, Awori, Ife, Igbomina, Ilorin, Oyo and Egba (Table 10). Thus, it can be said that the Ekiti and Yagba influenced the Igbomina; the Ijesa must have had some influence on the Owu and Ife, while the Ijebu must have influenced the Owu. The Awori must been influenced by the Eko and the Egbado while the Egba would have been influenced by the Egbado and Remo. The Egbado influence on the Ibarapa is as well very likely as a spill-over of boundary influences (Fig. 48). Based on the blood group 'O' values of the "u" diaclect Yoruba, the possibility of an order of antiquity based

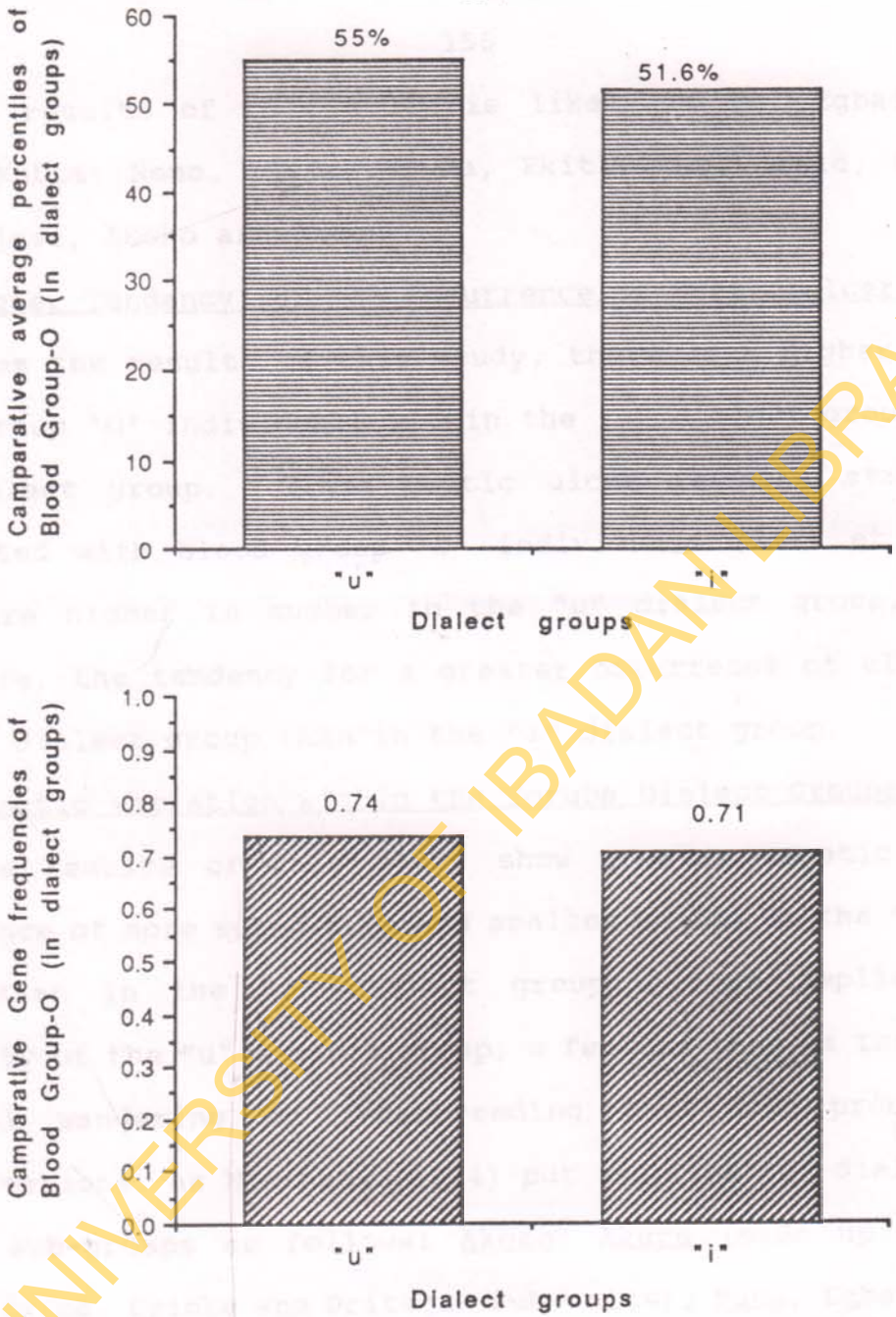


Fig. 39: Comparative average percentiles and gene frequencies of Blood Group-O in dialect groups.

on this results of this study is likely to be: Egbado, Ijebu, Ilaje, Kabba, Remo, Ijumu, Yagba, Ekiti, Owo, Ikale, Ondo, Eko, Bunu, Ijesa, Akoko and Akure.

Higher Tendency for the Occurrence of peptic ulcer:

From the results of this study, there is a higher number of blood group 'O' individuals within the "u" dialect group than the "i" dialect group. Since peptic ulcer is more statistically associated with blood group 'O' individuals (Bell et al, 1972) which are higher in number in the "u" dialect group, there is therefore, the tendency for a greater occurrence of ulcer within the "u" dialect group than in the "i" dialect group.

Genetic variation within the Yoruba Dialect Groups:

The results of this study show greater genetic variation (existence of more sub-groups and smaller units) in the "u" dialect group than in the "i" dialect group. This implies greater antiquity of the "u" dialect group; a feature that is the result of internal wandering or interbreeding that has promoted such recombinations, as Hiernaux (1974) put it. The "u" dialect has 16 Yoruba sub-groups as follows: Akoko; Akure (made up of Isikan, Isolo, Igiso, Eyinke and Oritagun sub-units); Bunu, Egbado (made up of Anago, Ketu, Sabe, Popo, Idassa sub-units mainly); Ekiti (including aboriginal Ilesun sub-unit); Eko (made up of Awori, Edo,

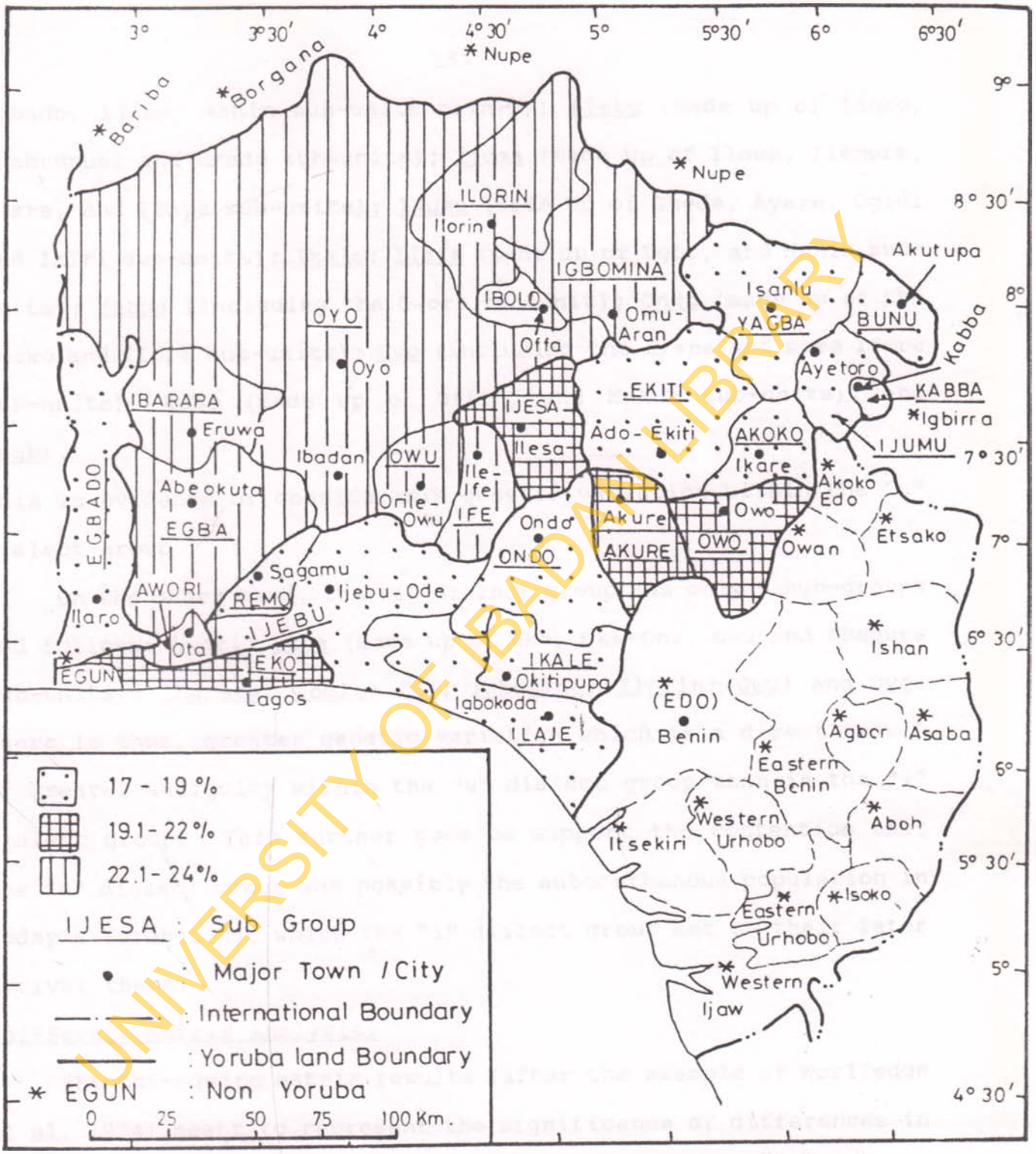


Fig. 40: Blood group map of Yoruba sub-groups : Gene-A

Egbado, Ijebu, Mahin sub-units mainly); Ijebu (made up of Idoko, Idokunnusi and Eredo sub-units); Ijesa (made up of Ilowa, Ilemure, Ilare, and Ilaye sub-units); Ijumu (made up of Gbede, Ayere, Ogidi and Ikiri sub-units); Ikale; Ilaje (made up of Ugbo, and Mahin sub-units); Kabba (including the Oworo sub-unit); Ondo (made up of the Idoko and Ifore sub-units); Owo (including the Efene and some Ifore sub-units); Remo (made up of Offin, and Makun sub-units); and Yagba.

This is evidence of considerable genetic variation within the "u" dialect group.

On the other hand, the "i" dialect group has only 9 sub-groups and follows: Awori; Egba (made up of Ake, Oke-Ona, Owu and Gbagura sub-units); Ibarapa; Ibolo; Ife; Igbomina; Ilorin; Owu; and Oyo. There is thus, greater genetic variation which is a direct result of greater antiquity within the "u" dialect group than in the "i" dialect group. This further goes to support the contention that the "u" dialect group was possibly the autochthonous population in today's Yorubaland, which the "i" dialect group met on their later arrival there.

Chi-Square Matrix Analysis:

The Chi-square matrix results (after the example of Worlledge et al, 1974) meant to represent the significance of differences in

