

Reconstructing the history of African crops: the contribution of linguistics and archaeology

Kyoto, 15.00, 2nd February, 2015

Ianamori Memorial Building

Kyoto University of African and Asian Studies

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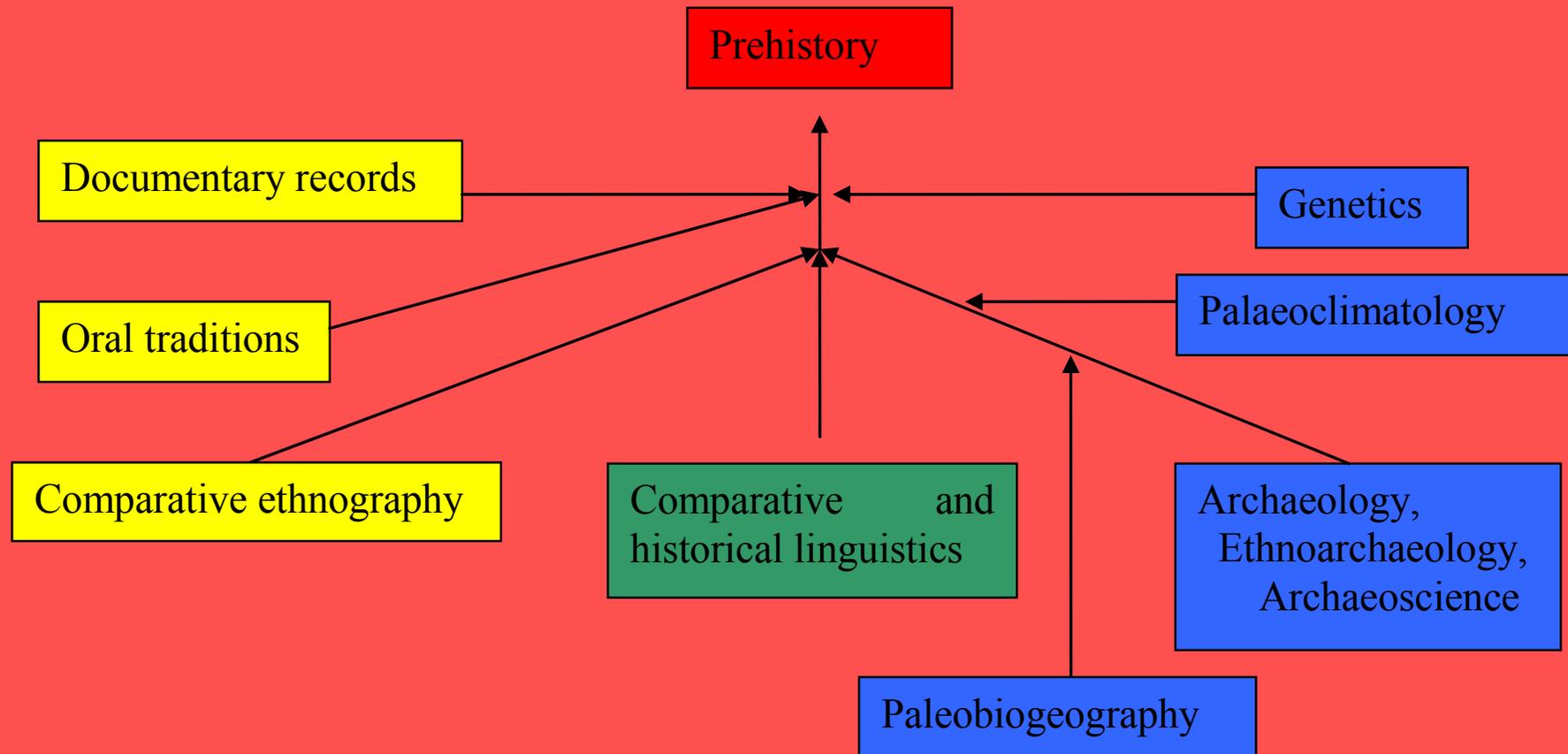
Visiting Professor, University of New England, Armidale

Academic Visitor, Museu Emilio Goeldi, Belem, Brazil

The concept of integrated prehistory I

- If we want to reconstruct the past, most of the planet is inaccessible to the documentary approach
- Writing has only been around 5000 years and for much of that period, it has only limited things to say
- Hence we turn to archaeology, which has clear limitations
- Integrated prehistory is the idea that we need to bring on board as many disciplines as possible
- We need to **move on** from interdisciplinary studies to a new model of integrated prehistory
- i.e. not to join just two disciplines but to have a vision of how all disciplines can contribute to one another and an integrated reconstruction of prehistory
- The figure represents my working model of how this might look

Integrated prehistory: a model



Linguistics, interdisciplinary studies and integrated prehistory II

- Alphonse Pictet, with his 'linguistic palaeontology' in the 1860s probably first states the method still in use, with modifications
- The key assumption is that there is a link between linguistic reconstruction and empirical reality
- So that, for example, if you claim 'horse' is reconstructible in proto-Indo-European, then this implies speakers of PIE were familiar with the horse
- Similarly that loanwords can be used to track the diffusion of material and cultural items and institutions
- Using the same example of 'horse' we can show that words for 'horse' are borrowed in East Asian languages, along with the spread of the horse itself

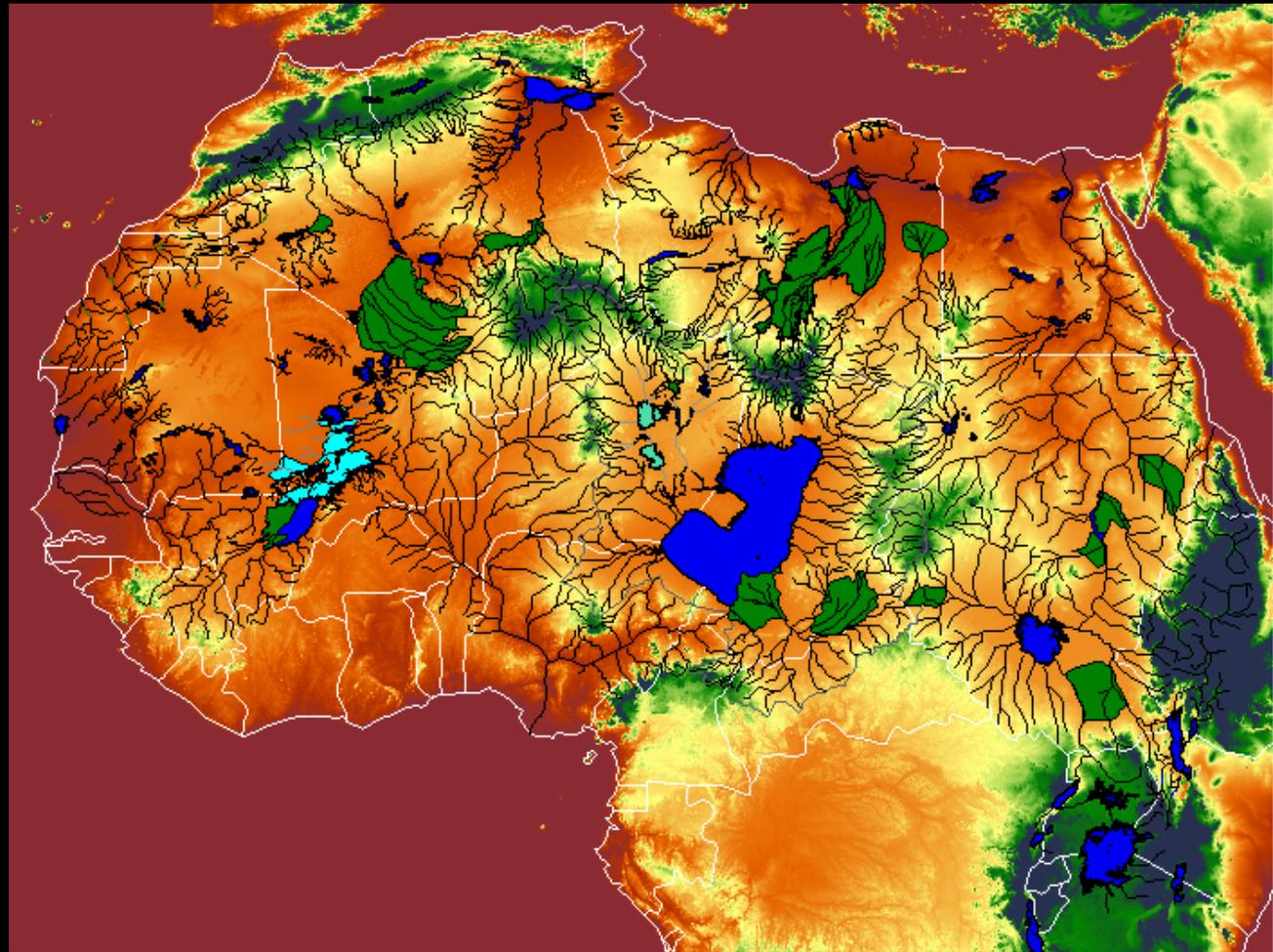
Linguistics, archaeology
and palaeoclimatology

The Nilo-Saharan phylum

The end of the Pleistocene in the Sahara

- ❑ The Late Pleistocene arid episode ended in the Sahara around 12,000 BP. It has generally been accepted that the climate improves after this.
- ❑ Recent research suggests that the Sahara developed a network of rivers and lakes relatively rapidly and then gradually aridified again, reaching its present status

Importantly, the waterways connected West Africa to North Africa, allowing the transit of particular animal species



Pleistocene Sahara biogeography I

- ❑ Two types of fauna would have been able to take advantage of this new resource niche; aquatic species that depend on continuous water bodies and savannah mammals that can cross open plains but must drink regularly
- ❑ Examples of aquatic species are hippo, crocodile, *Arvicanthus* sp., cane rat (*Thryonomys*), fish, hydrophilous amphibians, molluscs, crabs
- ❑ Many species only appear to have been distributed as far north as the central Sahara whereas some species only spread south from the Maghreb to this point
- ❑ In particular, deepwater species such as the hippo, and the Nile Perch have this distribution, whereas species that can survive with less water (such as crocodiles) make it across the desert

Pleistocene Sahara biogeography II

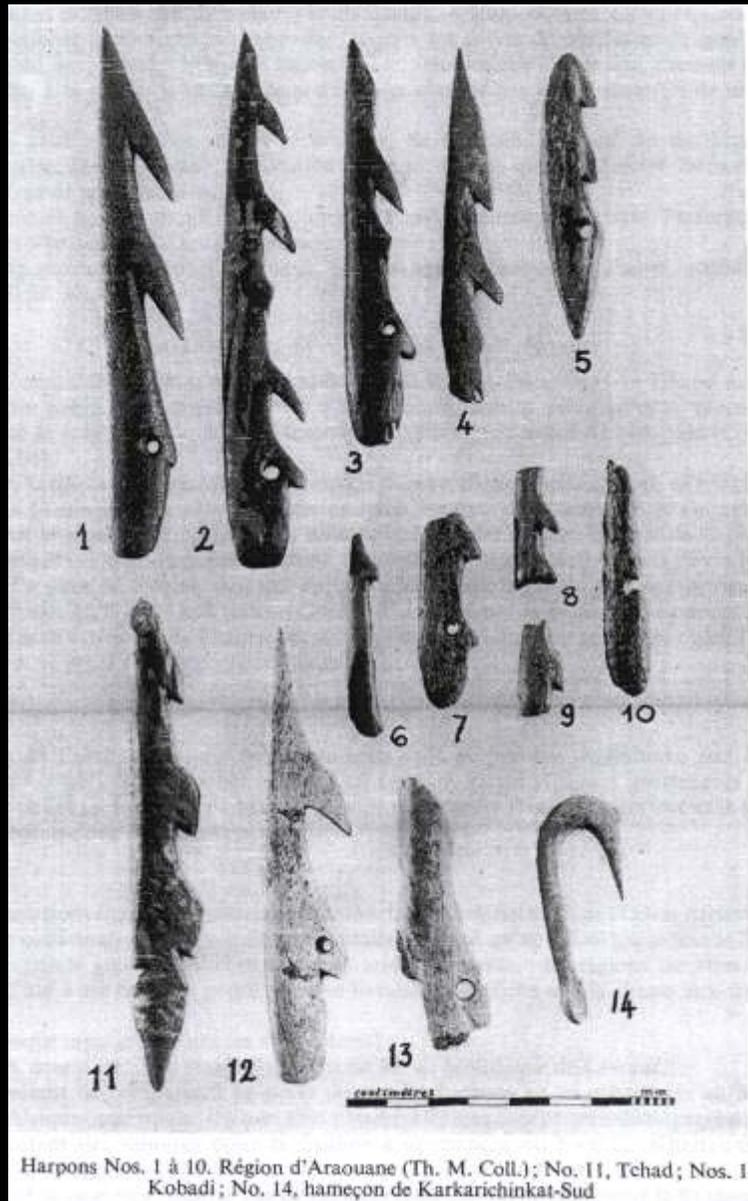
- ❑ 'Shallow-water' aquatic species (which could exploit scattered pools) include *Tilapia zillii* and the Nile crocodile
- ❑ Savannah species include elephant, rhino, giraffe show maps, typical predators and a host of smaller mammals
- ❑ Few examples of birds are clear, but anthropic species such as the guinea-fowl, *Numida meleagris*, with a relic population in Morocco is a likely trace of this period