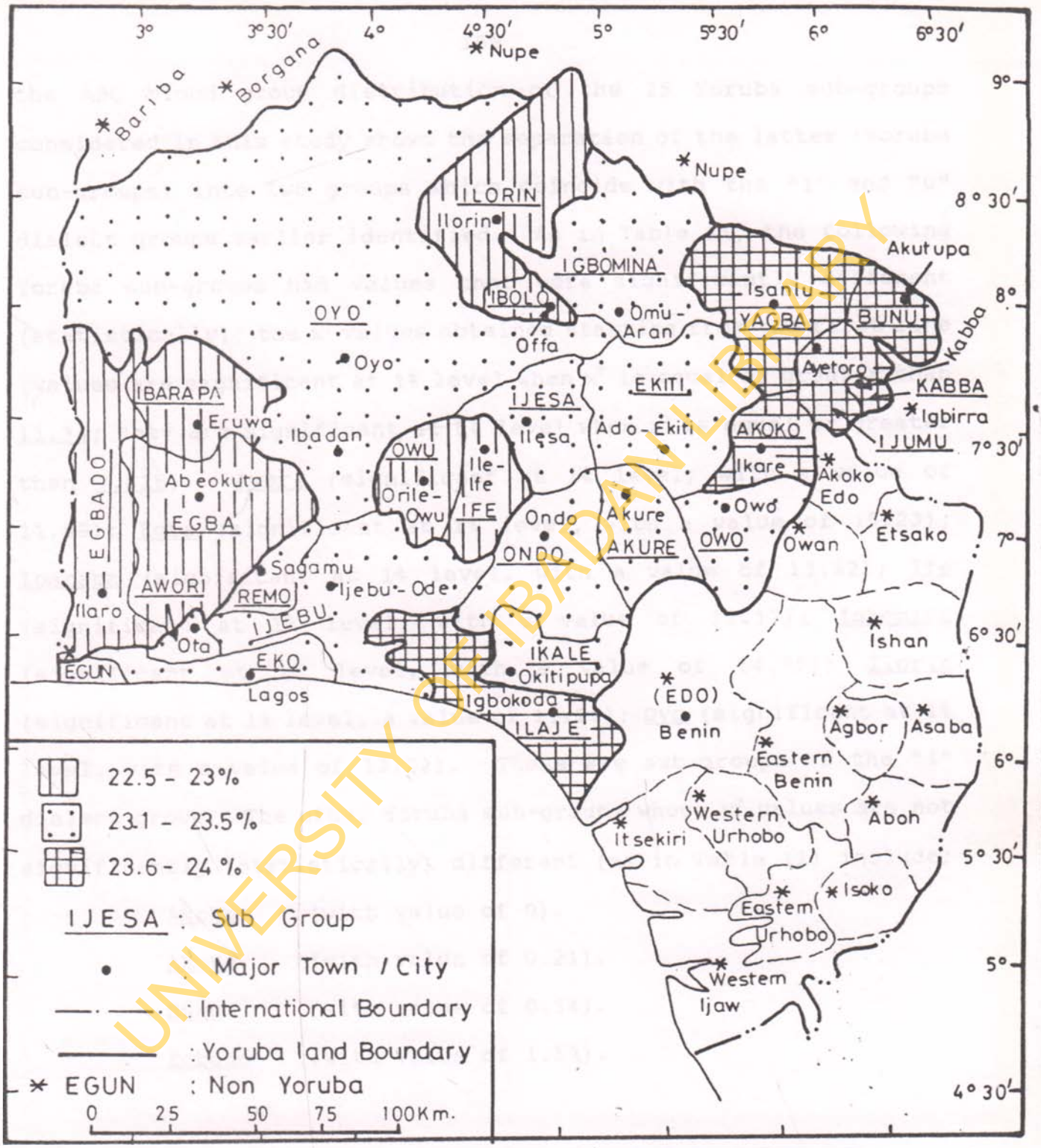


Fig. 41: Blood group map of Yoruba sub-groups: Gene-B

the ABO blood group distribution of the 25 Yoruba sub-groups considered in this study shows the separation of the latter (Yoruba sub-groups) into two groups which coincide with the "i" and "u" dialect groups earlier identified. As in Table 11, the following Yoruba sub-groups had values that were significantly different (statistically); the x^2 values obtained starting from the first line (values are significant at 1% level when x^2 is equal or greater than 11.34; they are significant at 5% level when x^2 is equal or greater than 7.815). Awori (significant at 1% level; with a value of 11.89); Egba (significant at 1% level, with a value of 15.23); Ibarapa (significant at 1% level, with a value of 13.82); Ife (significant at 1% level, with a value of 13.17); Igbomina (significant at 1% level, with a value of 14.95); Ilorin (significant at 1% level, a value of 11.20); Oyo (significant at 1% level, with a value of 13.22). These are sub-groups of the "i" dialect group. The other Yoruba sub-groups whose x^2 values are not significantly (statistically) different (as in Table 11) include:

Akoko (with value of 0).
Akure (with value of 0.21).
Bunu (with value of 0.34).
Egbado (with value of 1.53).

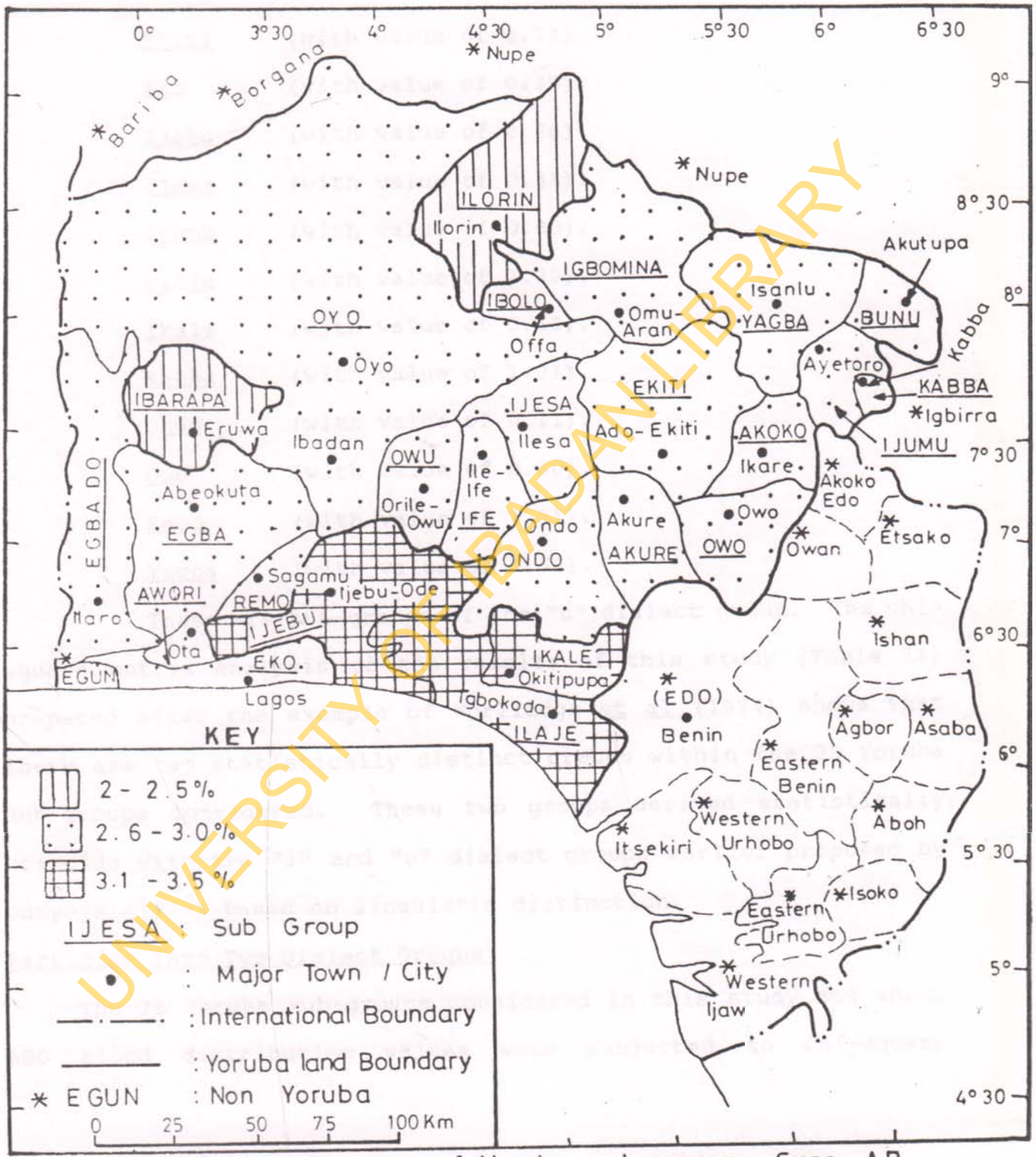


Fig. 42 : Blood group map of Yoruba sub-groups : Gene - AB

Ekiti (with value of 0.73).

Eko (with value of 0.39).

Ijebu (with value of 2.68).

Ijesa (with value of 0.38).

Ijumu (with value of 0.90).

Ilaje (with value of 3.39).

Ikale (with value of 0.68).

Kabba (with value of 1.31).

Ondo (with value of 0.11).

Owo (with value of 0.60).

Remo (with value of 1.31).

Yagba (with value of 0.52).

These are sub-groups of the "u" dialect group. The chi-square matrix analysis of the results of this study (Table 11) prepared after the example of Worlledge et al (1974) shows that there are two statistically distinct groups within the 25 Yoruba sub-groups considered. These two groups derived statistically coincide with the "i" and "u" dialect groups earlier proposed by Oduyoye (1972) based on linguistic distinction.

Partition Into Two Dialect Groups:

The 25 Yoruba sub-groups considered in this study and whose ABO blood distribution values were subjected to Chi-square

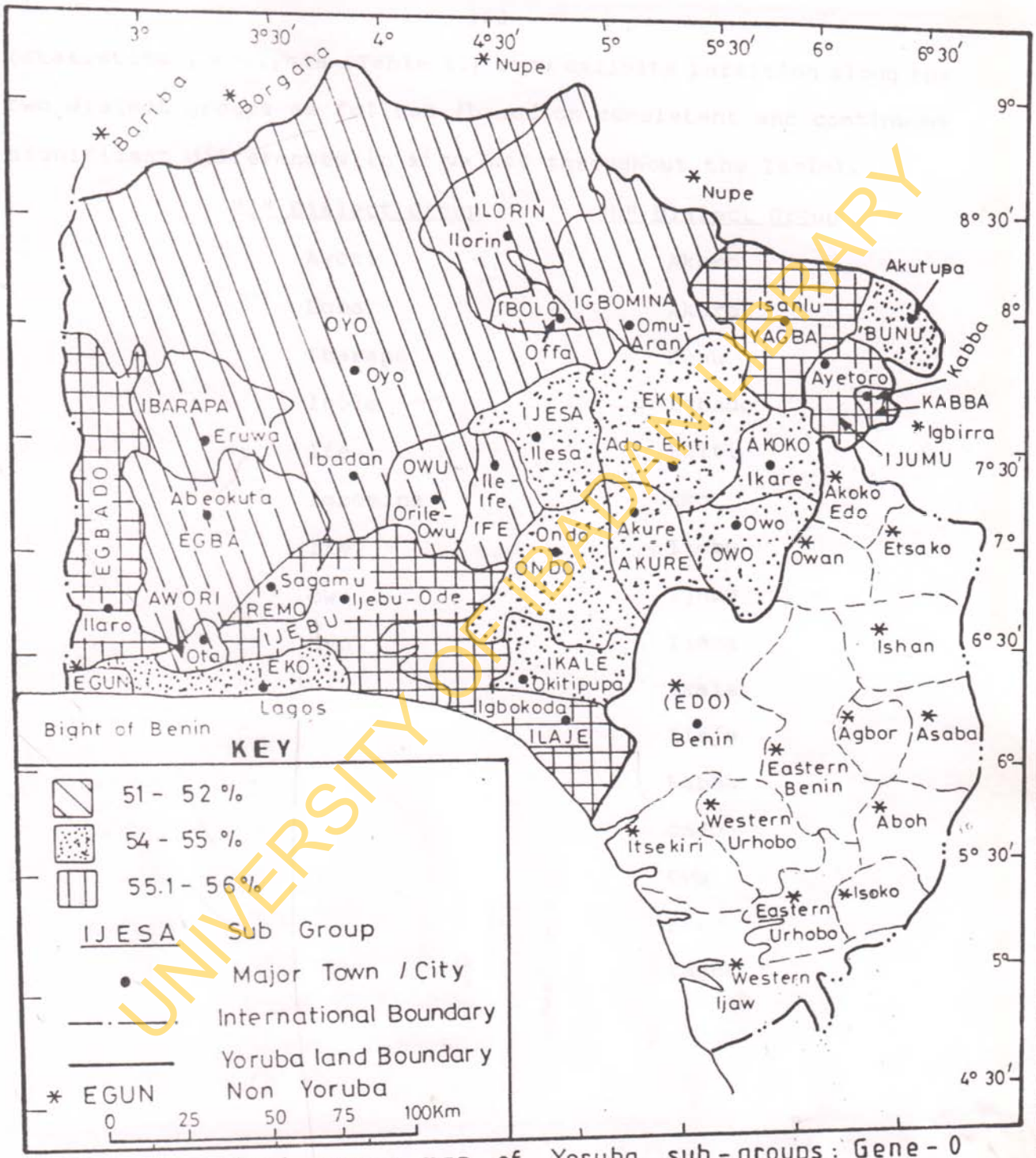


Fig. 43 : Blood group map of Yoruba sub-groups : Gene - 0

(statistical) analysis (Table 11) show definite partition along the two dialect groups as follows (based on consistent and continuous significant differences in x^2 values throughout the Table):

"i" Dialect Group	"u" Dialect Group
Awori	Akoko
Egba	Akure
Ibarapa	Bunu
Ibolo	Egbado
Ife	Ekiti
Igbomina	Eko
Ife	Ijebu
Owu	Ijumu
Oyo	Ijesa
	Ikale
	Ilaje
	Kabba
	Ondo
	Owo
	Remo
	Yagba

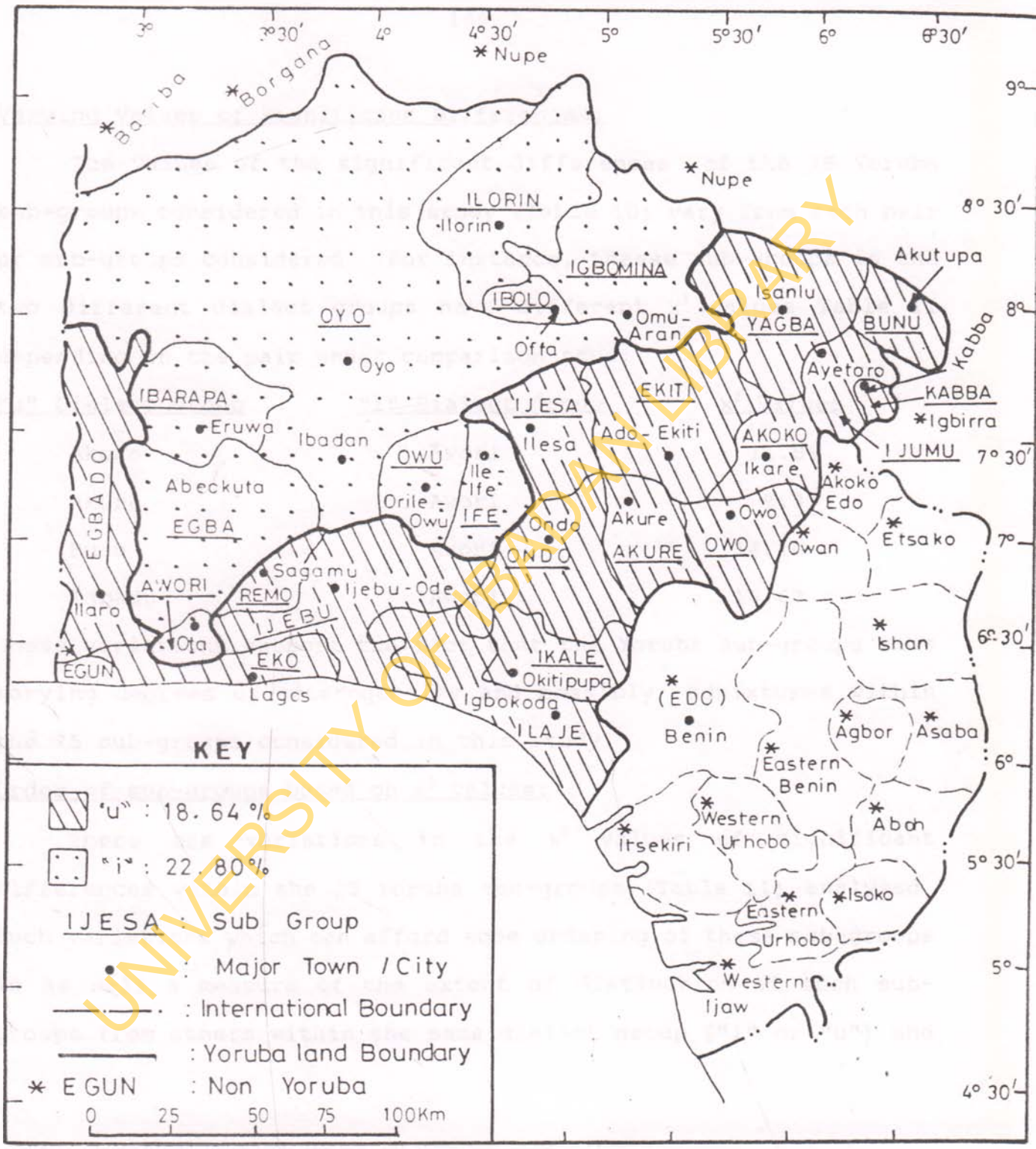


Fig. 44: Blood group map of Yoruba dialect groups: Gene-A

Varying Values of Significant Differences:

The values of the significant differences of the 25 Yoruba sub-groups considered in this study (Table 10) vary from each pair of sub-groups considered. For instance, thesse sub-groups in the two different dialect groups have different x^2 values Table 11 depending on the pair under comparison thus:

"u" Dialect Group	"i" Dialect Group	x^2 Values
Akoko	Awori	11.89
Akure	Awori	9.37
Bunu	Awori	14.10
Egbado	Awori	16.63

These variations support the fact that the Yoruba sub-groups have varying degrees of heterogeneity and possibly admixtures within the 25 sub-groups considered in this study.

Order of sub-groups based on x^2 values:

There are variations in the x^2 values of significant differences within the 25 Yoruba sub-groups (Table 11) analysed. Such variations which can afford some ordering of these sub-groups is as well a measure of the extent of distinction of such sub-groups from others within the same dialect group ("i" or "u") and

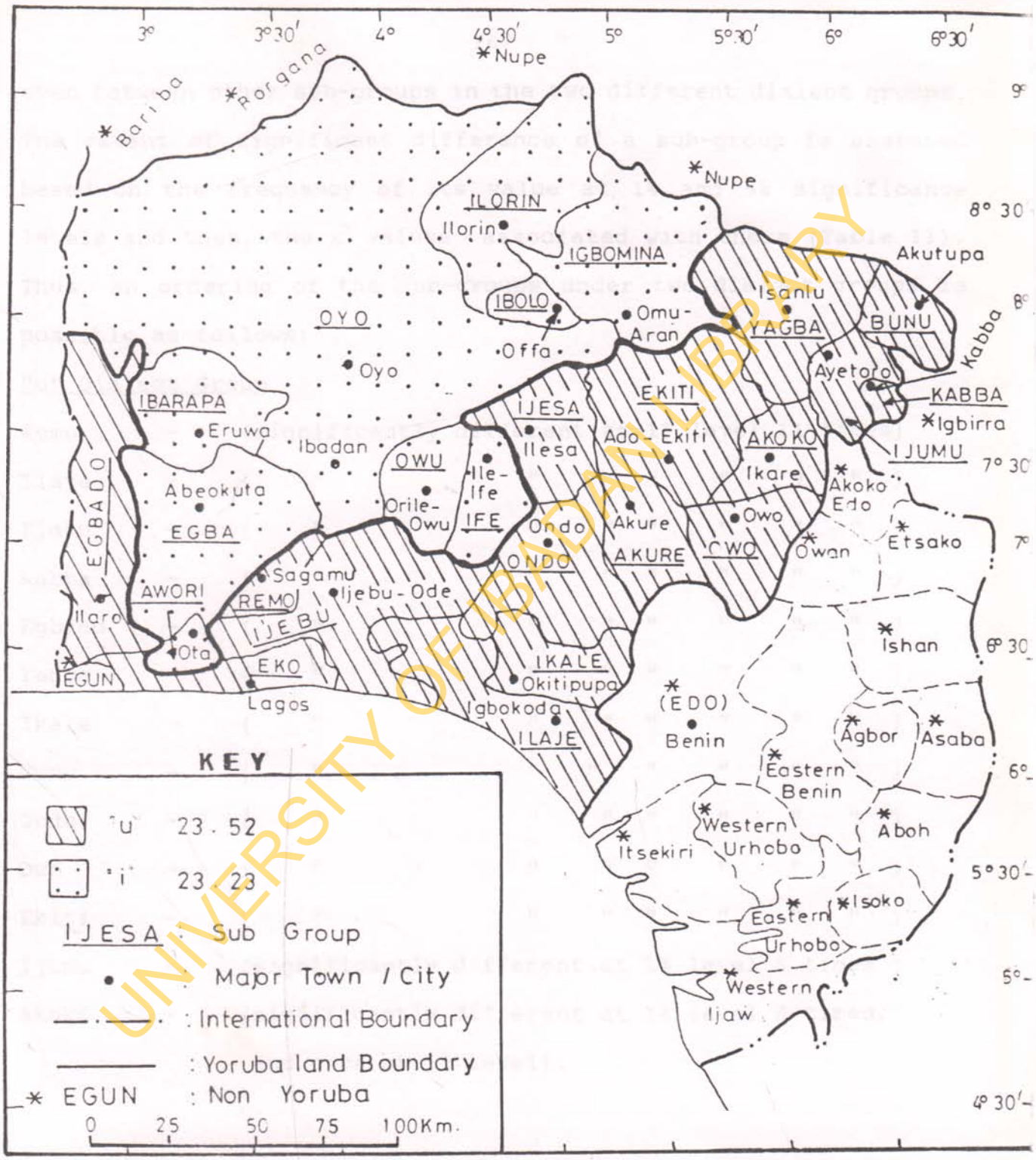


Fig. 45: Blood group map of Yoruba dialect groups: Gene-B

even between other sub-groups in the two different dialect groups. The extent of significant difference of a sub-group is assessed based on the frequency of its value at 1% and 5% significance levels and then, the x^2 values associated with these (Table 11). Thus, an ordering of the sub-groups under two dialect groups is possible as follows:

"u" Dialect Group

Remo - (significantly different at 1% level 11 times)
Ilaje - (" " " " " 9 ")
Ijebu - (" " " " " " ")
Kabba - (" " " " " " ")
Egbado - (" " " " " " ")
Yagba - (" " " " " " ")
Ikale - (" " " " " " ")
Bunu - (" " " " " " ")
Ondo - (" " " " " " ")
Owo - (" " " " " " ")
Ekiti - (" " " " " " ")
Ijumu - (significantly different at 1% level 8 times)
Akoko - (significantly different at 1% level 8 times; and once at 5% level).

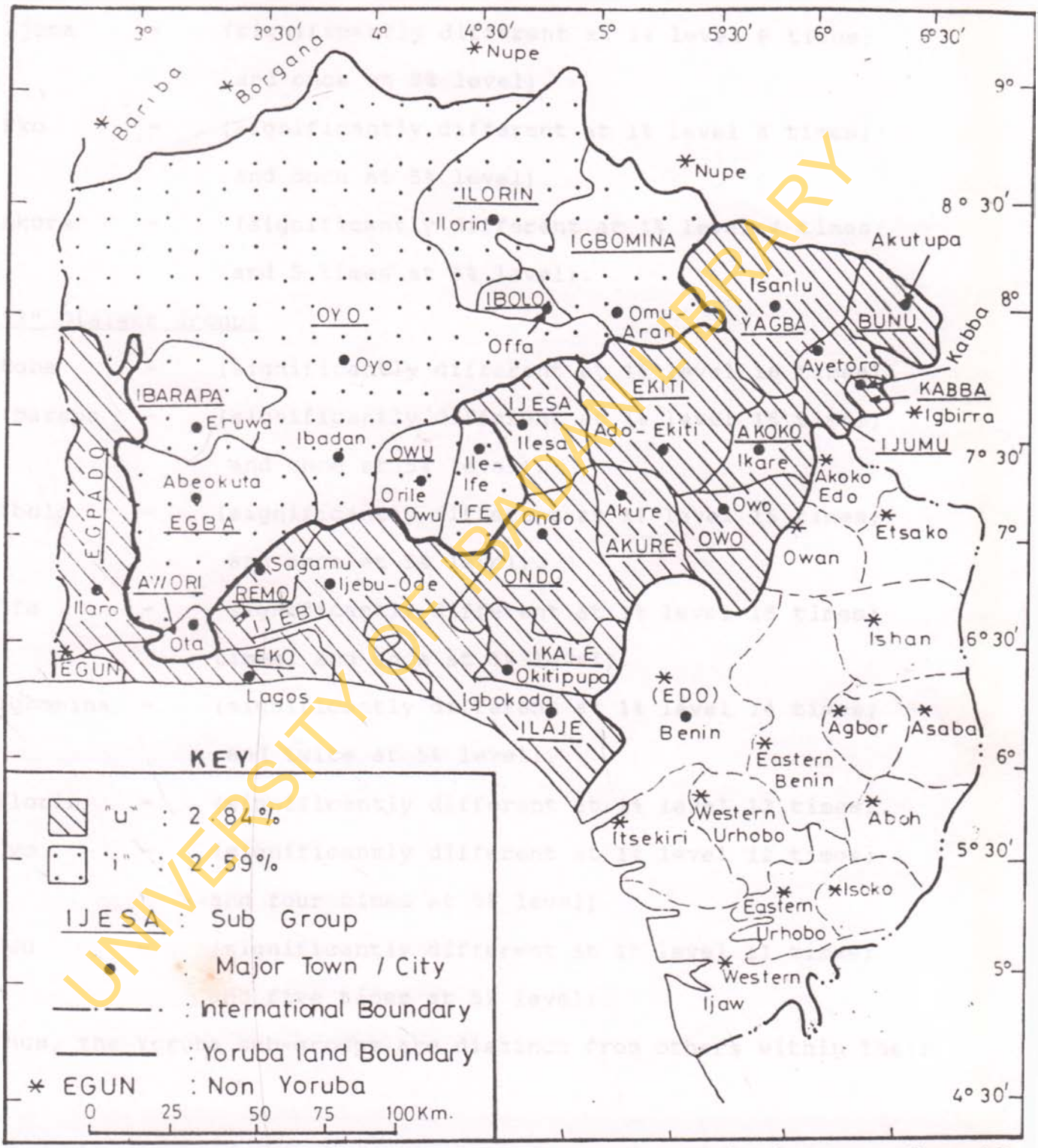


Fig. 46: Blood group map of Yoruba dialect groups: Gene-AB

Ijesa - (significantly different at 1% level 8 times; and once at 5% level).

Eko - (significantly different at 1% level 8 times; and once at 5% level).

Akure - (significantly different at 1% level 4 times; and 5 times at 5% level).

"i" Dialect Group:

Egba - (significantly different at 1% level 16 times).

Ibarapa - (significantly different at 1% level 15 times; and once at 5% level).

Ibolo - (significantly different at 1% level 15 times; and once at 5% level).

Ife - (significantly different at 1% level 15 times; times; and once at 5% level).

Igbomina - (significantly different at 1% level 14 times; and twice at 5% level).

Ilorin - (significantly different at 1% level 13 times).

Oyo - (significantly different at 1% level 12 times; and four times at 5% level).

Owu - (significantly different at 1% level 11 times; and five times at 5% level).