Taking advantage of new resource opportunities

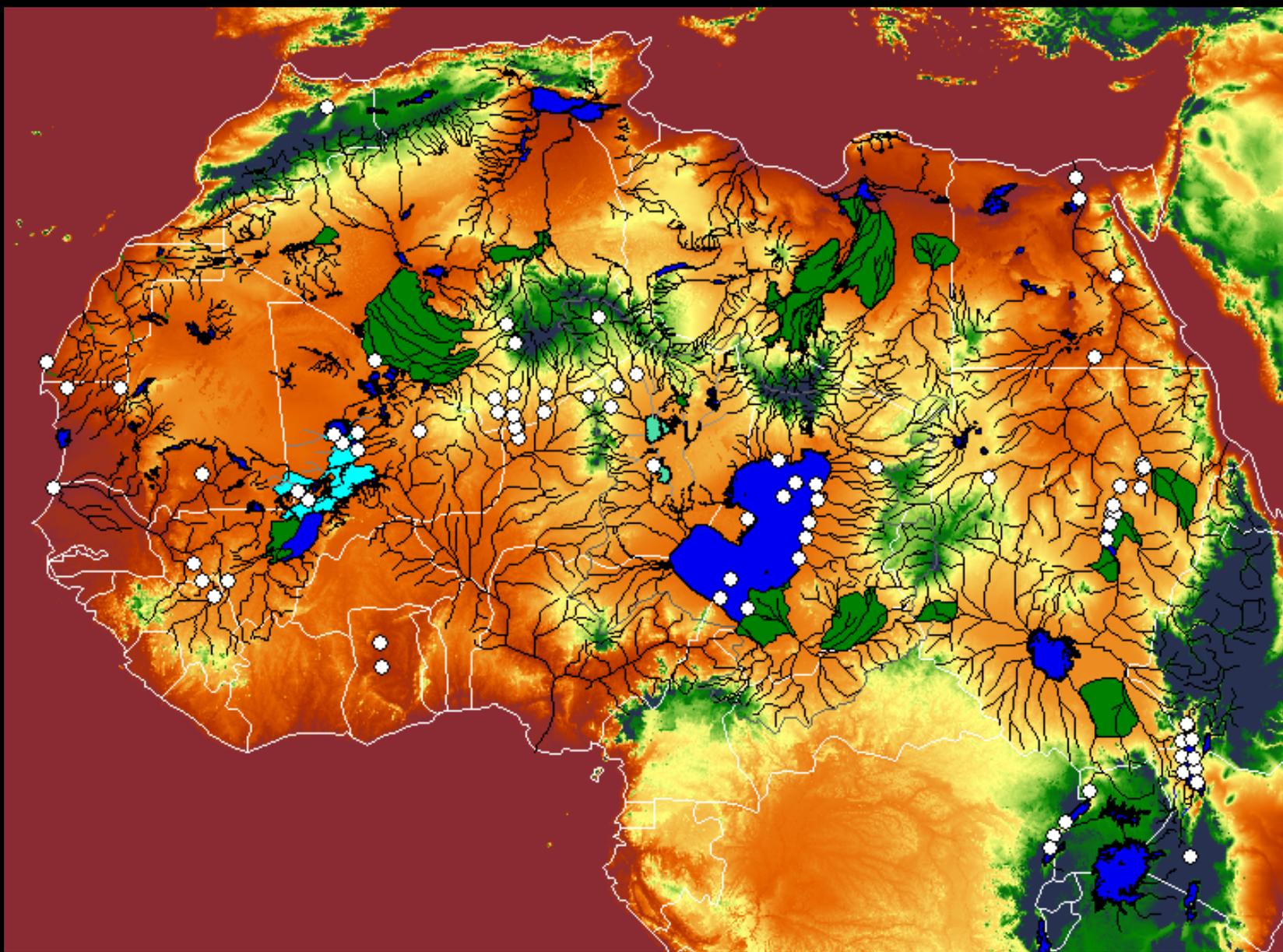
- If so, then this would have represented a major expansion in huntable and gatherable resources and that these would divide into two major sets; aquatic and plains
- Specialised foragers could then develop to exploit these different niches, crudely fishing people and plains hunters
- Two different populations might have exploited these resources and that this can be correlated with the expansion of two of Africa's language phyla; Nilo-Saharan and Niger-Congo
- And that this in turn broadly correlates with two archaeological cultures, the spread of serrated bone harpoons and the Ounanian, microlithic points, here interpreted as the spread of the bow and arrow

Seriated bone harpoons

Gobero



Finds of seriated bone harpoons



Fish hooks and a pendant

- Distribution of fish-hooks is much more limited than harpoons and moreover, the technology died out rather than surviving as skeuomorphs in newer materials

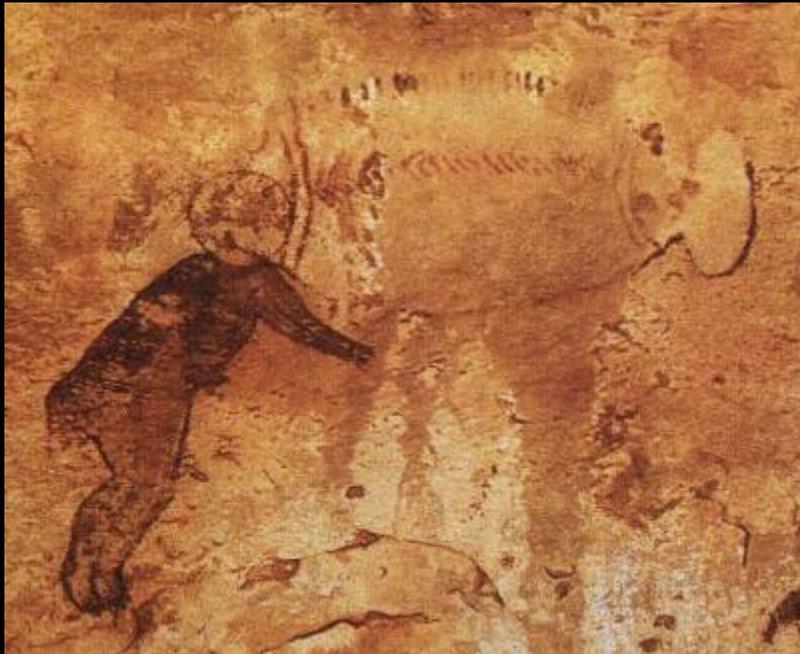
Hippo pendant



Gobero



Fish in Saharan rock art



Harpoons and Nilo-Saharan

- Seriated bone harpoons are generally found *below* the watershed with the sole exception of the Moroccan one
- This is treated by Yellen as typologically exceptional and moreover is pre-Holocene
- It is suggested here that it is essentially unconnected with the harpoons typical of the aquatic expansion
- The expansion of Nilo-Saharan would only have gone as far as the 'watershed line' as these specialised aquatic resource exploiters did not have the technology to survive in the more arid region further north

Is there any actual linguistic data to support this?

- ❖ Nilo-Saharan is much more problematic than Niger-Congo because it is older and more internally fragmented and because its languages remain much less well documented
- ❖ However, it is possible to say that 'bow' and 'arrow' and 'spear' can be reconstructed for proto-Niger-Congo and apparently not for proto-Nilo-Saharan
- ❖ It would be pleasant to have 'harpoon' in proto-Nilo-Saharan but the type of specialised vocabulary is not recorded

Hippo in Nilo-Saharan

Family	Subgroup	Language	Attestation
Gumuz		Kokit	baᅇa
Maba		Aiki	bùngùr
CS	Sara	Nar	àbà
Songhay		Kaado	bàᅇà
		Koyra Chiini	baᅇa

Sahara rock engravings: hippo at Mathendous



Terracotta hippo recovered from the edge of Lake Chad



Two roots for crocodile in Nilo-Saharan

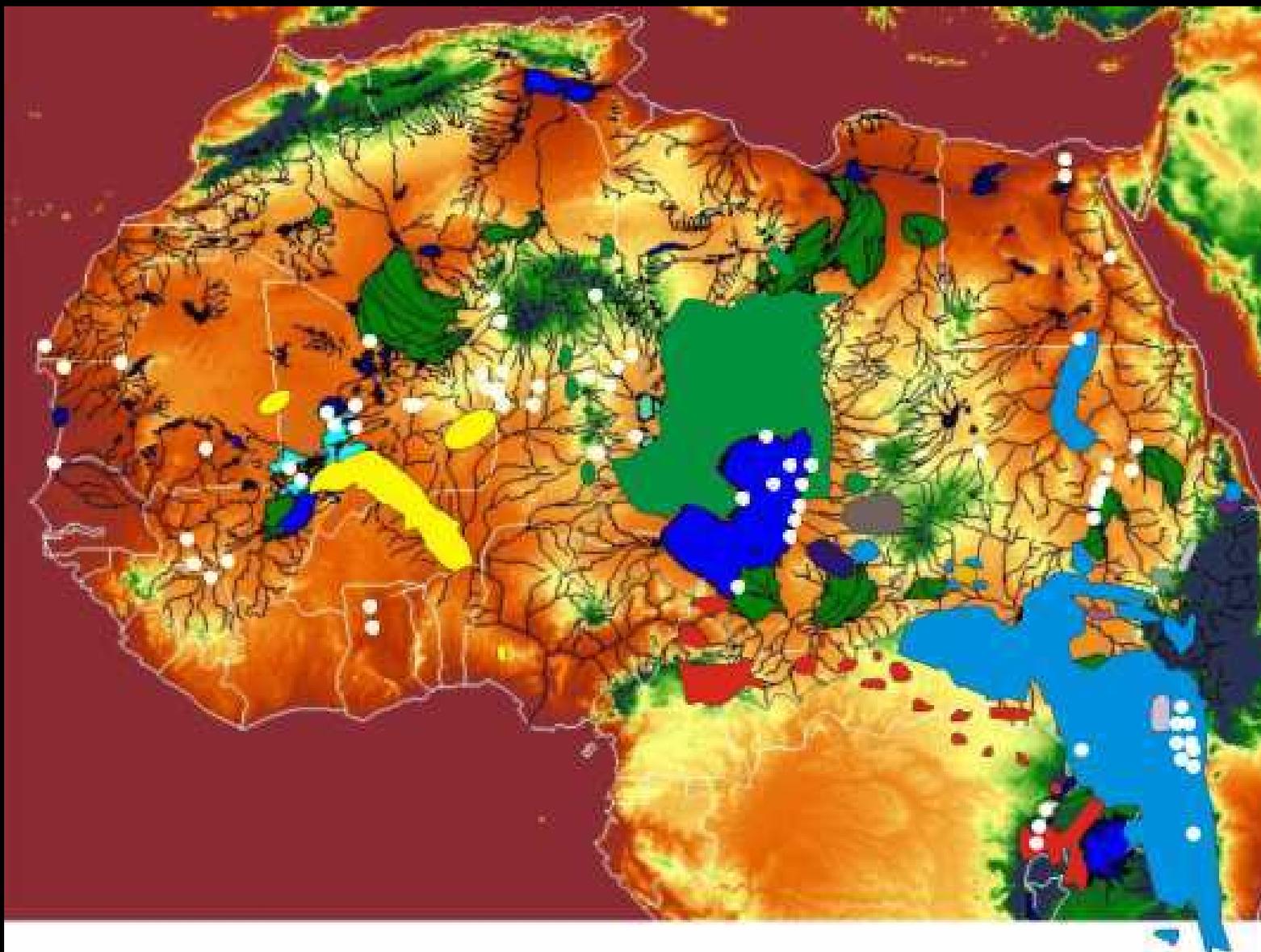
Family	Language	Attestation
Koman	Uduk	ànáṅà
Kuliak	Ik	nyeti-nyáṅ
Eastern Sudanic	*PN	ṅaaṅ
Eastern Sudanic	Gaam	ṅaaṅ
Maba	Aiki	gòrndí
Songhay	Zarma	kààrà̀y
Saharan	Kanuri	kárá̀m