Thus, the Yoruba sub-groups are distinct from others within their

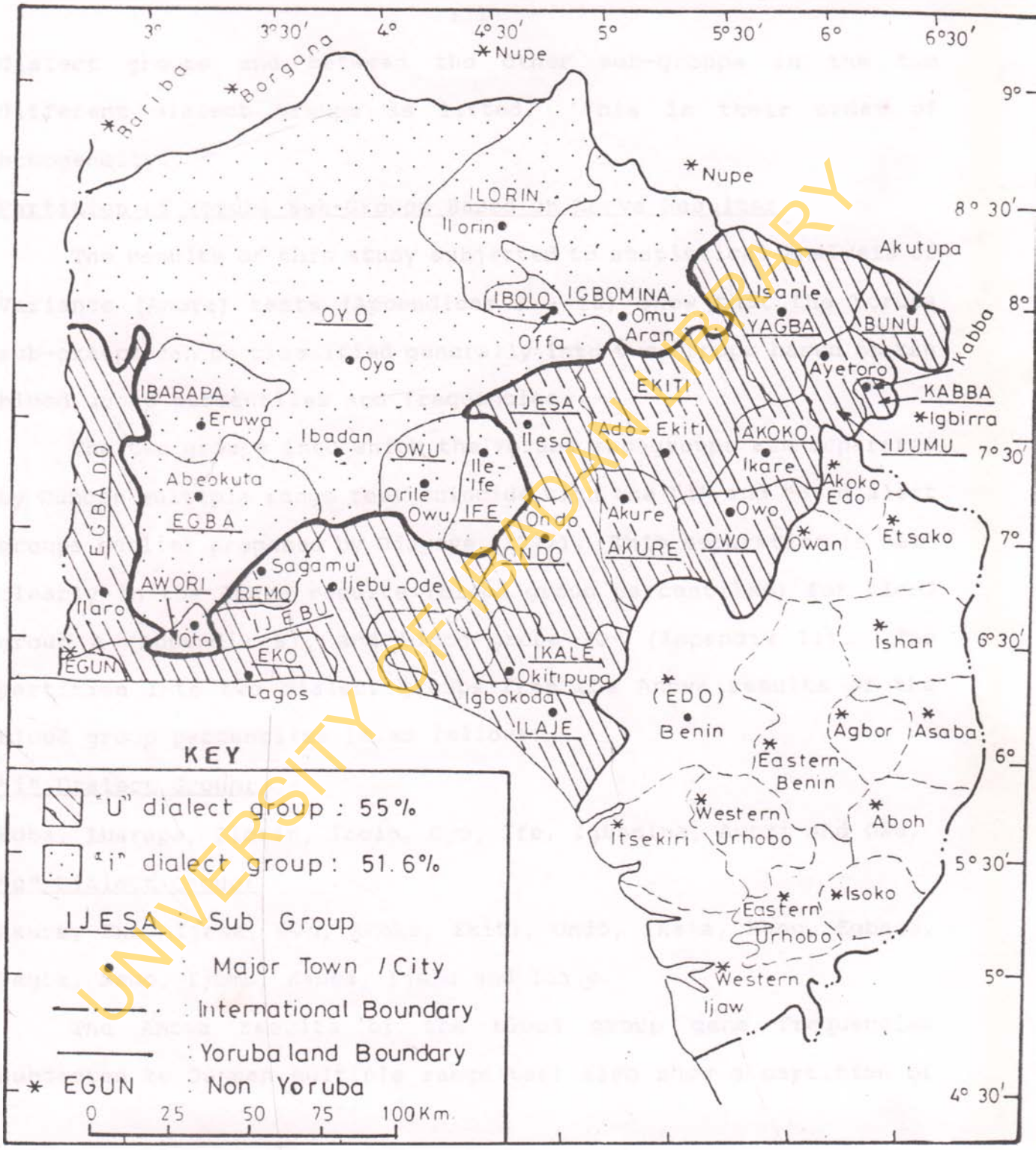


Fig. 47: Blood group map of Yoruba dialect groups: Gene- 0

dialect groups and between the other sub-groups in the two different dialect groups as listed. This is their order of homogeneity.

Partition of Yoruba Sub-Groups Based on Anova Results:

The results of this study subjected to statistical Analysis of Variance (Anova) tests (Appendices 8 - 15) show that the Yoruba sub-groups can be classified generally into two groups based on the blood group percentiles and frequencies.

The two groups into which the Yoruba sub-groups are separated by Duncan multiple range test coincide with the "i" and "u" dialect groups earlier proposed by Oduyoye (1972). This separation is seen clearly in the Anova results (blood group percentiles) for blood group A (Appendix 8), and blood group 'O' (Appendix 11). The partition into two dialect groups from the Anova results of the blood group percentiles is as follows:

"i" Dialect Group:

Egba, Ibarapa, Ilorin, Ibolo, Oyo, Ife, Igbomina, Awori and Owu.

"u" Dialect Group:

Akure, Eko, Ijesa, Owo, Akoko, Ekiti, Ondo, Ikale, Bunu, Egbado, Yagba, Remo, Ijumu, Kabba, Ijebu and Ilaje.

The Anova results of the blood group gene frequencies subjected to Duncan multiple range test also show a partition of

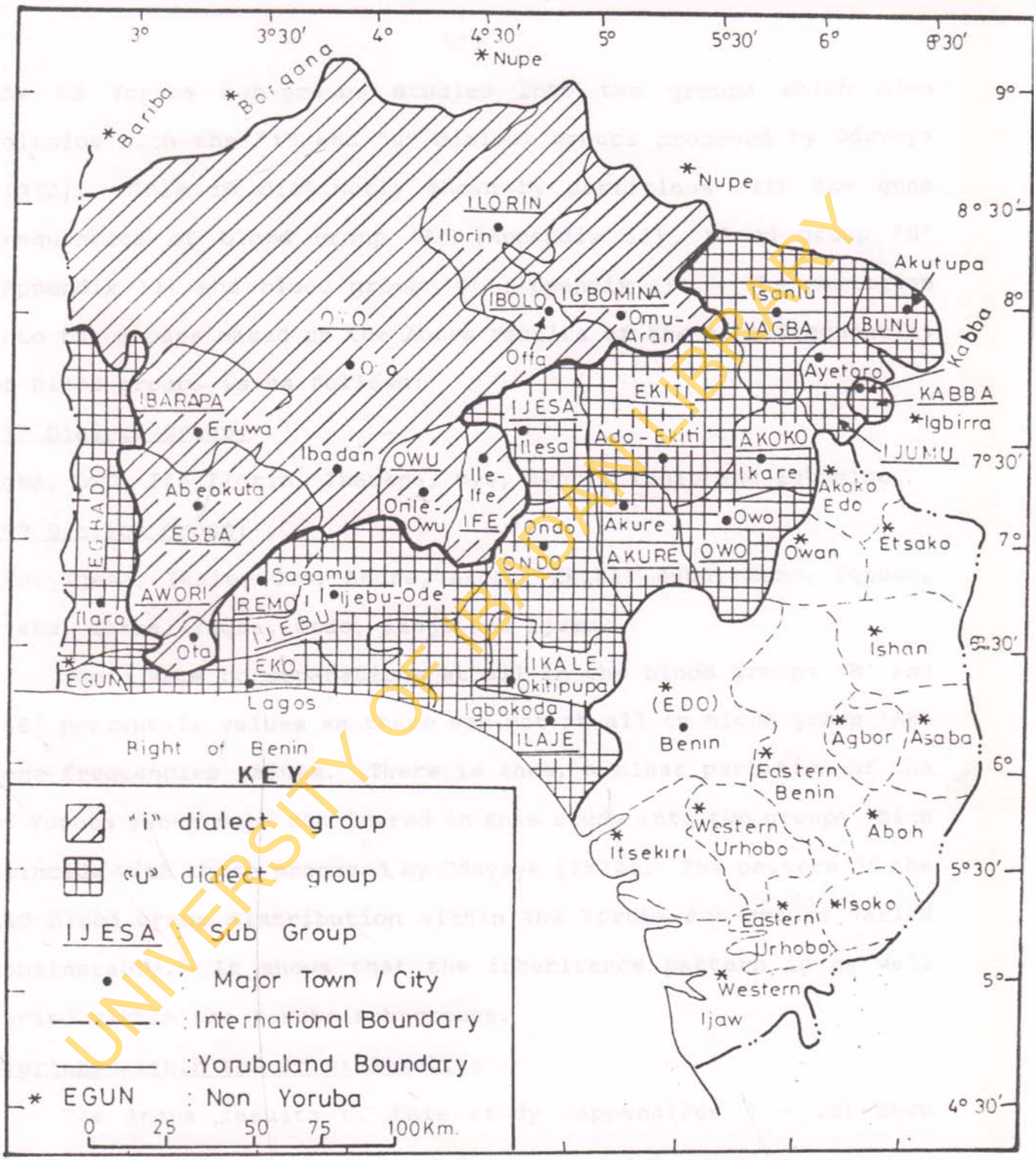


Fig. 48: Yorubaland showing dialect groups (based on blood groups partitions)

the 25 Yoruba sub-groups studied into two groups which also coincide with the "i" and "u" dialect groups proposed by Oduyoye (1972). This is distinctly shown by partitions with the gene frequencies of blood group 'A' (Appendix 12), blood group 'B' (Appendix 13) and blood group 'O' (Appendix 15). The partition into the groups based on the Anova results of the gene frequencies of blood groups is as follows:

"i" Dialect Group:

Egba, Owu, Ife Ilorin, Ibarapa, Oyo, Awori, Ibolo and Igbomina.

"u" Dialect Group:

Eko, Ijesa, Ikale, Owo, Akure, Akoko, Ekiti, Bunu, Remo, Egbado, Ijebu, Kabba, Yagba, Ondo, Ilaje and Ijumu.

There were no separations at all in the blood groups 'B' and 'AB' percentile values as there was not at all in blood group 'AB' gene frequencies values. There is thus, a clear partition of the 25 Yoruba sub-groups considered in this study into two groups which coincide with those proposed by Oduyoye (1972). The pattern of the ABO blood group distribution within the Yoruba sub-groups varied considerably. It shows that the inheritance pattern is as well varied within the Yoruba sub-groups.

Overlaps within the Anova Results:

The Anova results of this study (Appendices 8 - 15) show

overlaps as seen with the Duncan grouping for all the blood groups of the 25 Yoruba sub-groups considered.

There are more overlaps within the Duncan grouping for blood groups 'B' and 'AB' percentiles (Appendices 9 and 10) as well as in the Duncan grouping for blood groups 'B' and 'AB' gene frequencies (Appendices 13 and 14). This is evidence of greater recombinations within the blood groups 'B' and 'AB' within the Yoruba sub-groups.

There are also more overlaps within the Yoruba sub-groups of the "u" dialect group than those of the "i" dialect group (Appendices 8 - 15). This is also evidence of greater heterogeneity of the "u" dialect group than the "i" dialect group. This corroborates earlier deductions of greater genetic variation and antiquity of the "u" dialect group than the "i" dialect group. a phenomenon which Hiernaux (1974) said was caused by more active interbreeding or internal wandering and hence recombinations over longer period of time. The "u" dialect group is possibly the older autochthonous group based on the Anova results of this study.

Blood Group "B" Distribution: Negritude

The distribution of blood group 'B' within 25 Yoruba sub-groups considered in this study and shown by the Anova results, indicate that the "u" dialect group has higher and more overlapping group 'B' values than the "i" dialect group. This is an evidence

that the Yoruba sub-groups in the "u" dialect group display a greater degree of Negritude, antiquity and genetic variation than the Yoruba sub-groups in the "i" dialect group.

Blood Group 'A' Distribution: Cancer of the stomach

The Anova results of the blood group distribution of the 25 Yoruba sub-groups considered in this study show the occurrence of higher blood group 'A' values in the "i" dialect group than in the "u" dialect group. The tendency for a higher prevalence of cancer of the Stomach within the "i" dialect group than in the "u" dialect group is possible (Appendices 8 and 12) since cancer of the stomach is more statistically associated with blood group 'A' individuals (Bell et al, 1972).

Blood Group 'O' Distribution: Ulcer and Dilution

The Anova results of the blood group distribution of the 25 Yoruba sub-groups considered in this study show that there is the occurrence of higher blood group 'O' values within the "u" dialect group (with greater interactions as revealed by the Duncan grouping) than in the "i" dialect group. This implies that there is a higher possibility of a greater tendency of peptic ulcer within the "u" dialect group than in the "i" dialect group. It also points to the fact that the "i" dialect group must have been more diluted especially with its lower blood group 'O' values, which is

similar to the finding of El-Hassan et al. (1968) on their work on the Beja of Sudan.

Overlaps and Yoruba Sub-groups' Boundaries

The Anova results of the blood group distribution of the 25 Yoruba sub-groups considered in this study show considerable overlaps (or interactions) between the Yoruba sub-groups (Appendices 8 - 15) under the Duncan grouping system. This is a clear indication that the present boundaries of the Yoruba sub-groups which are politically delineated would not agree exactly with one based on the biological partitions of the Yoruba sub-groups. There is hardly any Yoruba sub-group considered in this study which is homogenous. Each reflect some admixtures in varying degrees.