Crocodiles

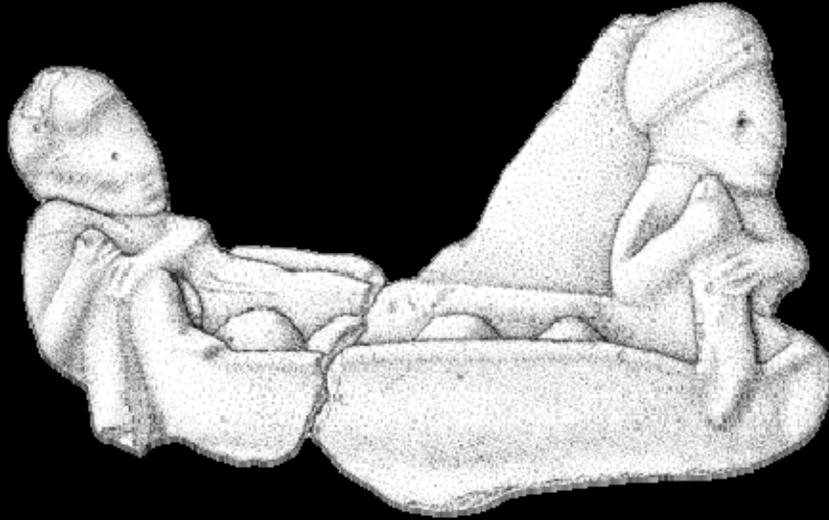


Crocodile and young in the Fezzan

The dispersal of Nilo-Saharan languages, bone harpoons and the 'Green Sahara'



The Nok canoe



This representation of a canoe on a Nok terracotta was recently excavated in Central Nigeria
Dated to around 2500 bp



Carrying produce to market

The Bantu expansion I

- The Bantu expansion is in some ways an ideal problem where this methodology can be applied, as the expansion of data in recent times has made hypothesis-building more than unanchored speculation.
- The approach I am summarising here derives strongly from my colleagues in Lyon, Montpellier and Gabon (where some of this emerged in a workshop at the University of Libreville in July 2013)
- Although the interpretation is strictly my own
 - The Bantu speaking-peoples occupy almost all of Sub-Saharan Africa below the Equator, a vast land area
 - They speak some 500 languages, all of which are relatively closely related
 - This points to a relatively recent expansion, which must have taken place across the tropical forest

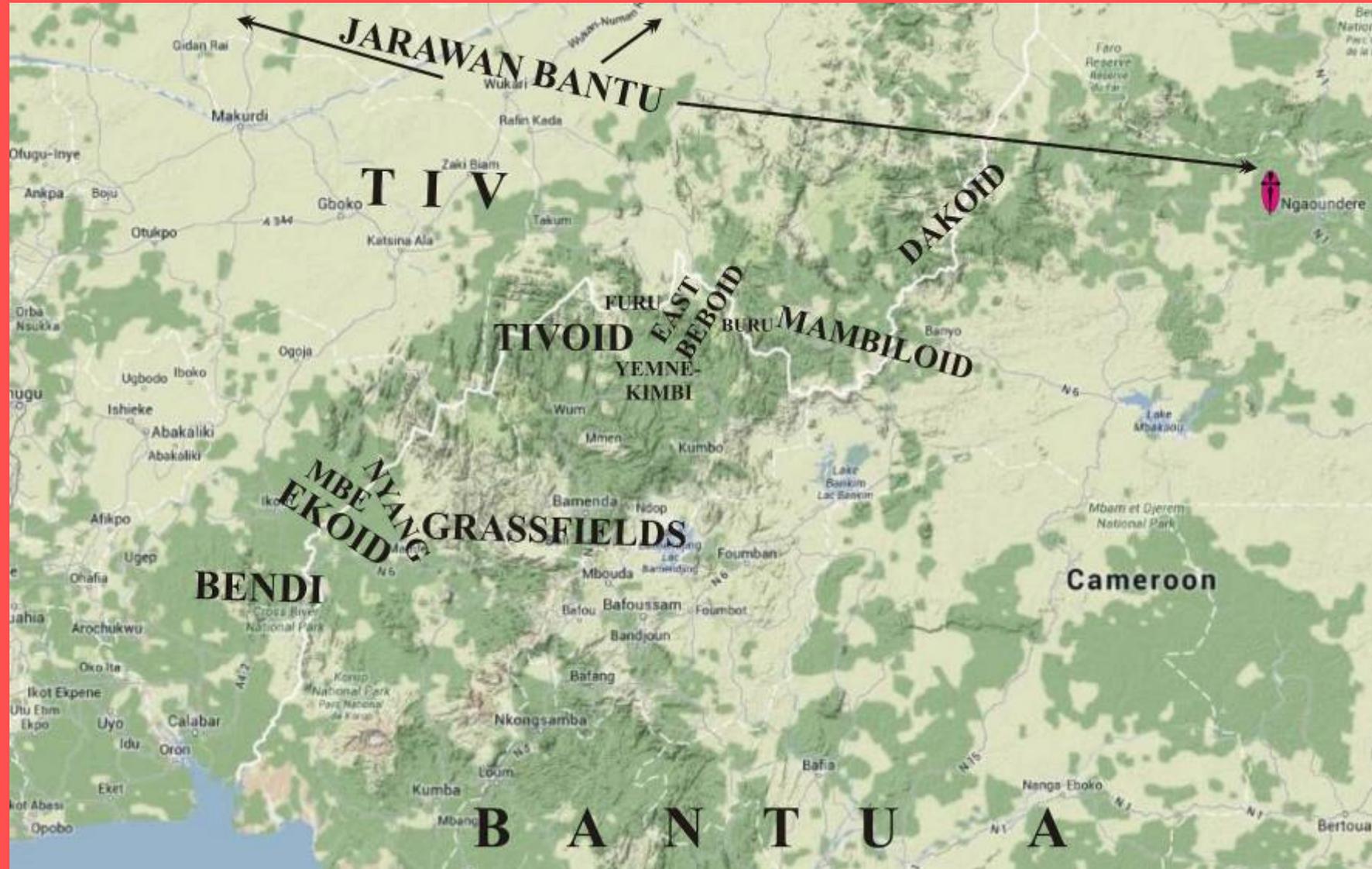
The Bantu expansion II

- And this pretty much must have been a migration initially, rather than assimilation of an *in situ* population
- As a consequence, the timing, causes and routes for this movement have been much debated
- ❖ The kinship of Bantu languages was first noticed as early as the seventeenth century, with traders noticing the language of the Kongo kingdom bore obvious resemblance to those in South Africa
- ❖ By the time of Wilhelm Bleek (mid-nineteenth century) the notion of a family was well established

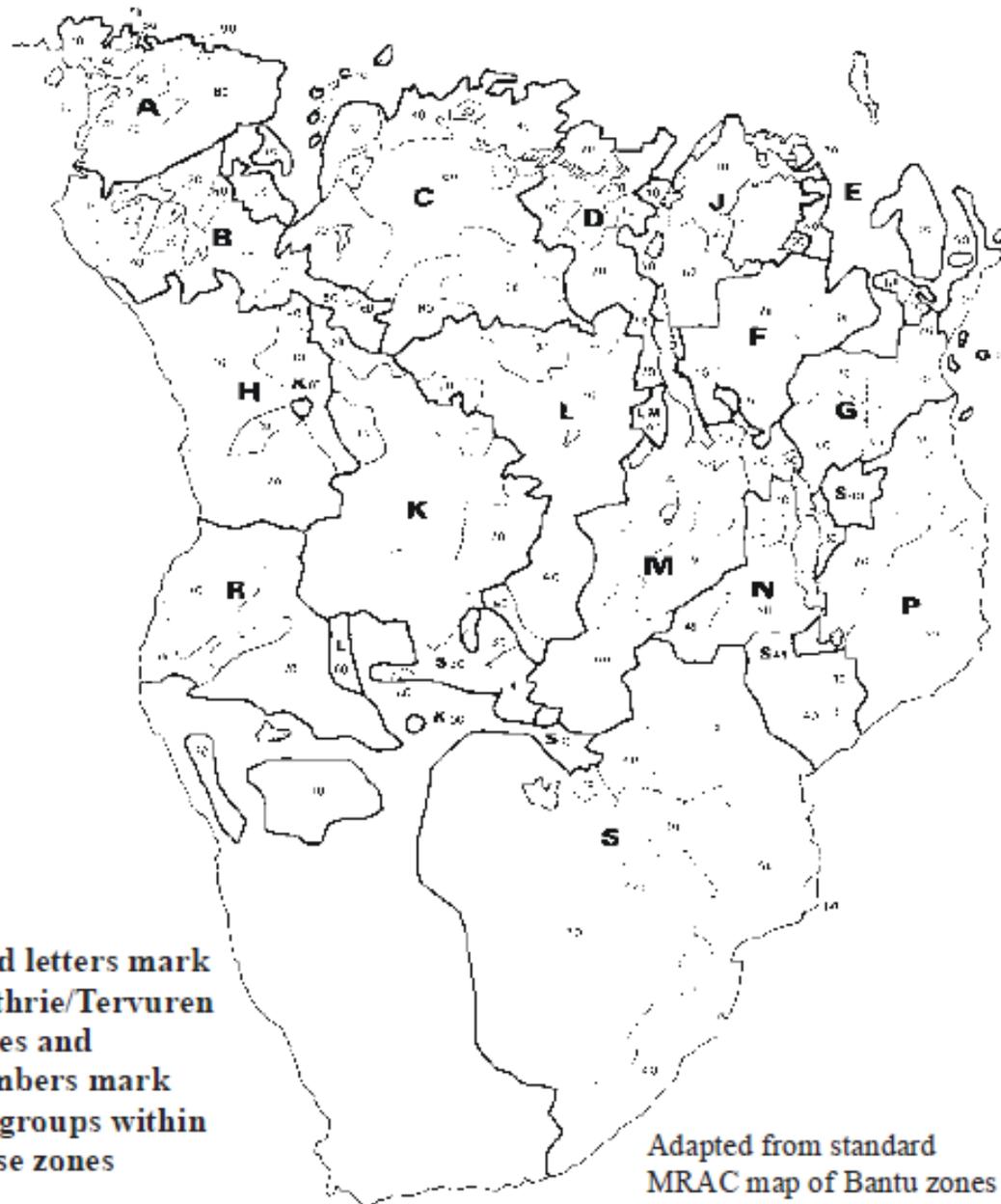
The Bantu expansion III

- ❖ Our modern understanding of Bantu as a language family we owe to Malcolm Guthrie, who published a vast four-volume classification (1967-71)
- ❖ In the earlier literature it was not necessarily understood where Bantu originated due to a poor understanding of the linguistic relatives of Bantu
- ❖ We are now very clear that these are the Bantoid languages, a large complex of diverse languages spoken in Cameroun and adjacent Nigeria
- ❖ Greenberg (1963) first pointed out that given this, Bantu had to originate in the northwest of the region, i.e. in what is now southern Cameroun
- ❖ Exactly who lived in the forest zone prior to the Bantu is much debated, but clearly they were extremely low density foragers and the expansion of new populations with different subsistence strategies was a real demographic event