Ife and the Advent of the "i" Dialect Group:

The results of this study suggest that the growth of royal dynasties began in Yorubaland with the advent of the "i" dialect group to Ife. This it seems was predicated on the fact that the "i" dialect group probably developed superior military abilities required to achieve this intrusion while it sojourned at its early settlements around Mejiro (5,000 Y.B.P.), and Old Oyo. (Soper and Darling, 1980). This intrusion into Ife possibly gave a chance to the rise of Oduduwa at Ife between the 10th and 12th centuries.

The "i" dialect group within the Yoruba blood group samples does not show the continuity of a diminution of blood group 'B' from West to East as observed by Hardy (1972) from Yoruba to Benin and then the Ibo. This distruption suggest the intrusion of the "i" dialect group later than the "u" dialect group. The intrusion of the "i" dialect group is also seen in the distribution of its sub-groups within Yorubaland (compare Figs.18 & 48) like a wedge into some autochthonous sub-groups.

The fact that the "i" dialect group chooses its lingual (dialect) shiboleth and sibilant forms according to the practice of the "u" dialect group (Oduyoye, 1972) is evidence of some later arrival into Yorubaland (Fig. 48).

The higher values of blood group 'B' (a Negro marker) within the "u" dialect group than within the "i" dialect group (Fig. 25) is an indication of lesser antiquity and Negritude of the latter ("i") dialect group.

Archaeological sites associated with settlements (Table 3) indicate earlier occupation of areas North-East and South-East of Yorubaland. This also suggests earlier occupation and greater antiquity of the Yoruba sub-groups there now. Ife seems to have an earlier spiritual centre, especially based on charcoal dated to the 5th century (Ryder, 1984). It possibly became a major centre of

Yoruba dispersal as Aderibigbe (1965) puts it; affording the rise of small bands of dominant royal dynasty groups which got absorbed into other sub-groups' territories (Smith, 1988). Thus, Yoruba influence and growth proliferated as from then since only the Oyo-Yoruba (or the "i" dialect group) was ever addressed as Yoruba up till 1900 A.D. (Wallerstein, 1960). Besides, the "u" dialect group which possibly comprises the major autochthonous sub-groups seems to have been acephalous before the 10th - 15th centuries, based on historical accounts. (Ijagbemi, 1987). There is the great possibility that the post-Oduduwa dispersal from Ife was due to anarchy, hence the tendency to associate many Yoruba sub-groups' derivation with Ife since the time of the dispersal is common in the rendition of their oral traditions.

Possible Derivation of Yoruba Dialect Groups:

The results of this study coupled with some archaeological evidence on the Mejiro cave materials dated to 5000 Y.B.P. (Willet, 1960), and those of Old Oyo (810 $\pm$ 80 A.D.) (Agbaje-Williams, 1981); Diogun Pottery, Old Oyo (1100 $\pm$ 110 A.D.), (Soper and Darling, 1980); Mejiro Pottery: Old Oyo (1300 + 80 A.D.) (Soper and Darling, 1980) suggest that the "i" dialect group possibly grew from some nearby local population around North-West Yorubaland migrating later Eastwards and Southwards as a result of its

military superiority as from the 10th century and dominating Ife as from the rise of Oduduwa.

The "u" dialect group grew possibly from the area of the Niger-Benue confluence, around the homeland of the 'Okun' Yoruba (Ijagbemi, 1987) or from a population referred to as 'proto Yoruba' (Atanda, 1980: Smith, 1988). This is possible since their blood group values (percentiles and gene frequencies) are not as significantly different from values obtained for neighbouring Nupe, Ebira and Bini by Worlledge et al (1974) (Table 5). Besides, the results of the blood group analysis in this study suggest that the "u" dialect group is of greater antiquity than its "i" dialect counterpart, and that it is probably made up of the major autochthonous Yoruba sub-groups. The extent of its ancient community by 1800 A.D. is as seen in Fig. 18. (Isichei, 1983).

The fact that the common Yoruba language has drawn its features from both dialect groups is noteworthy but that the "i" dialect group chooses its sibilant(s) and shiboleth(sh) forms according to the practice of the "u" dialect group (Oduyoye, 1972) implies that the latter settled in the Yoruba territory first. This is possibly proof that the "u" dialect group spoke the language first and was made up of the major autochthonous sub-groups. The "i" dialect group possibly acquired some version of

the language at its advent or intrusion into the Yoruba territory as from about the 10th century.

Biological Implications of Intrusions at Ife:

The fact that Ife experienced intrusion between the 10th - 12th century with the coming into prominence of Oduduwa and later during the rise of the Oyo empire (about 15th century) and then Ibadan forces, must have possibly occasioned frequent displacements of the populations in and around Ife which is evident from the result of this study which shows that Ife and some other Yoruba sub-groups in the "i" dialect groups must have been subject of inter-mixing by some elements of the "u" dialect group. The blood group 'O' percentiles of such sub-group is as follows: Awori (51.7%); Owu (51.8%); Ife (51.6%); Igbomina (51.9%); and Ibarapa (51.9%). Ife and these sub-groups have thus shown that there are instances of elements of the "u" dialect group within its sample populations since Worlledge et al (1974) obtained the blood group 'O' percentile value for the "i" dialect territory to be 51.5%.

The Place of Oduduwa:

The coming into prominence of Oduduwa at Ife was possibly due to the military superiority of the "i" dialect group which he led there, thus overcoming the autochthonous people. There is no basis, therefore, to justify the claim that Oduduwa was a

progenitor of the Yoruba race when he only came with the group that invaded Ife between the 10th - 12th centuries. The notion of Oduduwa as a major factor in the development of royal dynasties in Yorubaland can be sustained. The claim of his having been the progenitor of the Yoruba race is rather far fetched from the results of this study.

CHAPTER SIX

SUMMARY AND CONCLUSIONS

Summary of the Discussions of Results:

In Summary, the study reflect the following:

Dominance of Blood Group "O":

Most individuals (51.6 - 55%) sampled in this study belong to the blood group "O". This affords a predictive model to be developed mainly on the blood group "O" especially as regards the Yoruba population, as done by some earlier workers: Garlick (1962); Hardy (1962); and Worlledge et al (1974).

Two Yoruba Dialect Groups:

The 25 Yoruba sub-groups considered in this study belong to two Yoruba dialect groups as follows:

"i" Dialect Group:

Awori, Egba, Ibarapa, Ibolo, Ife, Igbomina, Ilorin, Owu, and Oyo.

"u" Dialect Group:

Akoko, Akure, Bunu, Egbado, Ekiti, Eko, Ijebu, Ijumu, Ijesa, Ikale. Ilaje, Kabba, Ondo, Owo, Remo and Yagba.

This partition is based on statistical analysis (through Chi-square and Anova analysis) of the biological differences (blood group gene frequencies). The same biological values were then

compared with the proposal that the Yoruba language sub-family is divided into "i" and "u" dialect groups by Oduyoye (1972) and found to coincide. This thus confirms that an anthropological divide exists based on the biological evidence from this study.

Blood group "B" Distribution: measure of Negritude

There are more blood group 'B' individuals than 'A' in the 25 Yoruba sub-groups considered in this study confirming that the Yoruba sub-family is a Negroid one, as found by Hardy (1962), and Worlledge et al (1974). The diminution of blood group "B" values on moving from West to East along Yorubaland, as found by Hardy (1962) is disrupted from the results of this study, possibly because the 'i' dialect Yoruba came in later to occupy its present territory. The results of this study also show that the "u" dialect group has higher blood group "B" values than its "i" dialect counterpart, thus suggesting that the former is of greater antiquity and more Negroid. It possibly lends some credence to the fact that the "u" dialect group is the older autochthonous group.

Blood Group "A" Distribution: Stomach Cancer and Dilution

There are more blood group "A" individuals within the "i" dialect group than in the "u" dialect group suggesting the possibility of greater dilution of the "i" dialect group from its source of derivation. This possibly is evidence of some different

source of biological derivation of the "i" dialect group from "u" dialect group. The possibility of higher occurrence of cancer of the stomach in "i" dialect group than in the "u" dialect group is likely as a statistical association has always been found to exist between blood group "A" individuals and cancer of the stomach, as Bell et al (1972) discovered.

Boundary Effects Between Yoruba Sub-groups:

Some Yoruba sub-groups, especially along the boundary of the two dialect groups show evidence of some degree of admixtures. This is evident from the higher values in the blood group "O" in such sub-groups as Ibarapa (51.9%); Owu (51.8%); Awori (51.7%); Ife (51.6%); and Igbomina (51.6%). This possibly is due to the intrusion by "u" dialect group elements. This also reflect an order of antiquity that can be associated with a period of time over which some interbreeding or internal wandering (Hiernaux, 1974) that effected the recombination occurred.

The boundary influences possibly reflect the fact that the present political boundaries of the Yoruba sub-groups may not necessarily coincide with biologically-derived boundaries, based on the features of over-lapping observed in this study.

Blood Group "O" Distribution: Peptic Ulcer tendencies

There are more blood "O" individuals (55%) within the "u"

dialect group than in the "i" dialect group (51.6%) from the results of this study. There is thus the tendency for a higher occurrence of peptic ulcer within "u" the dialect group than in the "i" dialect group since peptic ulcer is more statistically associated with blood group "O" individuals, as Bell et al (1972) found out.

In fact, there is a higher tendency for the occurrence of peptic ulcer in the Yoruba language sub-family than the occurrence of cancer since most individuals (51.6 - 55%) from the results of this study,belong to blood group "O". This follows from the fact that blood group "O" individuals, are more statistically associated with peptic ulcer as against blood group "A" individuals who are more statistically associated with cancer of the stomach (Bell et al, 1972).

Genetic Variation within the Yoruba:

The Yoruba sub-groups of the "u" dialect group show greater genetic variation that the "i" dialect group, with overlaps as seen in the statistical analysis of the blood group data in this study. Such interactions due to inter-breeding and recombinations (Hiernaux, 1974) take a long period of time.

This suggests the possibility of greater antiquity of the "u" dialect group especially with the additional evidence of heterogeneity observed from overlaps of the blood grouping statistical analysis. The possibility that the "u" dialect group comprises the older autochthonous Yoruba sub-groups is as well, likely.

Sources of derivation of Yoruba Dialect Groups

The "i" dialect group probably grew in the area North-West of Yorubaland, mainly from settlements such as those belonging to the same period as Mejiro cave dated to 5000 Y.B.P. by Willet (1960) and later, Old Oyo dated to between 810 to 1300 A.D. by Agbaje-Williams (1981); Soper and Darling (1980). Their acquisition of military superiority enabled their proliferation and eventual invasion of Ife as from about the 10th century. The "i" dialect Yoruba then extended its influence to the South West portions of Yorubaland as well. Their domination eventually culminated in the rise of Oduduwa to power at Ife, from whom royal dynastic traditions grew and proliferated to several Yoruba settlements (including "u" dialect areas) thus, establishing as from 10th century onwards what was to be later claimed as Ife source of derivation. Ife thus, became a centre of dispersal as from about 10th century A.D. as Aderibigbe (1965) and Smith (1988) had noted.

This explains why Ife influence seems to have been neglible biologically from the results of this study. The small dynastic bands that left Ife to settle in many Yoruba sub-groups territories were too few to be of biological significance. Similarly, distant migrant groups from elsewhere would have also been biologically insignificant if they ever came. The dispersal from Ife was possibly due to anarchy. This post-Oduduwa dispersal was, therefore the basis for the general claim of Ife source of derivation by many Yoruba oral (royal) traditions; the influence probably extended to Benin as well.

The "u" dialect Yoruba is possibly derived from the area around the Niger-benue confluence, North-East of Yorubaland since about 3000 Y.B.P. at least; this being the home of the 'proto-Yoruba' (Atanda, 1980; Smith, 1988). They are more closely related by blood group gene frequencies to the Nupe, Bini, Ebira and Igala who seem to have been derived from the same source. They are of greater antiquity that the "i" dialect Yoruba. The "u" dialect group probably contain the older autochthonous Yoruba sub-groups. This fact is reinforced by the fact that "u" dialect group is biologically (through blood group evidence) of greater antiquity and that linguistic choice of the sibilant and shiboleth dialect forms by the 'i' dialect group follow the 'u' dialect-group's

practice (Oduyoye, 1972).

This thus raises the possibility that the "i" dialect Yoruba acquired the use of the language later than its "u" dialect counterpart; a phenomenon which must have been consolidated after the intrusion of the "i" dialect group into Ife and other parts of Yorubaland as from the 10th century. A conquering group can adopt the language of its subjects if the former is of smaller number which is often the case with small bands of conquerors. Besides, the need for a small group of subjects to communicate with a large group of subjects for effective control make it inevitable for such conquerors to learn the language of its resident, conquered people. The case of the Fulani invasion at Ilorin in 1796 is a good example. The few Fulani conquerors got absorbed into the larger Yoruba language sub-family. Prior to this time, the "u" dialect Yoruba were largely acephalous, from many historical accounts.

The Primacy of Ife and the Place of Oduduwa:

Ife was an early spiritual centre for the Yoruba, especially from charcoal remains dated to 5th century, A.D. (Ryder, 1984). It was thus, an important centre of attraction to the 'i" dialect Yoruba whose development of military superiority led to their intrusion of it from about the 10th century. As from this period, a new wave of royal dynastic pattern emerged with the rise of

Oduduwa to power at Ife, leading to the growth of similar traditions that eventually spread to most of Yorubaland often by royal dynastic groups who however, appear to be biologically insignificant compared to the autochthonous populations. The primacy of Ife in Yoruba oral traditions was established only as from about the 10th century. Ife influence is thus, biologically limited. It was thus an eventual centre of Yoruba dispersal.

The fact that Ife had witnessed upheavals, especially military, which must have promoted the mixing of autochthonous and migrant peoples is possibly responsible for its slightly higher blood group values, implying that some "u" dialect features may be found around its territory despite the fact that it is essentially in the "i" dialect group from the results of this study. This is corroborated by blood group "O" value which is 51.6%. The same feature may be said to be probably applicable to such a nearby sub-group as the Owu which has blood group "O" value of 51.8%. The two show evidence of "u" dialect admixtures, even though at an insignificant level.

The opportunistic rise of Oduduwa at Ife as from about the 10th century afforded him the status of the propagator of the royal dynastic influences over most Yoruba sub-groups' territories hence its acknowledgements in Yoruba royal oral traditions. His

recognition as the fore-runner of the present wave of the royal dynastic traditions in Yorubaland is acceptable.

The fact that he rose to power in Ife about the 10th - 12th century is a confirmation of the assertion that he did not belong to the earliest known generation of the Yoruba (Atanda, 1980) and could thus, not have been the progenitor of the Yoruba race! The historical accounts of Ife and Oduduwa as related, often by royal historians, is based on this migration to Ife as from about the 10th century. It often does not talk of autochthonous peoples or sub-groups before the advent of Oduduwa.

Conclusions:

From the results of this study, the following can be concluded:

The Yoruba language sub-family, which is evidently Negroid in biological content is subject to some anthropological partition into two dialect groups: "i" and "u" based on blood group evidence from this study which linguistic, historical, archaeological, and statistical data apppear to corroborate.

The 25 Yoruba sub-groups considered in this study reveal that there is a higher tendency for the occurrence of peptic ulcer than cancer of the stomach within its population; a feature which also reflects the possibility of a higher level of occurrence of peptic

ulcer in the "u" dialect group than in its "i" dialect counterpart, and vice versa.

The display of a high level of heterogeneity within the Yoruba is evident; more so in the "u" dialect group than in its "i" dialect counterpart, confirming the greater antiquity and autochthony of the "u" dialect group.

The primacy of Ife was established as from about the 10th century when Oduduwa rose to power there becoming a major influence in the subsequent spread of the present royal dynastic traditions throughout most of Yorubaland. The fact that Ife had always existed before the advent of Oduduwa implies that he was not part of the earliest known Yoruba, and therefore, could not have been the progenitor of the Yoruba race as claimed in many royal historical traditions.

The limitations of Yoruba history is to be found in the partial accounts of royal historians which is often only limited to the emergence of royal dynasties after Oduduwa's rise to power at Ife. The true historical account of many autochthonous populations of Yoruba sub-groups when derived along with the existing royal historical accounts will make Yoruba history complete.

The results of this study showing the partition of the Yoruba language sub-family into: ("i" and "u") dialect groups is the

results of finer sampling methods employed in this study as not hitherto carried out for the Yoruba ABO blood group analysis. It is then possible to derive further partitions with more discrete sampling methods in future.

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PERSONAL COMMUNICATION

BOLORUNDURO, PAUL (1990) A young man of about 35 years from Aiyetoro in Ijumu district who gave basic information on the Ijumu sub-group and other "Okun" Yoruba sub-groups.

APPENDIX 1

Sampling locations of the Yoruba Sub-groups

Yoruba Sub-Groups	Batch I	Batch II	Batch III	Batch IV	Batch V	Batch VI
AKOKO	Ikare	Oke-Agbe	Arigidi	Akungba	Oka	Erusu
AKURE	Oba-Ile	Owena	Akure	Ita-Ogbolu	Italepo	Aiyelaboro
AWORI	Ota	Ado-Odo	Sango-Ota	Osuke	Sojuolu	Igbessa
BUNU	Ofere	Akutupa	Olle	Aiyede	Iluke	Suku
EGBA	Abeokuta	Owode-Egba	Ifo	Odeda	Opeji	Obafemi
EGBADO	Idi-Iroko	Ajilete	Aiyetoro	Meko	Ilaro	Ipokia
EKITI	Aramoko	Ijero	Ikole	Ikere	Igede	Ado-Ekiti
EKO	Ebute-Ero	Obalende	Idumagbo	Isale-Eko	Idumota	Olowogbowo
IBARAPA	Aiyete	Tapa	Igangan	Eruwa	Lanlate	Igbo-Ora
IBOLO	Ipee	Igosun	Irra	Erin-Ile	Offa	Ilemona
IFE	Aiyepe-Olode	Ife	Ipetu-modu	Ifewara	Asipa	Ogbagba
IGBOMINA	Omu-aran	Obbo-Ile	Ajase-ipo	Obbo-Aiyegunle	Oro	Odo-Owa

Yoruba Sub-Groups	Batch I	Batch II	Batch III	Batch IV	Batch V	Batch VI
IJEBU	Ijebu-Ife	Ijebu-Ode	Ijebu-Igbo	Idowa	Ago-Iwoye	Aiyepe
IJESA	Ibokun	Ijebu-Ijesa	Atakumosa	Ilesa	Erin-Ijesa	Ipetu-Ijesa
IJUMU	Aiyetoro-Gbede	Iyamoye	Ayere	Iyara	Iffe	Ogidi
IKALE	Ode-Aye	Ode-Irele	Igbotako	Okitipupa	Omotoso	Akinfosile
LAJE	Igbokoda	Atijere	Mahin	Idi-Ogba	Aiyetoro	Ugbo
ILORIN	Ilorin	Malete	Iponrin	Afon	Alapa	Bode-Saadu
KABBA	Aiyetoro -Egunbe	Kabba	Gbelenko	Okedayo	Onakiti	Egbeda
ONDO	Oke-Igbo	Ile-Oluji	Ondo	Owena	Epe	Idanre
OWO	Ido-Ani	Owo	Emure	Okeluse	Arinmogija	Ifon
OWU	Owu-Ipole	Orile-Owu	Owu-Ogbere	Ago-Owu	Araromi-Owu	Monlewo
OYO	Ogbomoso	Oyo	Ibadan	Ede	Osogbo	Iwo
REMO	Sagamu	Iperu	Ikenne	Ilisan	Ogere	Isara
YAGBA	Egbe	Mopa	Odo-Ere	Isanlu	Aiyede	Ejuku

APPENDIX 2

CALCULATION OF ABO BLOOD GROUP PERCENTILES

(After Race and Sanger, 1968; Boorman and Dodd, 1970)

Example

If one were to calculate the percentile for the AKOKO sub-group (see table 9).

The values of blood groups in sample were given as follows:

A	B	AB	O	Total Sample
570	717	84	1629	3000

Now, percentiles are obtained thus:

For A: $\frac{570}{3000} \times \frac{100}{1} = 19\%$

For B: $\frac{717}{3000} \times \frac{100}{1} = 23.9\%$

For AB: $\frac{84}{3000} \times \frac{100}{1} = 2.8\%$

For O: $\frac{1629}{3000} \times \frac{100}{1} = 54.3\%$

APPENDIX 3

CALCULATION OF ABO BLOOD GROUP GENE FREQUENCIES

Gene Frequencies:

Derived from the Formula: p+q+r=1
(After Race and Sanger, 1968)

P = frequency for Blood group A in sample

q = " " " " B " "

r = " " " " O " "

Now r^2 is given to be $\frac{(O)}{N}$ $\frac{(O)}{N}$ = total O in sample / total sum of sample

Thus, $r = (O)/N$ 1

p is given to be $1 - \frac{(O)}{N} + \frac{(B)}{N}$ ....2.

where (b) is total B in sample

q is given to be $1 - \frac{(O)}{N} + \frac{(A)}{N}$ ....3.

where (A) is total A in sample

Frequency of AB is given to be $\frac{(AB)}{N}$ 4

where (AB) is total AB in sample

Thus for AKOKO sub-group (see Table 7)

$r^2 = \frac{1629}{3000}$; $r = \frac{1629}{3000} = 0.7369$

$p = 1 - \frac{(O)}{N} + \frac{(B)}{N} = \frac{1629}{3000} + \frac{717}{3000} = 1 - 0.8843 = 0.1157$

$q = 1 - \frac{(O)}{N} + \frac{(A)}{N} = \frac{1629}{3000} + \frac{570}{3000} = 1 - 0.856 = 0.144$

Now, Frequency of AB $= \frac{(AB)}{N} = \frac{84}{3000} = 0.028$

APPENDIX 4

CALCULATION OF CHI-SQUARE VALUES FOR THE YORUBA SUB-GROUPS

(After Worlledge et al, 1974)

In order to calculate the values of X^2 for the significance of difference in ABO blood group distribution of the Yoruba sub-groups, the following steps were taken.

For instance, in the use of the blood group values for AKOKO and AKURE sub-groups (Table 9), wehave:

YORUBA SUB-GROUPS	A	B	AB	O	ROW TOTALS
AKOKO	570	717	84	1629	3000
AKURE	582	711	81	1626	3000
COLUMN TOTALS	1152	1428	165	3255	6000

(i) Values for AKOKO and AKURE were added horizontally to obtain "Row Totals".(i.e. 3000 in each case)

(ii) The values for A, B, AB, and O blood groups are also added vertically, to obtained "Column Totals" (i.e. 6000)

(iii) Then, the "Expected" values for all the entries in the table were obtained by the formula:

$$\text{Expected value} = \frac{\text{Row totals x Column totals}}{\text{Grand total}}$$

$$\text{For 570} = \frac{3000 \times 1152}{6000} = 576$$

Similarly for other entries:

$$\text{For 582, Expected value} = \frac{3000 \times 1152}{6000} = 576$$

$$\text{For 717, Expected value} = \frac{3000 \times 1428}{6000} = 714$$

$$\text{For 84, Expected value} = \frac{3000 \times 165}{6000} = 82.5$$

$$\text{For 81, Expected value} = \frac{3000 \times 165}{6000} = 82.5$$

$$\text{For 1629, Expected value} = \frac{3000 \times 3255}{6000} = 1627.5$$

$$\text{For 1626, Expected value} = \frac{3000 \times 3255}{6000} = 1627.5$$

The X^2 value is given by the formula:

$$\frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}} \text{ for each case}$$

then, all added together.

$$= \frac{(570 - 576)^2}{576} + \frac{(582 - 576)^2}{576}$$

$$+ \frac{(717 - 714)^2}{714} + \frac{(711 - 714)^2}{714} + \frac{(84 - 82.5)^2}{82.5}$$

$$+ \frac{(81 - 82.5)^2}{82.5} + \frac{(1629 - 1627.5)^2}{1627.5}$$

$$+ \frac{(1626 - 1627.5)^2}{1627.5}$$

$$= (0.0625) + (0.0625) + (0.0126) + (0.0126)$$
$$+ (0.0273) + (0.0273) + (0.0014) + (0.0014)$$

$\therefore X^2 = 0.208$ or $\underline{0.21}$ (as in table 8).

The values for X^2 on standard statistical tables were read at 0.01 (or 1%) and 0.05 (or 5%) for 3 degrees of freedom (since four blood groups were involved, and degree of freedom (d.f.) is given by d.f. = n - 1). It was then found that X^2 values obtained (table 8) are significant at 0.05 level if not less than $\underline{7.81}$ or at 0.01 if not less than 11.34.

The value of X^2 for the significance of difference between AKOKO and AKURE sub-groups, obtained as $\underline{0.21}$ is thus, not significant.

Values of X^2 for pairs of other sub-groups were thus, similarly obtained and used to derive the table 8.