The Bantoid languages



The Bantu languages



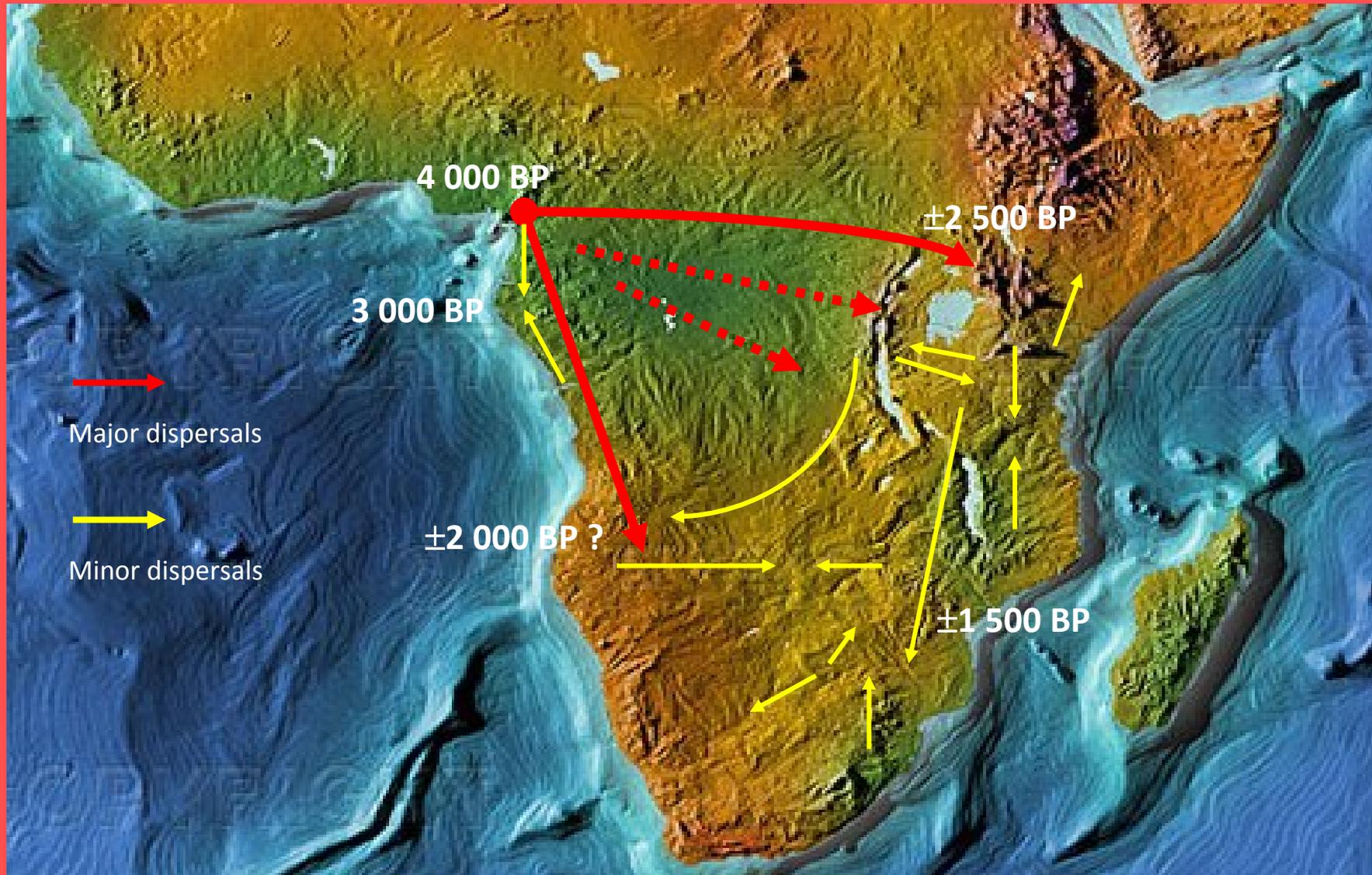
**Bold letters mark
Guthrie/Tervuren
zones and
numbers mark
subgroups within
those zones**

Adapted from standard
MRAC map of Bantu zones

Overview

- The map shows a synthesis of current thinking to help you focus
- The following slides will present some of the different types of evidence supporting this

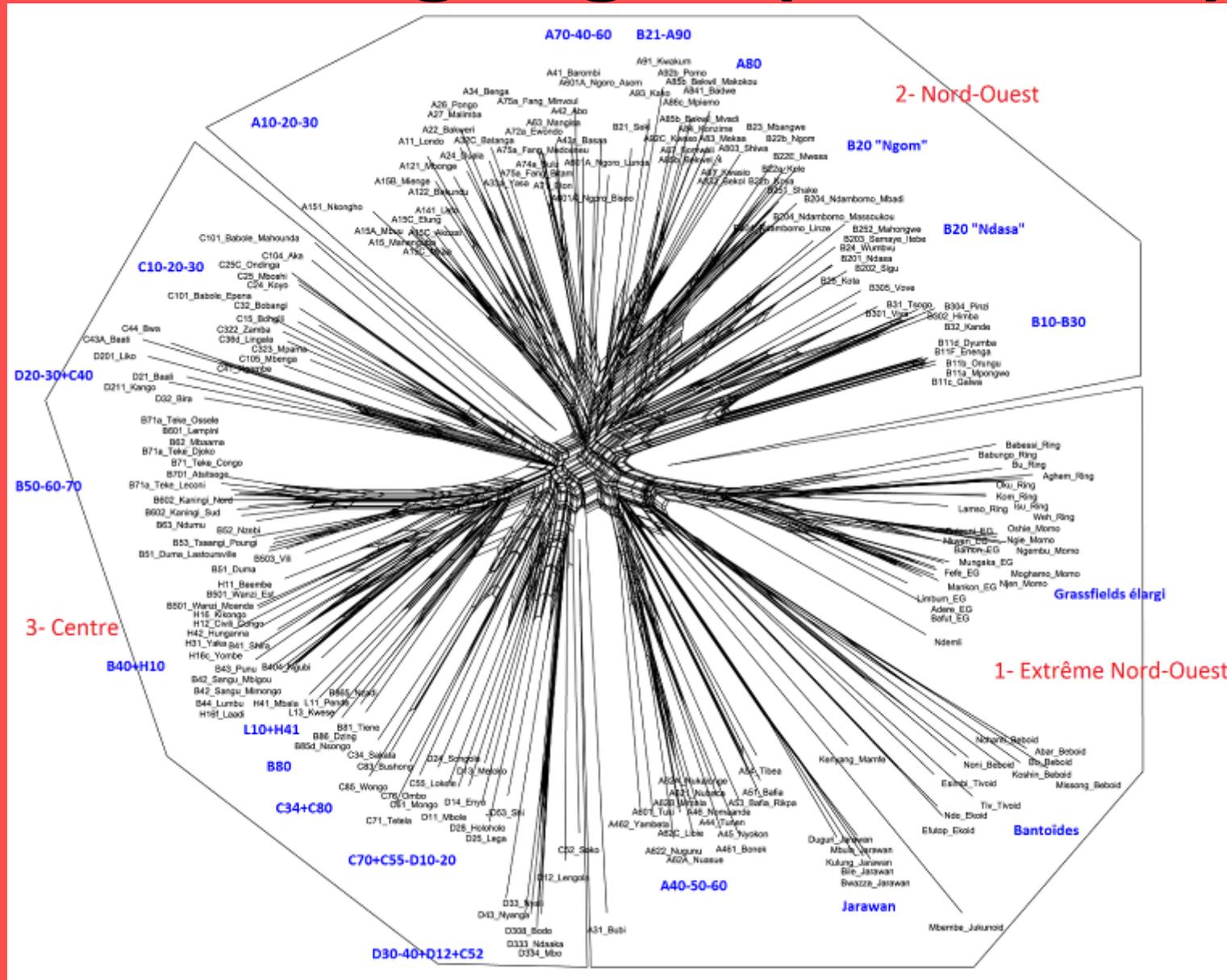
A synthesis of the Bantu expansion



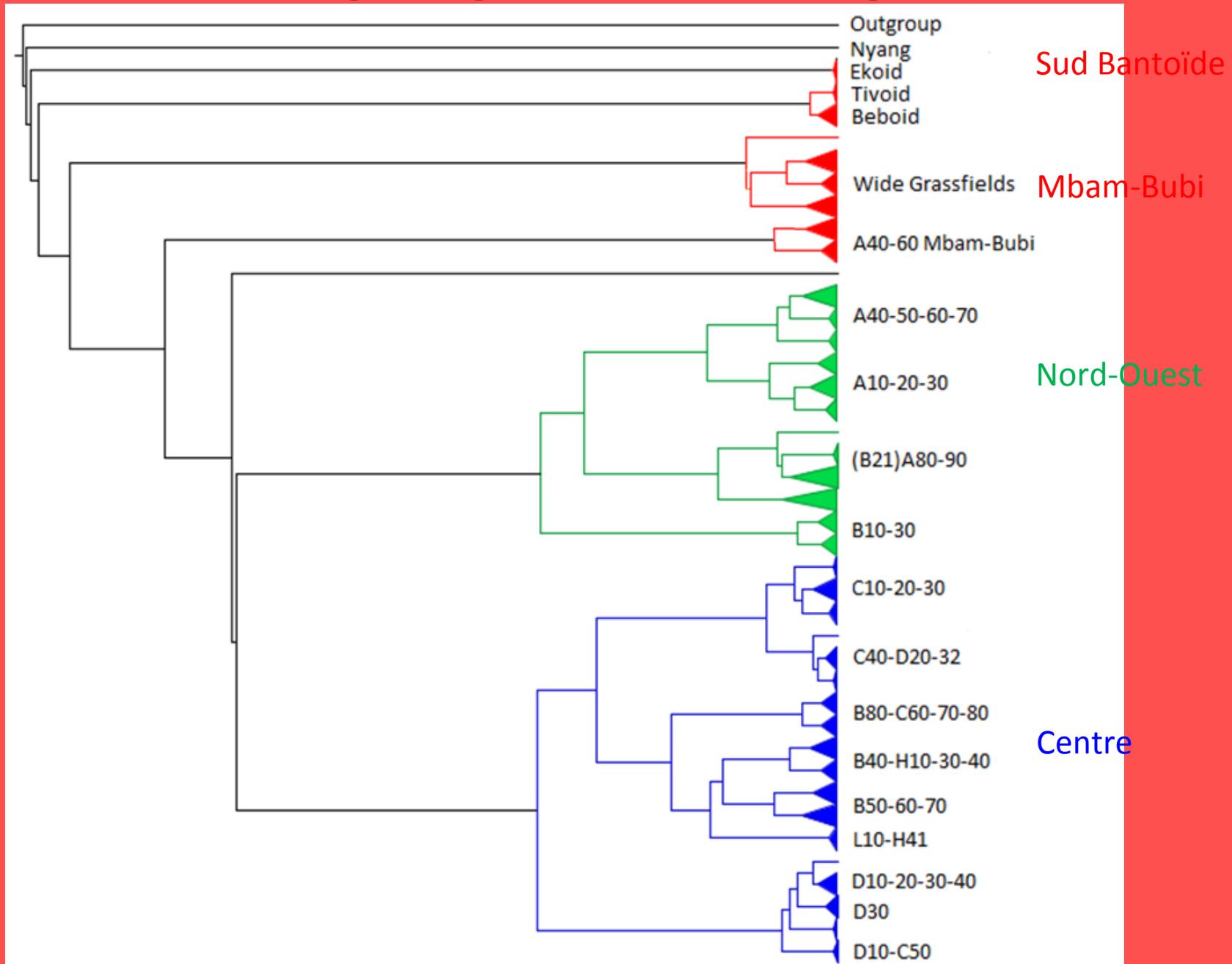
Linguistic classification

- ❑ There have been various attempts to classify all the Bantu languages and their relatives
- ❑ In recent times, the approach has been to use network analysis which produces somewhat hard to use starburst type graphics
- ❑ Tree-like outputs are easier to make sense of
- ❑ But the key findings are;
 - ❖ Clear separation of Bantoid and Bantu
 - ❖ Early divisions, with a coastal stream, a 'north of the forest' stream, and a less well defined movement into the equatorial forest

Bantu languages (starburst)



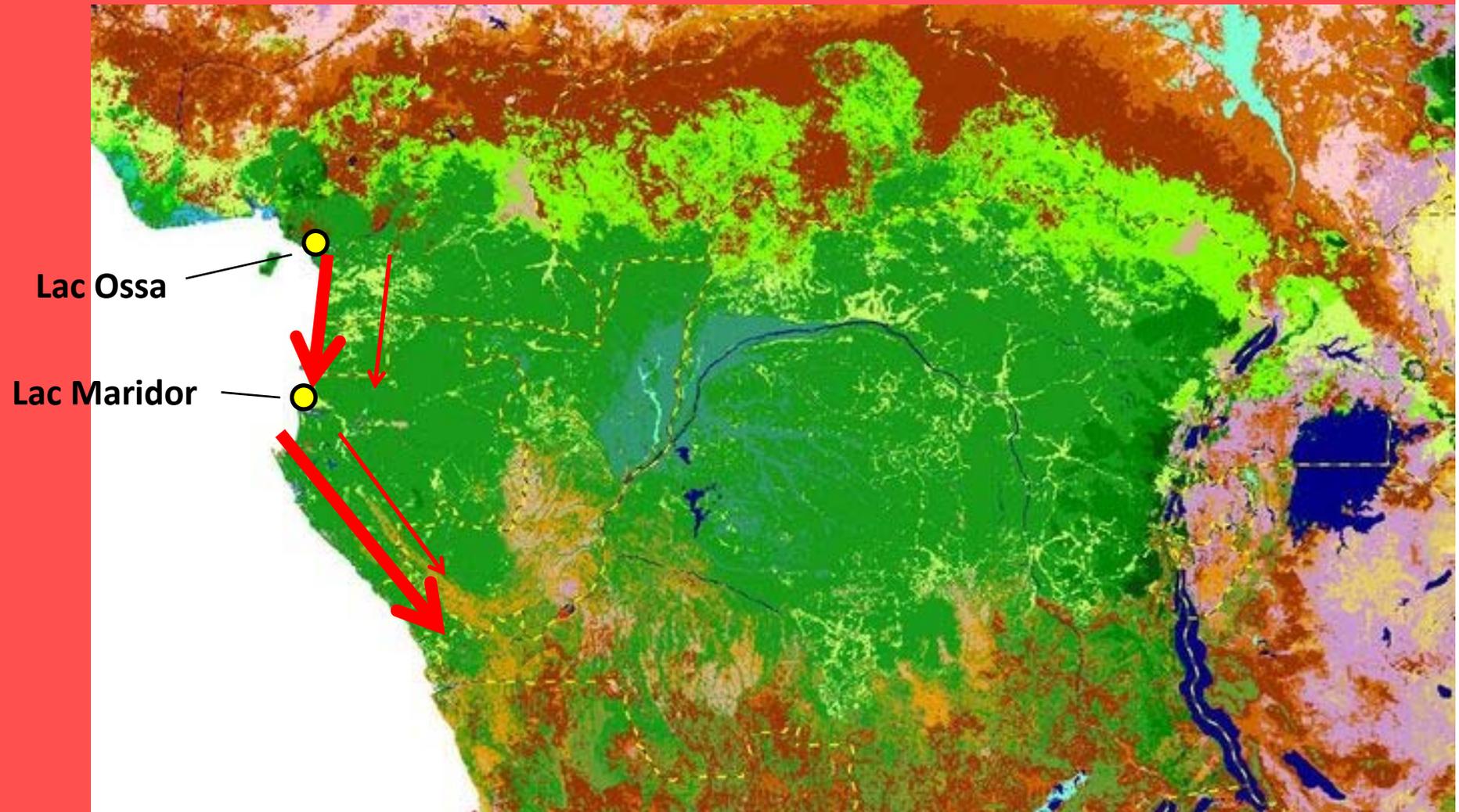
Bantu languages first stage (tree)



Lake cores in the NW Bantu area

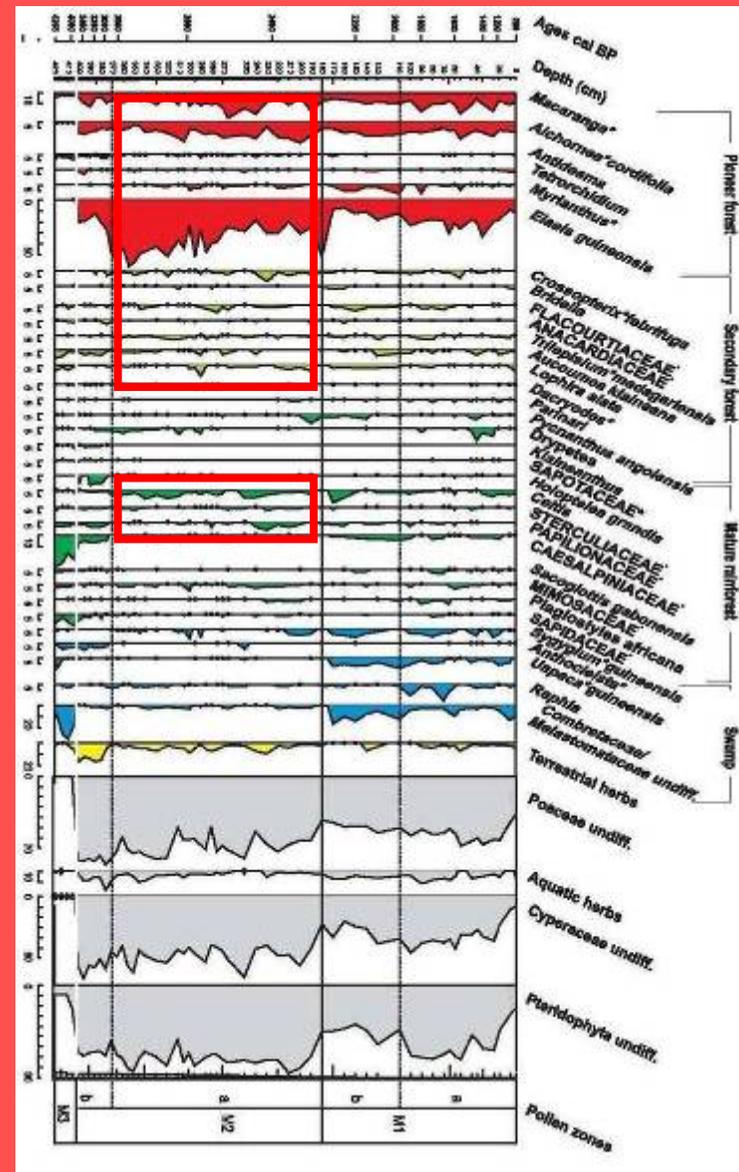
- ❑ If the earliest phase of the Bantu expansion was into the forest, then this should leave a mark on the vegetation profile, either due to opening spaces for cultivation or introducing anthropic species
- ❑ There are now a number of lake cores in the NW Bantu area with published profiles
- ❑ These point to two rather different episodes of forest disturbance, beginning around 3800 BP
- ❑ And in particular a striking disjunct distribution of some species on either side of the 'Sangha gap'
- ❑ Which is correlated with vernacular names for tree species
- ❑ And points to two distinct phases of Bantu expansion

Profile sites

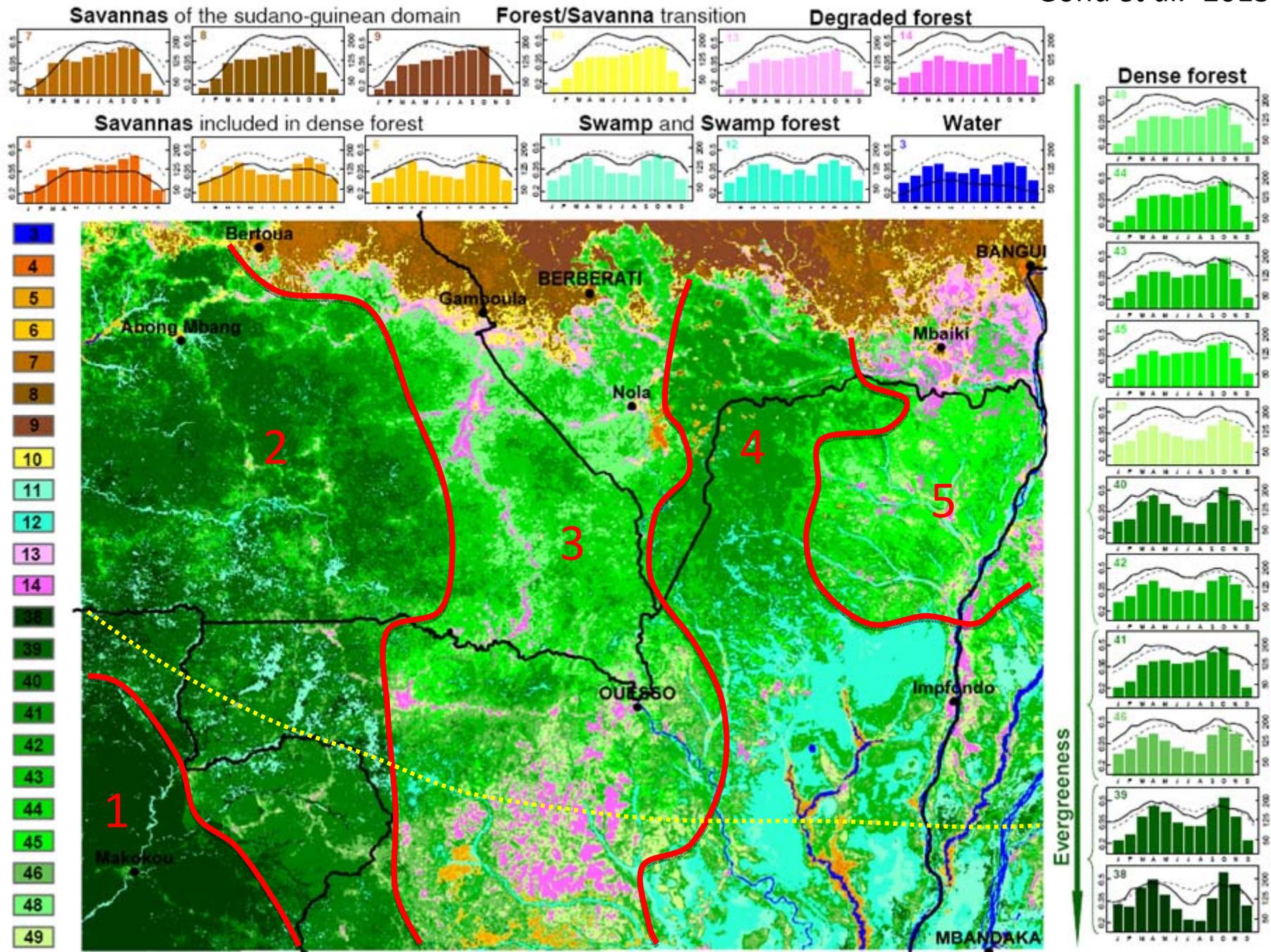


Lac Maridor (Gabon)

- 4300-4000 years BP : Forest cover, but abrupt change at the end of this period
- From 3500 years BP, rapid decline of the forest, extension of savanna, expansion of pioneer species
- **2900—2300 years BP : much greater expansion of savannas** (Poaceae) forest disturbance (*Elaeis*, pollens of semi-deciduous forests). Climate probably more seasonal than today.
- Forest fragmentation between 2500 and 2300 BP : more arid, more marked dry season.
- Corresponding expansion in number and density of Bantu peoples



Ngomanda et al. 2009



Animal distributions suggesting repeated invasions at times of savanna corridors

- ❑ The forest boundaries are not static and savanna corridors have been opening and closing over millions of years
- ❑ Drier-zone species moved in and occupied these regions and then became trapped in the forest when it recolonised
- ❑ They could survive by specialising in particular habitats such as the patches of savanna that remained, along the littoral etc.
- ❑ Sometimes we only know this from archaeozoology but species such as hyenas still survive
- ❑ The most dramatic example of this is the forest elephant, *Loxodonta cyclotis*, now known to have separated from the bush elephant more than 2 million years ago
- ❑ But there are other species