Appendix 5: Yoruba sub-groups: blood group distribution

	YORUBA	Blood Groups (I)				Blood Groups (II)				Blood Groups (III)				Blood Groups (IV)				Blood Groups (V)				Blood Groups (VI)				Total In Samples				TOTAL
	SUB-GROUPS	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	SAMPLE
1	AKOKO	95	120	12	273	95	119	14	272	96	118	13	273	95	121	16	268	94	120	13	273	95	119	16	270	570	717	84	1629	3000
2	AKURE	97	119	12	272	99	118	13	270	96	117	14	273	95	120	14	271	99	118	15	268	96	119	13	272	582	711	81	1626	3000
3	AWORI	113	116	13	258	112	114	13	261	115	116	12	257	113	115	14	258	113	115	14	258	112	117	12	259	678	693	78	1551	3000
4	BUNU	92	118	13	277	94	121	15	270	95	119	12	274	90	122	15	273	93	118	13	276	97	122	10	271	561	720	78	1641	3000
5	EGBA	115	115	15	255	118	117	13	252	116	113	14	257	114	112	11	263	115	114	13	258	115	116	15	254	693	687	81	1539	3000
6	EGBADO	92	114	12	282	90	115	11	284	93	112	10	285	92	114	14	280	96	116	13	275	94	119	18	269	557	690	78	1675	3000
7	EKITI	94	118	13	275	95	120	15	270	93	117	14	276	95	116	12	277	94	118	14	274	98	116	13	273	569	705	81	1645	3000
8	EKO	96	117	13	274	97	117	13	273	96	116	13	275	96	116	14	274	97	117	14	272	95	116	14	275	577	699	81	1643	3000
9	IBARAPA	114	115	12	259	115	114	12	259	115	114	12	259	113	116	12	259	115	114	12	259	115	111	12	262	687	684	72	1557	3000
10	IBOLO	114	115	13	258	115	115	14	256	115	115	13	257	114	114	13	259	114	114	13	259	115	114	12	259	687	687	78	1548	3000
11	IFE	114	115	12	259	114	114	14	258	115	114	14	257	113	115	13	259	115	116	12	257	113	116	13	258	684	690	78	1548	3000
12	IGBOMINA	113	116	13	258	113	115	14	258	114	116	12	258	113	115	14	258	114	116	13	257	111	118	12	259	678	696	78	1548	3000
13	IJEBU	90	115	18	277	88	118	15	279	91	116	14	279	90	116	16	278	88	118	15	279	86	119	18	277	533	702	96	1669	3000
14	IJESA	96	116	15	273	95	117	14	274	94	115	16	275	98	119	14	269	94	118	16	272	96	117	15	272	573	702	90	1635	3000
15	IJUMU	92	118	14	276	93	116	14	277	90	118	11	281	92	120	12	276	90	119	15	276	91	117	15	277	548	708	81	1663	3000
16	IKALE	94	116	15	275	96	114	14	276	94	118	16	272	92	119	16	273	95	117	18	270	94	118	14	274	565	702	93	1640	3000
17	ILAJE	87	118	16	279	89	117	17	277	88	118	16	278	87	120	14	279	90	116	18	276	86	119	18	277	527	708	99	1666	3000
18	ILORIN	114	115	13	258	115	114	11	260	113	117	13	257	115	116	14	255	117	114	12	257	115	114	12	259	689	690	75	1546	3000
19	KABBA	90	117	15	278	88	118	16	278	91	119	12	278	92	116	13	279	88	120	16	276	91	118	15	276	540	708	87	1665	3000
20	ONDO	94	117	14	275	92	118	15	275	95	120	13	272	94	118	12	276	96	121	13	270	95	120	14	271	566	714	81	1639	3000
21	OWO	94	118	13	275	93	121	12	274	97	114	12	277	97	113	15	275	96	119	10	275	96	120	14	270	573	705	76	1646	3000
22	OWU	112	115	12	261	110	116	13	261	112	118	12	258	114	113	16	257	113	114	13	260	114	114	15	257	675	690	81	1554	3000
23	OYO	114	114	13	259	115	117	14	254	114	116	12	258	112	116	13	259	116	115	13	256	113	115	13	259	684	693	78	1545	3000
24	REMO	92	114	16	278	93	116	14	277	92	116	16	276	91	118	15	276	91	115	15	279	90	117	14	279	549	696	90	1665	3000
25	YAGBA	90	118	14	278	94	116	13	277	93	118	13	276	91	120	13	276	92	117	16	275	93	119	15	273	553	708	84	1655	3000

Appendix 6: Yoruba sub-groups: blood group percentiles

	YORUBA	Blood Groups (Batch I)				Blood Groups (Batch II)				Blood Groups (Batch III)				Blood Groups (Batch IV)				Blood Groups (Batch V)				Blood Groups (Batch VI)			
	SUB-GROUPS	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O
1	AKOKO	19.00	24.00	2.40	54.60	19.00	23.80	2.80	54.40	19.20	23.60	2.60	54.60	19.00	24.20	3.20	53.60	18.80	24.00	2.60	54.60	19.00	23.80	3.20	54.00
2	AKURE	19.40	23.80	2.40	54.40	19.80	23.60	2.60	54.00	19.20	23.40	2.80	54.60	19.00	24.00	2.80	54.20	19.80	23.60	3.00	53.60	19.20	23.80	2.60	54.40
3	AWORI	22.60	23.20	2.60	51.60	22.40	22.80	2.60	52.20	23.00	23.20	2.40	51.40	22.60	23.00	2.80	51.60	22.60	23.00	2.80	51.60	22.40	23.40	2.40	51.80
4	BUNU	18.40	23.60	2.60	55.40	18.80	24.20	3.00	54.00	19.00	23.80	2.40	54.80	18.00	24.40	3.00	54.60	18.60	23.60	2.60	55.20	19.40	24.40	2.00	54.20
5	EGBA	23.00	23.00	3.00	51.00	23.60	23.40	2.60	50.40	23.20	22.60	2.80	51.40	22.80	22.40	2.20	52.60	23.00	22.80	2.60	51.60	23.00	23.20	3.00	50.80
6	EGBADO	18.40	22.80	2.40	56.40	18.00	23.00	2.20	56.80	18.60	22.40	2.00	57.00	18.40	22.80	2.80	56.00	19.20	23.20	2.60	55.00	18.80	23.80	3.60	53.80
7	EKITI	18.80	23.60	2.60	55.00	19.00	24.00	3.00	54.00	18.60	23.40	2.80	55.20	19.00	23.20	2.40	55.40	18.80	23.60	2.80	54.80	19.60	23.20	2.60	54.60
8	EKO	19.20	23.40	2.60	54.80	19.40	23.40	2.60	54.60	19.20	23.20	2.60	55.00	19.20	23.20	2.80	54.80	19.40	23.40	2.80	54.40	19.00	23.20	2.80	55.00
9	IBARAPA	22.80	23.00	2.40	51.80	23.00	22.80	2.40	51.80	23.00	22.80	2.40	51.80	22.60	23.20	2.40	51.80	23.00	22.80	2.40	51.80	23.00	22.20	2.40	52.40
10	IBOLO	22.80	23.00	2.60	51.60	23.00	23.00	2.80	51.20	23.00	23.00	2.60	51.40	22.80	22.80	2.60	51.80	22.80	22.80	2.60	51.80	23.00	22.80	2.40	51.80
11	IFE	22.80	23.00	2.40	51.80	22.80	22.80	2.80	51.60	23.00	22.80	2.80	51.40	22.60	23.00	2.60	51.80	23.00	23.20	2.40	51.40	22.60	23.20	2.60	51.60
12	IGBOMINA	22.60	23.20	2.60	51.60	22.60	23.00	2.80	51.60	22.80	23.20	2.40	51.60	22.60	23.00	2.80	51.60	22.80	23.20	2.60	51.40	22.20	23.60	2.40	51.80
13	IJEBU	18.00	23.00	3.60	55.40	17.60	23.60	3.00	55.80	18.20	23.20	2.80	55.80	18.00	23.20	3.20	55.60	17.60	23.60	3.00	55.80	17.20	23.80	3.60	55.40
14	IJESA	19.20	23.20	3.00	54.60	19.00	23.40	2.80	54.80	18.80	23.00	3.20	55.00	19.60	23.80	2.80	53.80	18.80	23.60	3.20	54.40	19.20	23.40	3.00	54.40
15	IJUMU	18.40	23.60	2.80	55.20	18.60	23.20	2.80	55.40	18.00	23.60	2.20	56.20	18.40	24.00	2.40	55.20	18.00	23.80	3.00	55.20	18.20	23.40	3.00	55.40
16	IKALE	18.80	23.20	3.00	55.00	19.20	22.80	2.80	55.20	18.80	23.60	3.20	54.40	18.40	23.80	3.20	54.60	19.00	23.40	3.60	54.00	18.80	23.60	2.80	54.80
17	ILAJE	17.40	23.60	3.20	55.80	17.80	23.40	3.40	55.40	17.60	23.60	3.20	55.60	17.40	24.00	2.80	55.80	18.00	23.20	3.60	55.20	17.20	23.80	3.60	55.40
18	ILORIN	22.80	23.00	2.60	51.60	23.00	22.80	2.20	52.00	22.60	23.40	2.60	51.40	23.00	23.20	2.80	51.00	23.40	22.80	2.40	51.40	23.00	22.80	2.40	51.80
19	KABBA	18.00	23.40	3.00	55.60	17.60	23.60	3.20	55.60	18.20	23.80	2.40	55.60	18.40	23.20	2.60	55.80	17.60	24.00	3.20	55.20	18.20	23.60	3.00	55.20
20	ONDO	18.80	23.40	2.80	55.00	18.40	23.60	3.00	55.00	19.00	24.00	2.60	54.40	18.80	23.60	2.40	55.20	19.20	24.20	2.60	54.00	19.00	24.00	2.80	54.20
21	OWO	18.80	23.60	2.60	55.00	18.60	24.20	2.40	54.80	19.40	22.80	2.40	55.40	19.40	22.60	3.00	55.00	19.20	23.80	2.00	55.00	19.20	24.00	2.80	54.00
22	OWU	22.40	23.00	2.40	52.20	22.00	23.20	2.60	52.20	22.40	23.60	2.40	51.60	22.80	22.60	3.20	51.40	22.60	22.80	2.60	52.00	22.80	22.80	3.00	51.40
23	OYO	22.80	22.80	2.60	51.80	23.00	23.40	2.80	50.80	22.80	23.20	2.40	51.60	22.40	23.20	2.60	51.80	23.20	23.00	2.60	51.20	22.60	23.00	2.60	51.80
24	REMO	18.40	22.80	3.20	55.60	18.60	23.20	2.80	55.40	18.40	23.20	3.20	55.20	18.20	23.60	3.00	55.20	18.20	23.00	3.00	55.80	18.00	23.40	2.80	55.80
25	YAGBA	18.00	23.60	2.80	55.60	18.80	23.20	2.60	55.40	18.60	23.60	2.60	55.20	18.20	24.00	2.60	55.20	18.40	23.40	3.20	55.00	18.60	23.80	3.00	54.60

Appendix 7. Yoruba sub-groups: blood group gene frequencies

	YORUBA	Blood Groups (Batch I)				Blood Groups (Batch II)				Blood Groups (Batch III)				Blood Groups (Batch IV)				Blood Groups (Batch V)				Blood Groups (Batch VI)			
	SUB-GROU	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O	A	B	AB	O
1	AKOKO	0.02	0.07	0.02	0.74	0.02	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.08	0.03	0.73	0.02	0.07	0.03	0.74	0.03	0.08	0.03	0.73
2	AKURE	0.02	0.07	0.02	0.74	0.03	0.07	0.03	0.73	0.03	0.07	0.03	0.74	0.02	0.07	0.03	0.74	0.03	0.07	0.03	0.73	0.02	0.07	0.03	0.74
3	AWORI	0.05	0.06	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.02	0.72	0.05	0.06	0.03	0.72	0.05	0.06	0.03	0.72	0.05	0.06	0.02	0.72
4	BUNU	0.02	0.07	0.03	0.74	0.02	0.08	0.03	0.73	0.02	0.07	0.02	0.74	0.04	0.08	0.03	0.74	0.02	0.07	0.03	0.74	0.02	0.07	0.02	0.74
5	EGBA	0.06	0.06	0.03	0.71	0.06	0.05	0.03	0.71	0.06	0.05	0.03	0.72	0.05	0.05	0.02	0.73	0.05	0.05	0.03	0.72	0.06	0.06	0.03	0.71
6	EGBADO	0.02	0.07	0.02	0.75	0.02	0.07	0.02	0.75	0.02	0.06	0.02	0.75	0.02	0.07	0.03	0.75	0.03	0.07	0.03	0.74	0.03	0.08	0.04	0.73
7	EKITI	0.02	0.07	0.03	0.74	0.03	0.08	0.03	0.73	0.02	0.07	0.03	0.74	0.02	0.07	0.02	0.74	0.02	0.07	0.03	0.74	0.03	0.07	0.03	0.74
8	EKO	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74
9	IBARAPA	0.05	0.05	0.02	0.71	0.05	0.05	0.02	0.72	0.05	0.05	0.02	0.72	0.05	0.05	0.02	0.72	0.05	0.05	0.02	0.72	0.05	0.05	0.02	0.72
10	IBOLO	0.05	0.05	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.02	0.72
11	IFE	0.05	0.05	0.02	0.72	0.05	0.05	0.03	0.72	0.06	0.05	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.02	0.72	0.05	0.06	0.03	0.72
12	IGBOMINA	0.05	0.06	0.03	0.72	0.05	0.06	0.03	0.72	0.05	0.05	0.02	0.72	0.05	0.06	0.03	0.72	0.05	0.06	0.03	0.72	0.04	0.06	0.02	0.72
13	IJEBU	0.03	0.08	0.04	0.74	0.02	0.08	0.03	0.75	0.02	0.07	0.03	0.75	0.02	0.07	0.03	0.75	0.02	0.08	0.03	0.75	0.02	0.08	0.04	0.74
14	IJESA	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.73	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74
15	IJUMU	0.02	0.07	0.03	0.74	0.02	0.07	0.03	0.74	0.01	0.07	0.02	0.75	0.02	0.07	0.02	0.74	0.02	0.08	0.03	0.74	0.02	0.07	0.03	0.74
16	IKALE	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.02	0.08	0.03	0.74	0.03	0.08	0.04	0.73	0.02	0.07	0.03	0.74
17	ILAJE	0.02	0.08	0.03	0.75	0.02	0.08	0.03	0.74	0.02	0.08	0.03	0.75	0.01	0.08	0.03	0.75	0.03	0.08	0.04	0.74	0.02	0.08	0.04	0.74
18	ILORIN	0.05	0.05	0.03	0.72	0.05	0.05	0.02	0.72	0.05	0.06	0.03	0.72	0.05	0.06	0.03	0.71	0.06	0.05	0.02	0.72	0.05	0.05	0.02	0.72
19	KABBA	0.02	0.07	0.03	0.75	0.02	0.08	0.03	0.75	0.02	0.07	0.02	0.75	0.02	0.07	0.03	0.75	0.02	0.08	0.03	0.74	0.02	0.08	0.03	0.74
20	ONDO	0.02	0.07	0.03	0.74	0.02	0.07	0.03	0.74	0.02	0.07	0.03	0.74	0.02	0.07	0.02	0.74	0.02	0.07	0.03	0.73	0.02	0.07	0.03	0.74
21	OWO	0.02	0.07	0.03	0.74	0.02	0.07	0.02	0.74	0.03	0.06	0.02	0.74	0.03	0.06	0.03	0.74	0.02	0.07	0.02	0.74	0.03	0.07	0.03	0.73
22	OWU	0.05	0.05	0.02	0.72	0.05	0.06	0.03	0.72	0.05	0.06	0.02	0.72	0.06	0.06	0.03	0.72	0.05	0.05	0.03	0.72	0.06	0.06	0.03	0.72
23	OYO	0.05	0.05	0.03	0.72	0.05	0.06	0.03	0.71	0.05	0.05	0.02	0.72	0.05	0.06	0.03	0.72	0.05	0.05	0.03	0.72	0.05	0.05	0.03	0.72
24	REMO	0.03	0.07	0.03	0.75	0.02	0.07	0.03	0.74	0.03	0.07	0.03	0.74	0.02	0.08	0.03	0.74	0.02	0.07	0.03	0.75	0.02	0.07	0.03	0.75
25	YAGBA	0.02	0.07	0.03	0.75	0.02	0.07	0.03	0.74	0.02	0.07	0.03	0.74	0.02	0.08	0.03	0.74	0.02	0.07	0.03	0.74	0.02	0.08	0.03	0.74