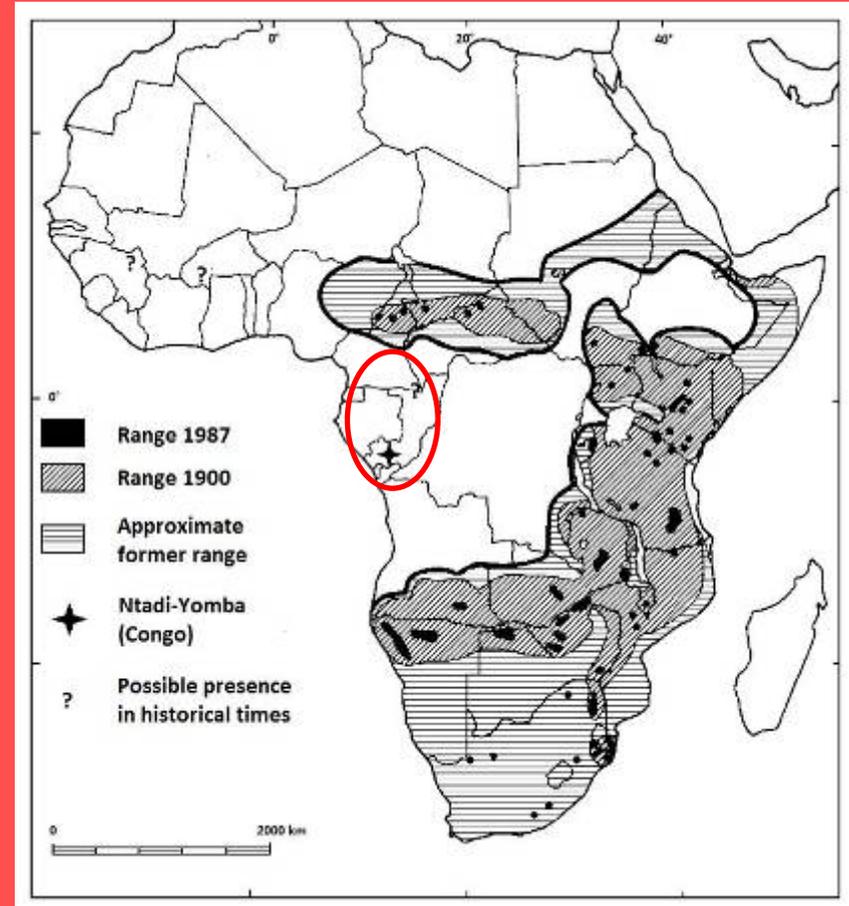




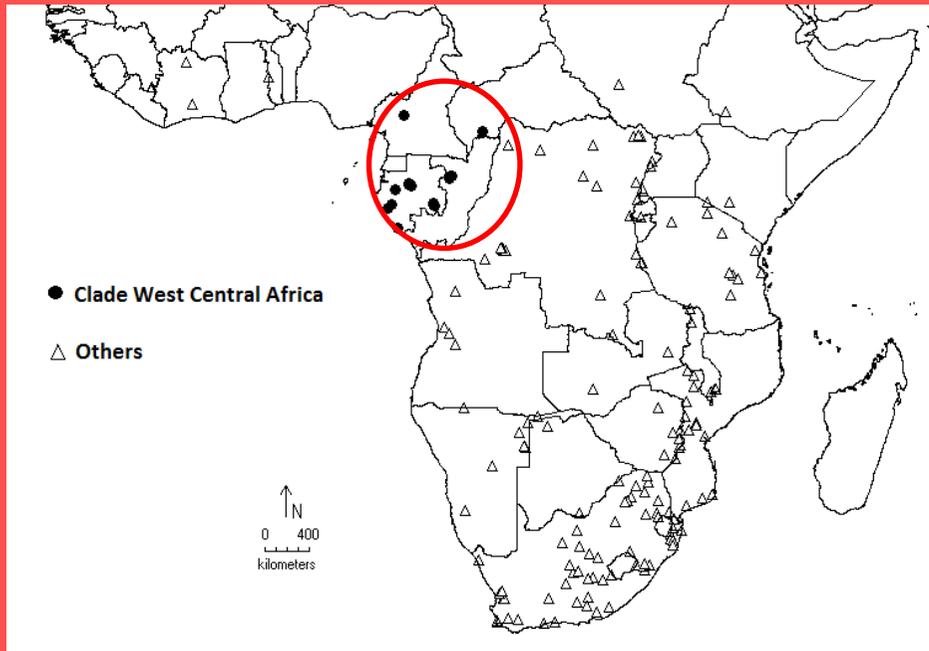
Diceros bicornis black rhino



- Black rhino tooth at 7000 BP (Ntadi-Yomba shelter; Van Neer & Lanfranchi 1985).
- Black rhino prefers edges of forest savanna mosaics
- Known as the 'browse' rhino and eats leaves and shoots of trees and shrubs, in contrast to the white or grass rhino
- No evidence for its presence in Angola or the left bank of the Congo : the rhinoceros of Ntadi Yomba must have entered from the savannas further north.



***Mus minutoides* (Muridae)**



- Strictly a savanna species
- Central African Atlantic clade diverged around 140,000 BP.
- Populations are genetically very homogeneous despite the current fragmentation of the savannas : this argues for a recurrent connection between the savannas of Gabon-Congo and those of the north since the Pleistocene (Mboumba *et al.* 2011).

An attractive reservoir of naïve huntable fauna

- The movements of the forest acted as a pump to push savanna species southwards, creating a reservoir of huntable fauna which seems to have little experience of human predators
- When the savanna corridors opened around 4000 BP, probably a natural succession, this could have attracted human populations southwards

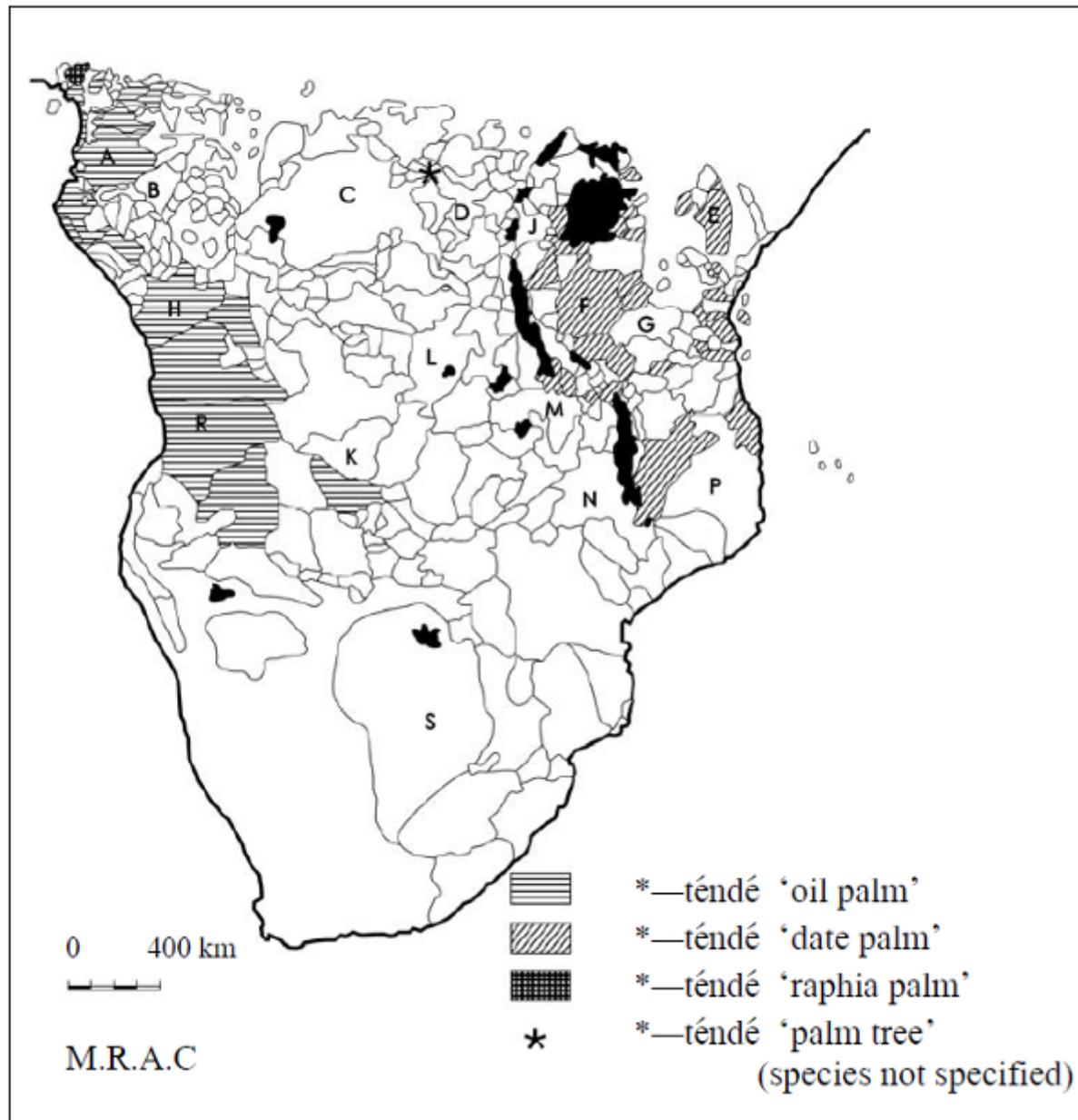
How do tree distributions reflect episodes of forest disturbance?

- ❑ There are a variety of tree species which are not normally considered cultivated or domesticated but which have distributions in the Bantu area which make it seem that humans were in part responsible either for their dispersal or their elimination
- ❑ Sometimes there is also linguistic evidence for this and the pattern of vernacular names maps against the two postulated phases of expansion
- ❑ Some examples;

The oil-palm *Elaeis guineensis*

- The oil-palm is a major component of forest subsistence. Although indigenous to Africa, it is probably naturally at quite low densities, it is typically encouraged by humans and many cores show increase in pollen from 5000 bp onwards.
- Bostoen (2005) has mapped the distribution of reflexes of Bantu names for oil-palm. The major reconstructed forms for the oil-palm are **-bá*, **-bídà*, **-tende*.
- The map shows the distribution of the major roots for oil-palm, spreading south on a coastal trajectory from the northwest
- But also, with a changed referent, much further east
- Pointing to an elimination of a key proto-Bantu root in the central region

Map 5: The distribution of *-téndé inside the Bantu domain



Human populations in the Sangha gap

- More carbonised palm-nuts in the open forest than in the dense forest, at all depths.
- Signs of the oldest ceramics and metallurgy at 2160-1407 BP in forests heavily populated with Marantaceae
- In open forests highest densities of palm-nuts **2146-1055** and **558-347 BP**.

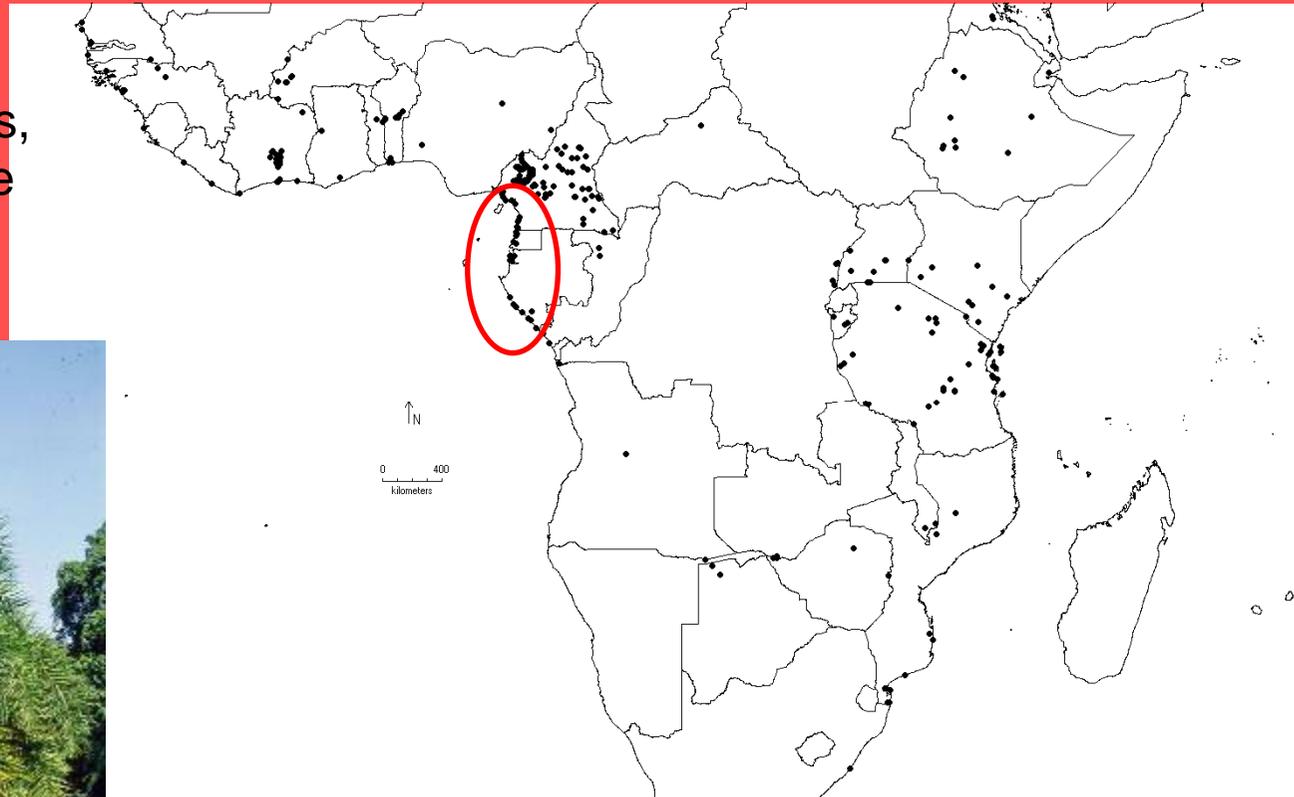
Fragments of oil-palm nuts ca. 2000 BP recovered at 50 cm.

Gillet & Doucet (2012)



Phoenix reclinata, wild date palm

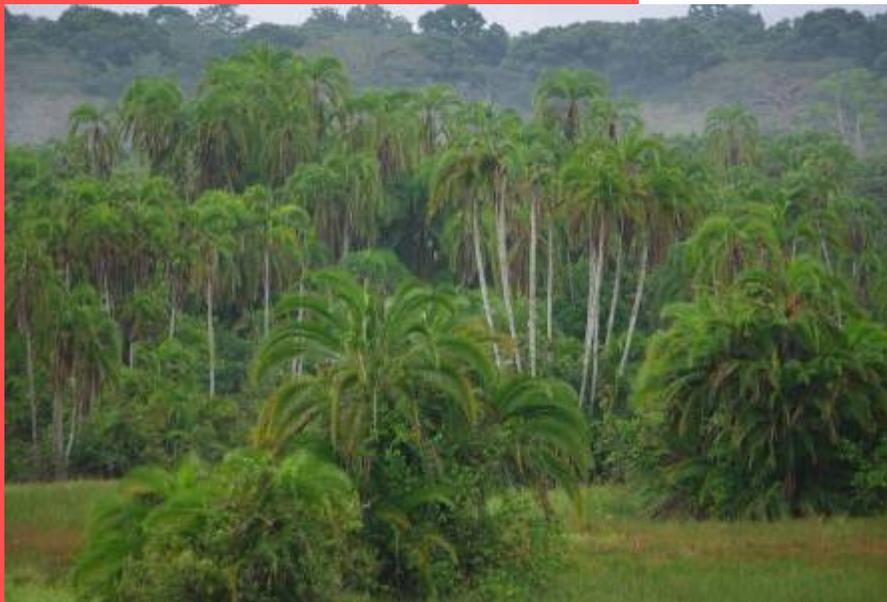
- Savanna palm species
- Important for humans, for leaves, palm-wine etc.



- Normally absent in dense forest
- But will grow on sandy soils behind the mangrove line

Phoenix reclinata (Arecaceae)

- Has a split distribution in the northwest, both along the littoral and down the riverline in the interior

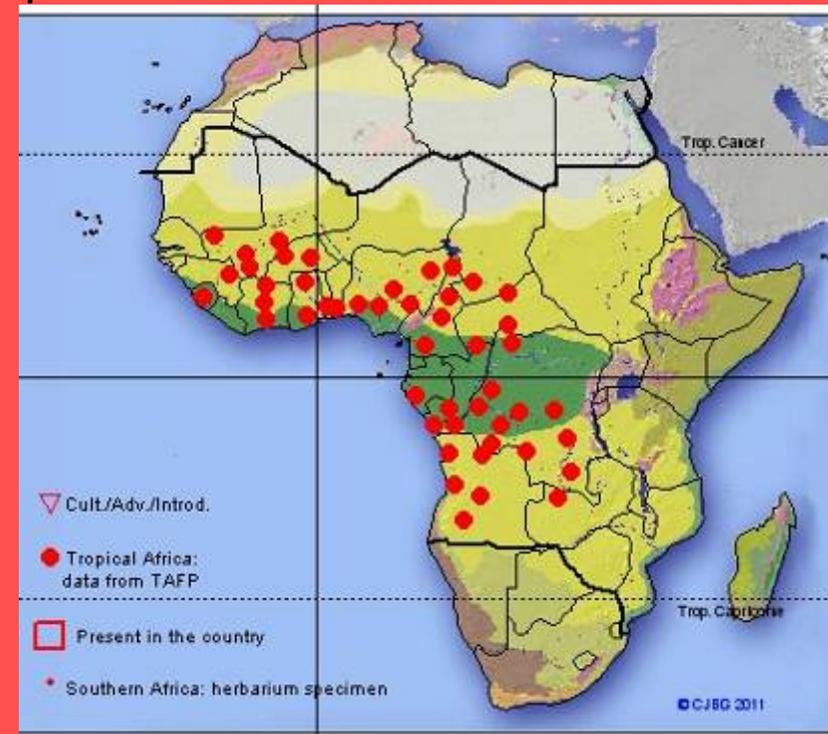


- Suggesting anthropic colonisation during the first wave of forest disturbances

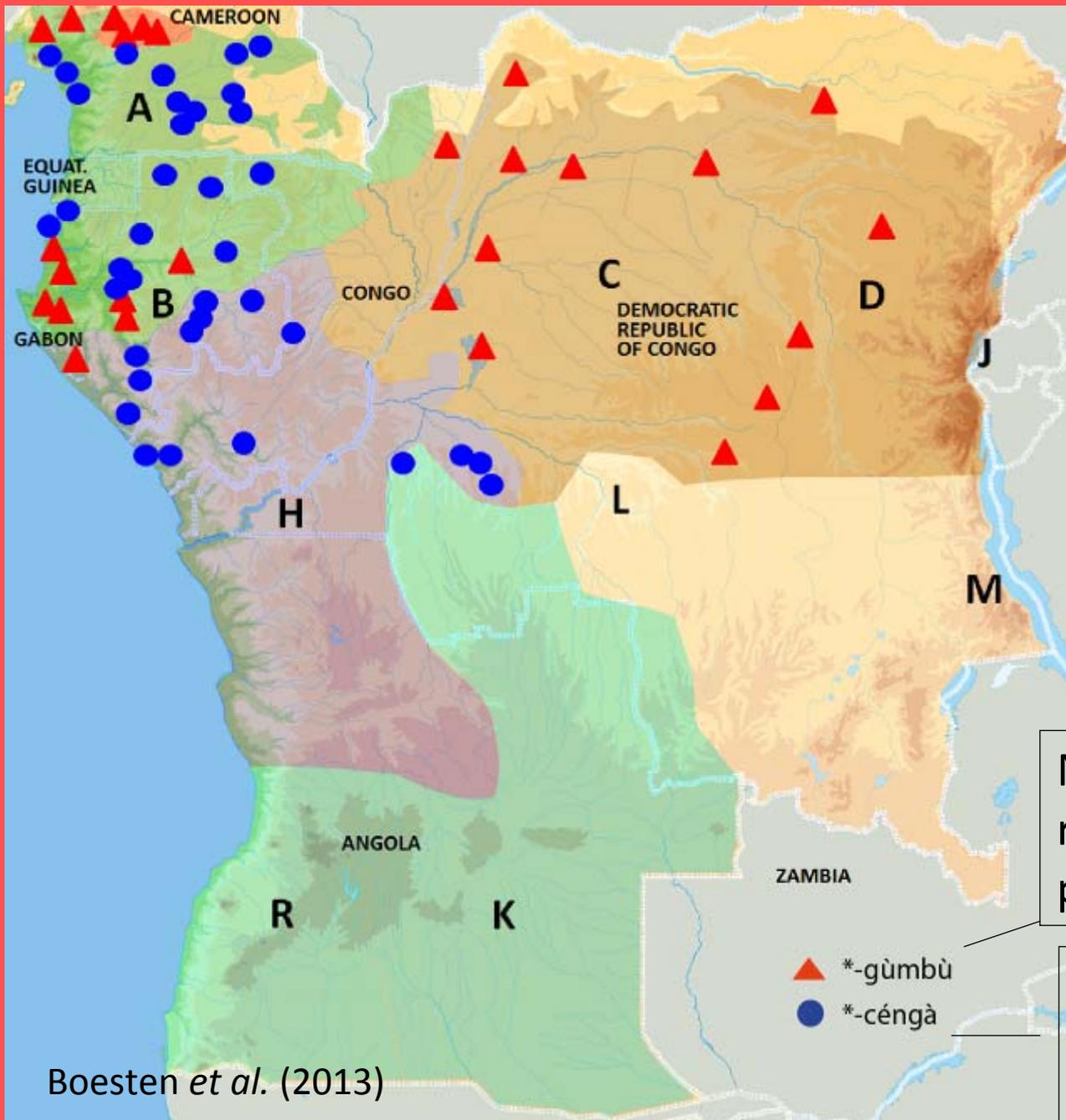
Doumenge et al. (2012)

Bridelia ferruginea (Euphorbiaceae)

- Tree or shrub characteristic of savannas and gallery forest. Important medicinal plant
- Occurs both north and south of the forest bloc, though usually absent from thick forest
- Occurs in the anthropic savannas of the Sangha gap (Dzanga-Sangha, Odzala) but also in the savannas of Lopé in Gabon.



Distribution of vernacular names of *Musanga cecropioides*, umbrella tree

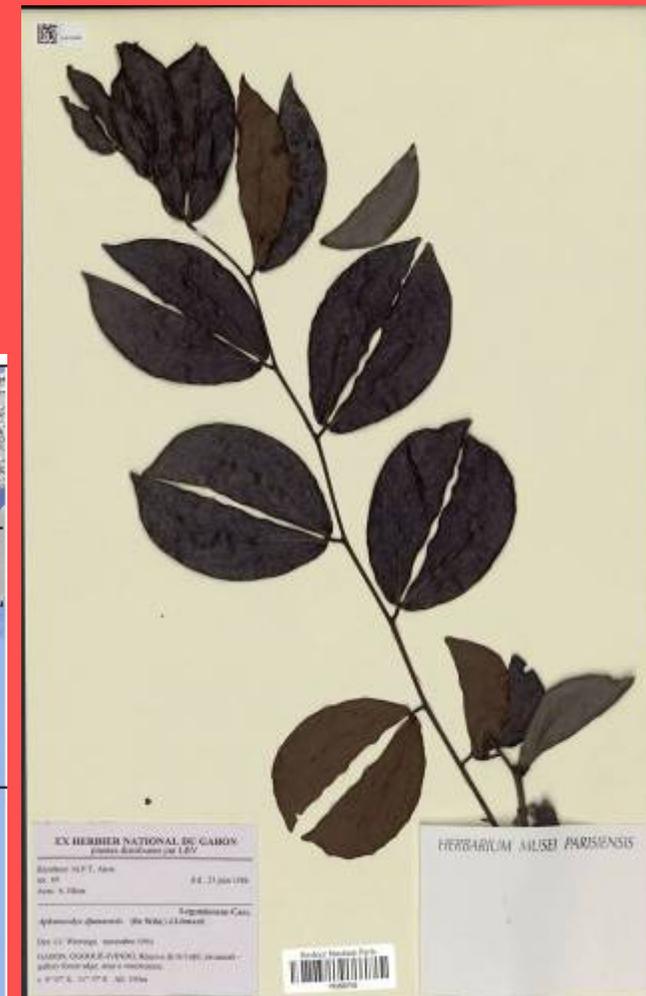
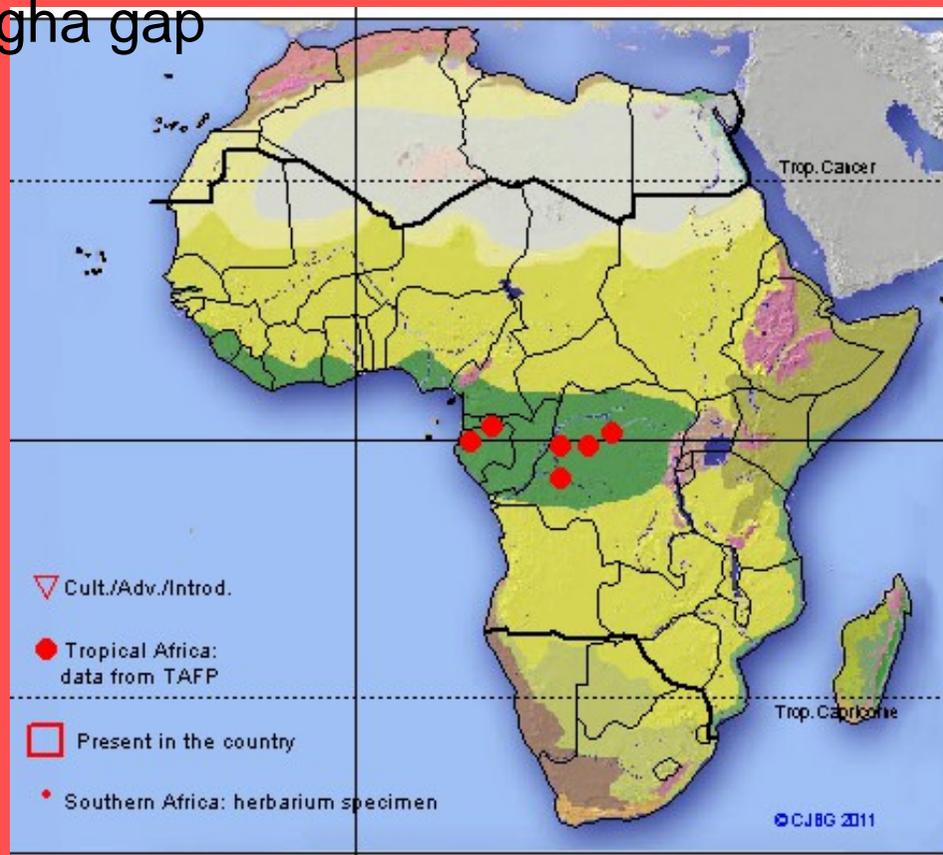