APPENDIX 8

ANOVA FOR BLOOD GROUP-A (PERCENTILES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	628.56	26.190	334.68	0.0	S
ERROR	125	9.78	0.078			
CORRECTED TOTAL	149	638.35				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-A

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	23.10	6	EGBA
A	22.97	6	IBARAPA
A	22.97	6	ILORIN
AB	22.90	6	IBOLO
ABC	22.80	6	OYO
ABC	22.80	6	IFE
BC	22.60	6	IGBOMINA
BC	22.60	6	AWORI
C	22.50	6	OWU
D	19.40	6	AKURE
DE	19.25	6	EKO
DEF	19.10	6	IJESA
DEF	19.09	6	OWO
EFG	19.00	6	AKOKO
EFG	18.97	6	EKITI
FGH	18.87	6	ONDO
FGH	18.83	6	IKALE
GH	18.76	6	BUNU
HI	18.57	6	EGBADO
I	18.43	6	YAGBA
IJ	18.30	6	REMO
IJ	18.27	6	IJUMU
JK	18.00	6	KABBA
KL	17.77	6	IJEBU
L	17.57	6	ILAJE

Note: S' = Sources of variation; DF = Degree of Freedom
SS = Sum of Squares; MS = Mean Square;
F-Value = Variance Ratio; I = Inference,
N = Number of Replicates.

APPENDIX 9

ANOVA FOR BLOOD GROUP-B (PERCENTILES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	14.22	0.592	5.67	0.0001	s
ERROR	125	13.06	0.104			
CORRECTED TOTAL	149	29.28				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-B

DUNCAN'S GROUPING	MEAN	N	TREAMENTS
A	23.90	6	AKOKO
AB	23.80	6	ONDO
ABC	23.74	6	BUNU
ABC	23.70	6	AKURE
ABCD	23.60	6	YAGBA
ABCD	23.60	6	KABBA
ABCD	23.60	6	IJUMU
ABCD	23.60	6	ILAJE
BCDE	23.50	6	EKITI
BCDE	23.49	6	OWO
CDEF	23.40	6	IKALE
CDEF	23.40	6	IJESA
CDEF	23.40	6	IJEBU
DEFG	23.32	6	EKO
EFGH	23.20	6	REMO
EFGH	23.20	6	IGBOMINA
FGH	23.10	6	OYO
FGH	23.10	6	AWORI
GH	23.00	6	ILORIN
GH	23.00	6	IFE
GH	23.00	6	EGBADO
GH	23.00	6	OWU
H	22.90	6	EGBA
H	22.90	6	IBOLO
H	22.87	6	IBARAPA

Note: S' = Source of variation; DF = Degree of Freedom;
SS = Sum of Squares; MS = Mean Square
F-value = Variance Ratio; I = Inference;
N = Number of Replicates.

APPENDIX 10

ANOVA FOR BLOOD GROUP-AB (PERCENTILES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	6.93	0.289	4.00	0.0001	S
ERROR	125	9.03	0.72			
CORRECTED TOTAL	149	15.97				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-AB

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	3.30	6	ILAJE
AB	3.20	6	IJEBU
ABC	3.10	6	IKALE
ABCD	3.00	6	IJESA
ABCD	3.00	6	REMO
BCDE	2.90	6	KABBA
CDEF	2.80	6	YAGBA
CDEF	2.80	6	AKOKO
DEFG	2.70	6	EKO
DEFG	2.70	6	EGBA
DEFG	2.70	6	OWU
DEFG	2.70	6	IJUMU
DEFG	2.70	6	AKURE
DEFG	2.70	6	ONDO
DEFG	2.70	6	EKITI
EFG	2.61	6	BUNU
EFG	2.60	6	IFE
EFG	2.60	6	EGBADO
EFG	2.60	6	IBOLO
EFG	2.60	6	OYO
EFG	2,60	6	IGBOMINA
EFG	2.60	6	AWORI
EFG	2.60	6	OWO
FG	2.50	6	ILORIN
G	2.41	6	IBARAPA

Note: S' = Sources of Variation; DF = Degree of Freedom;
SS = Sum of Squares; MS = Mean Square;
F-value = Variance ratio I = Inference;
N = Number of Replications.

APPENDIX 11

ANOVA FOR BLOOD GROUP-O (PERCENTILES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	426.80	17.78		0.0	S
ERROR	125	26.54	0.21			
CORRECTED TOTAL	149	453.34				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-O

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	55.83	6	EGBADO
AB	55.63	6	IJEBU
AB	55.53	6	ILAJE
AB	55.50	6	KABBA
AB	55.50	6	REMO
AB	55.43	6	IJUMU
BC	55.17	6	YAGBA
CD	54.89	6	BUNU
CD	54.83	6	EKITI
CD	54.83	6	OWO
CDE	54.74	6	EKO
CDEF	54.67	6	IKALE
DEF	54.63	6	ONDO
DEF	54.50	6	IJESA
EF	54.30	6	AKOKO
F	54.20	6	AKURE
G	51.80	6	OWU
G	51.75	6	IBARAPA
G	51.70	6	AWORI
G	51.60	6	IFE
G	51.60	6	IGBOMINA
G	51.60	6	IBOLO
G	51.53	6	ILORIN
G	51.50	6	OYO
G	51.30	6	EGBA

NOTE: S' = Sources of Variation; DF = Degree of Freedom
SS = Sum of Squares; MS = Mean Square
F-Value = Variance ratio; I = Inference;
N = Number of replicates.

APPENDIX 12

ANOVA FOR BLOOD GROUP-A (GENE FREQUENCIES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	0.03	0.001	66.76	0.0	S
ERROR	125	0.002	0.002			
CORRECTED TOTAL	149	0.032				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-A

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	0.057	6	EGBA
AB	0.053	6	OWU
BC	0.052	6	IFE
BC	0.052	6	ILORIN
BC	0.050	6	IBARAPA
BC	0.050	6	AWORI
BC	0.050	6	IBOLO
C	0.048	6	IGBOMINA
D	0.030	6	EKO
D	0.030	6	IJESA
DE	0.027	6	IKALE
EF	0.025	6	OWO
EF	0.025	6	AKURE
EF	0.025	6	AKOKO
EFG	0.023	6	EKITI
EFG	0.023	6	BUNU
EFG	0.023	6	REMO
EFG	0.023	6	EGBADO
FGH	0.022	6	IJEBU
GH	0.020	6	KABBA
GH	0.020	6	YAGBA
GH	0.020	6	ONDO
GH	0.020	6	ILAJE
H	0.018	6	IJUMU

NOTE: S' = Sources of Variation; DF = Degree of Freedom
SS = Sum of Squares; MS = Mean Square;
F-Value = Variance ratio; I = Inference;
N = Number of replicates.

APPENDIX 13

ANOVA FOR BLOOD GROUP-B (GENE FREQUENCIES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	0.013	0.0006	30.93	0.0	S
ERROR	125	0.002	0.00002			
CORRECTED TOTAL	149	0.015				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-B

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	0.080	6	ILAJE
AB	0.077	6	IJEBU
BC	0.075	6	KABBA
BCD	0.073	6	AKOKO
BCD	0.073	6	BUNU
BCD	0.073	6	YAGBA
BCD	0.073	6	IKALE
CD	0.072	6	EKITI
CD	0.072	6	IJUMU
CD	0.072	6	REMO
DE	0.070	6	EGBADO
DE	0.070	6	IJESA
DE	0.070	6	ONDO
DE	0.070	6	EKO
DE	0.070	6	AKURE
E	0.067	6	OWO
F	0.058	6	IGBOMINA
FG	0.057	6	AWORI
FG	0.057	6	OWU
GH	0.053	6	ILORIN
GH	0.053	6	OYO
GH	0.053	6	EGBA
H	0.052	6	IFE
H	0.050	6	IBARAPA
H	0.050	6	IBOLO

Source: S' = Sources of Variation; DF = Degree of Freedom;
SS = Sum of Square MS = Mean Square;
F-Value = Variance ratio; I = Inference;
N = Number of replicates.

APPENDIX 14

ANOVA FOR BLOOD GROUP-AB (GENE FREQUENCIES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	0.001	0.00005	2.32	0.0015	S
ERROR	125	0.003	0.00002			
CORRECTED TOTAL	149	0.004				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-AB

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	0.033	6	IKALE
A	0.033	6	ILAJE
A	0.033	6	IJEBU
AB	0.032	6	IJESA
ABC	0.030	6	EKO
ABC	0.030	6	YAGBA
ABC	0.030	6	REMO
ABC	0.028	6	IBOLO
ABC	0.028	6	EGBA
ABC	0.028	6	AKURE
ABC	0.028	6	KABBA
ABC	0.028	6	IJUMU
ABC	0.028	6	ONDO
ABC	0.028	6	EKITI
ABC	0.028	6	AKOKO
ABC	0.028	6	OYO
BC	0.027	6	IGBOMINA
BC	0.027	6	IFE
BC	0.027	6	BUNU
BC	0.027	6	AWORI
BC	0.027	6	OWU
BC	0.027	6	EGBADO
CD	0.025	6	OWO
CD	0.025	6	ILORIN
D	0.020	6	IBARAPA

Note: S' = Sources of Variation; DF = Degree of Freedom;
SS = Sum of Squares; MS = Mean Square;
F-Value = Variance Ratio; I = Inference;
N = Number of replicates.

APPENDIX 15

ANOVA FOR BLOOD GROUP-O (GENE FREQUENCIES)

S'	DF	SS	MS	F-VALUE	P F	I
MODEL	24	0.018	0.0007	38.01	0.0	S
ERROR	125	0.002	0.00002			
CORRECTED TOTAL	149	0.020				

DUNCAN MULTIPLE RANGE TEST FOR BLOOD GROUP-O

DUNCAN'S GROUPING	MEAN	N	TREATMENTS
A	0.747	6	KABBA
A	0.747	6	IJEBU
AB	0.745	6	ILAJE
AB	0.745	6	EGBADO
AB	0.745	6	REMO
ABC	0.742	6	IJUMU
ABC	0.742	6	YAGBA
BC	0.740	6	EKO
C	0.738	6	BUNU
C	0.738	6	EKITI
C	0.738	6	IJESA
C	0.738	6	ONDO
C	0.738	6	IKALE
C	0.738	6	OWO
C	0.738	6	AKURE
C	0.738	6	AKOKO
D	0.720	6	IFE
D	0.720	6	AWORI
D	0.720	6	IGBOMINA
D	0.720	6	IBOLO
D	0.720	6	OWU
D	0.718	6	OYO
D	0.718	6	IBARAPA
D	0.718	6	ILORIN
D	0.717	6	EGBA

NOTE: S' = Sources of Variation; DF = Degree of Freedom
SS = Sum of Squares; MS = Mean Square;
F-Value = Variance Ratio; I = Inference;
N = Number of replicates.