Name which can be reconstructed in proto-Bantu

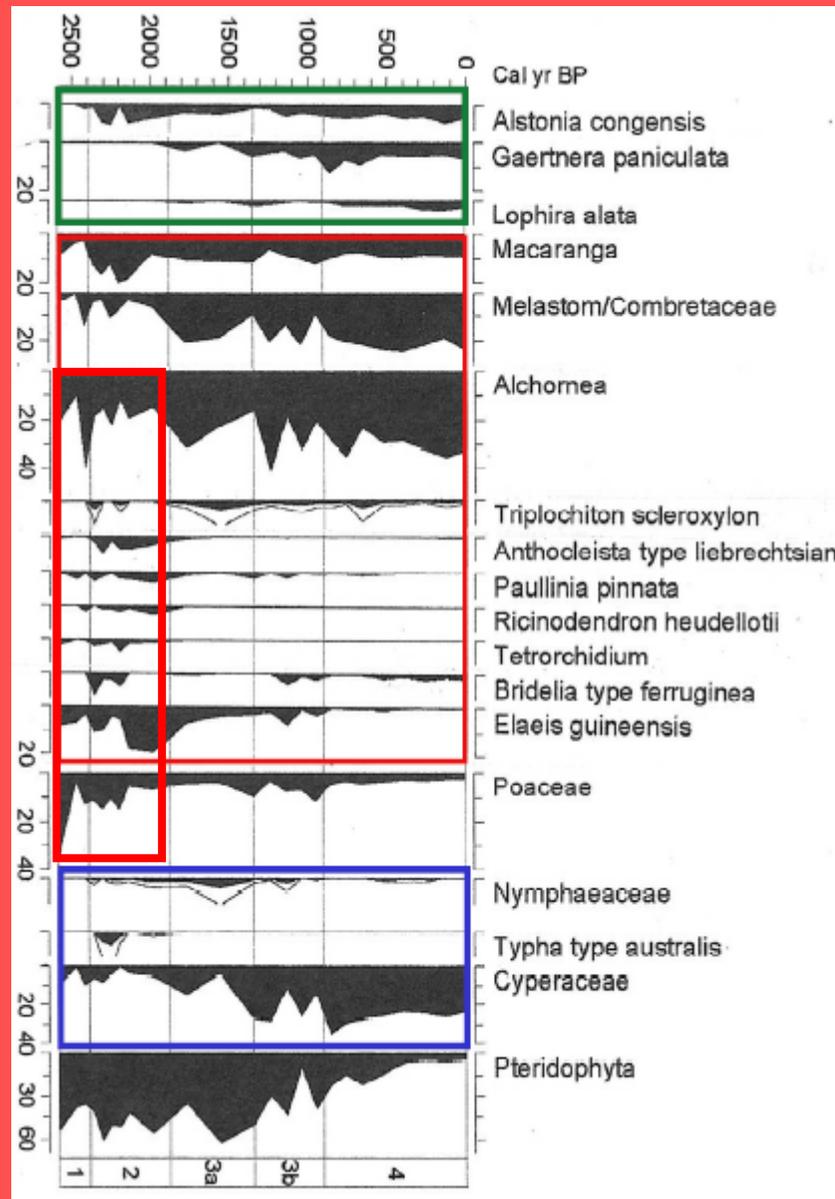
Name which subsequently developed

Aphanocalyx djumaensis (Fabaceae-Caesalpinioideae)

- Dense forest species, tolerates shade
- Weak dispersal capacity
- Occurs both east and west of the Sangha gap



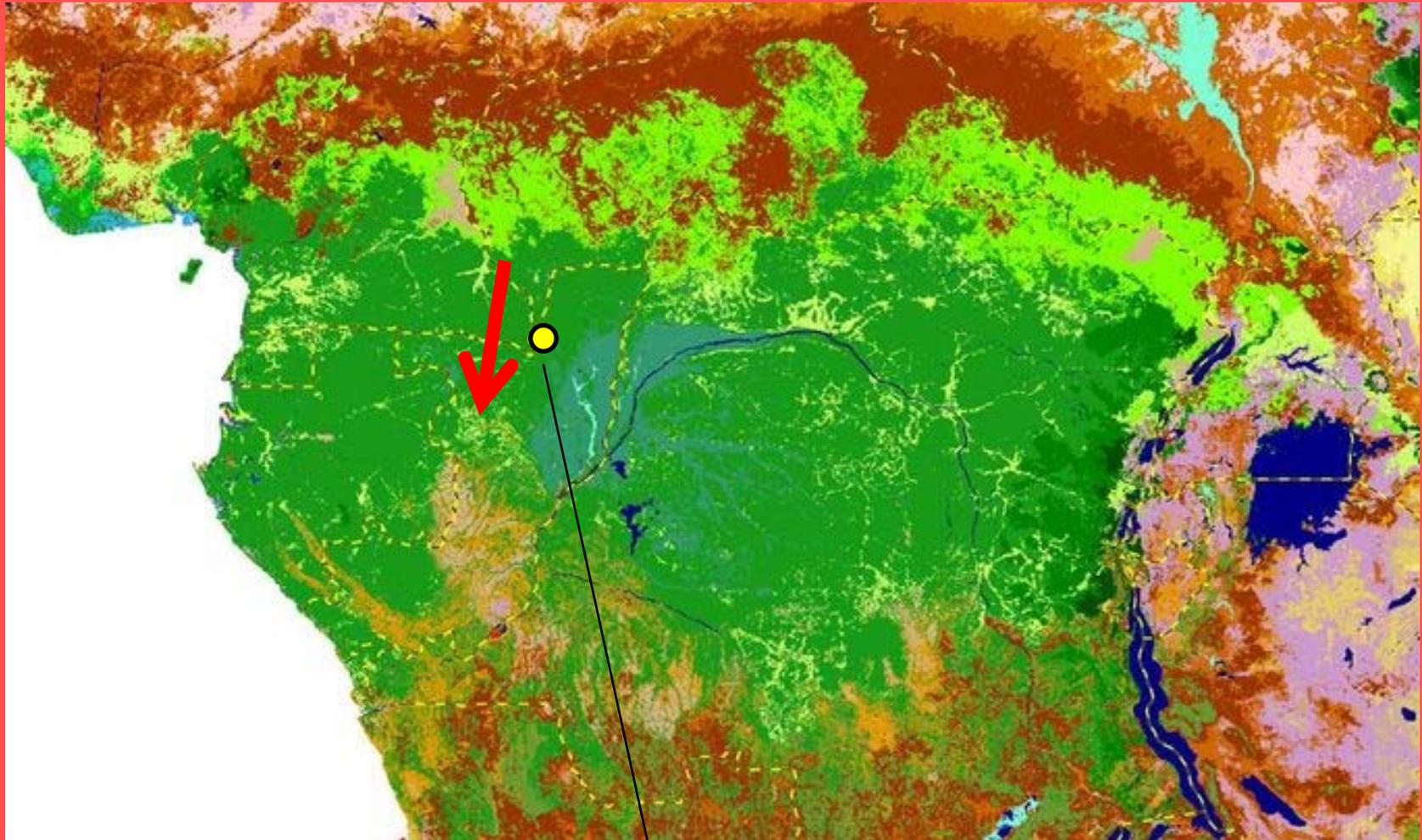
Evolution of the vegetation at Mopo (2600 BP – present)



- Strong perturbation at the lowest level (ca. 2500 BP) : 36% of Poaceae pollen.
- Followed by another phase of perturbation **2400-1900 BP** : and the appearance of pioneer taxa (*Alchornea*, *Macaranga*, *Elaeis...*).
- Virtual disappearance of *Elaeis* ca. 900 BP and corresponding development of mature high forest species

Brncic *et al.* 2009 ; Maley & Willis 2011

The Sangha gap and Mopo



Mopo

Gabon derived savanna

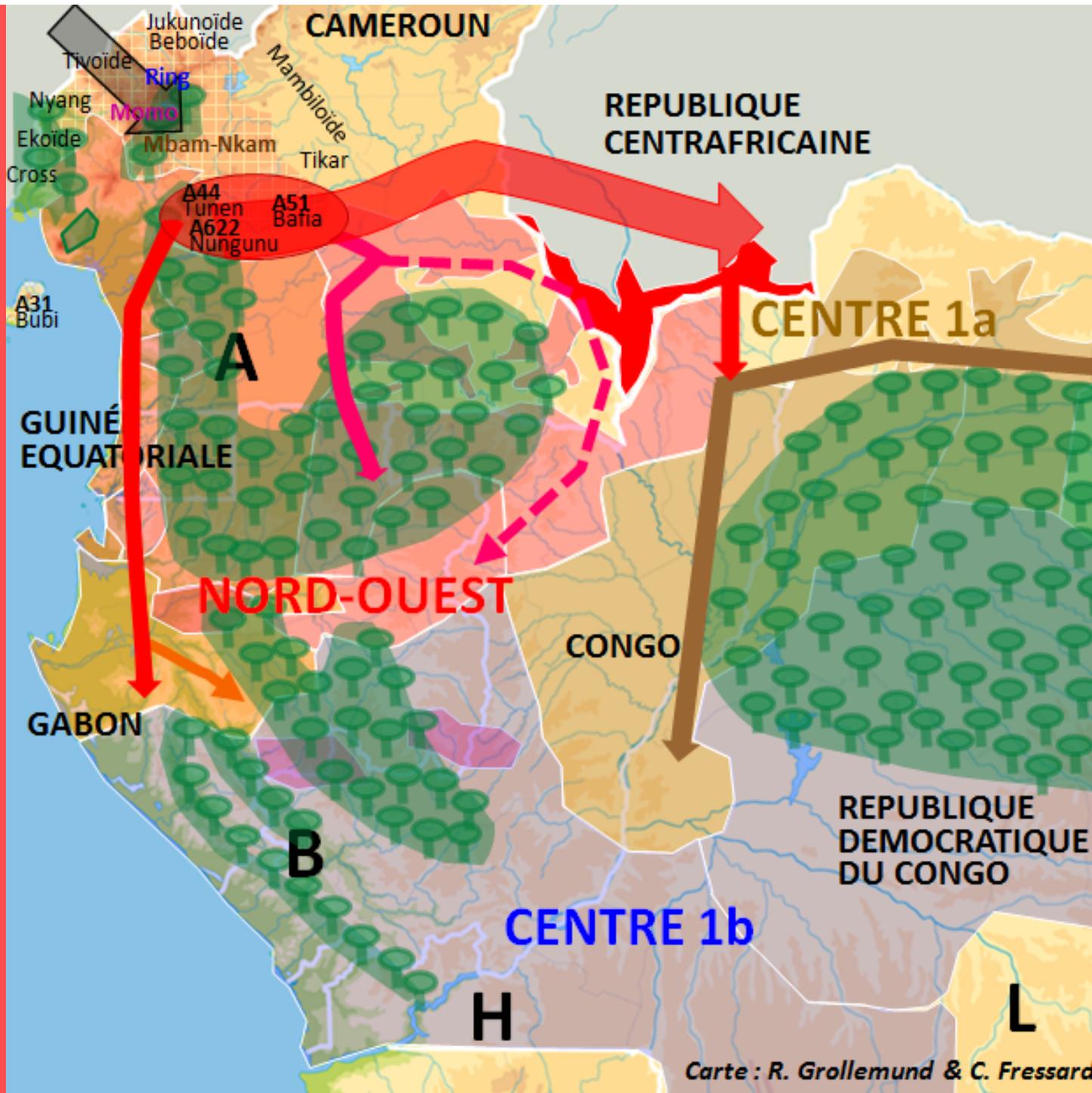


Lope derived savanna burning



Gabon: Iron Age petroglyphs





Carte : R. Grollemund & C. Fressard

Was there a coastal route?

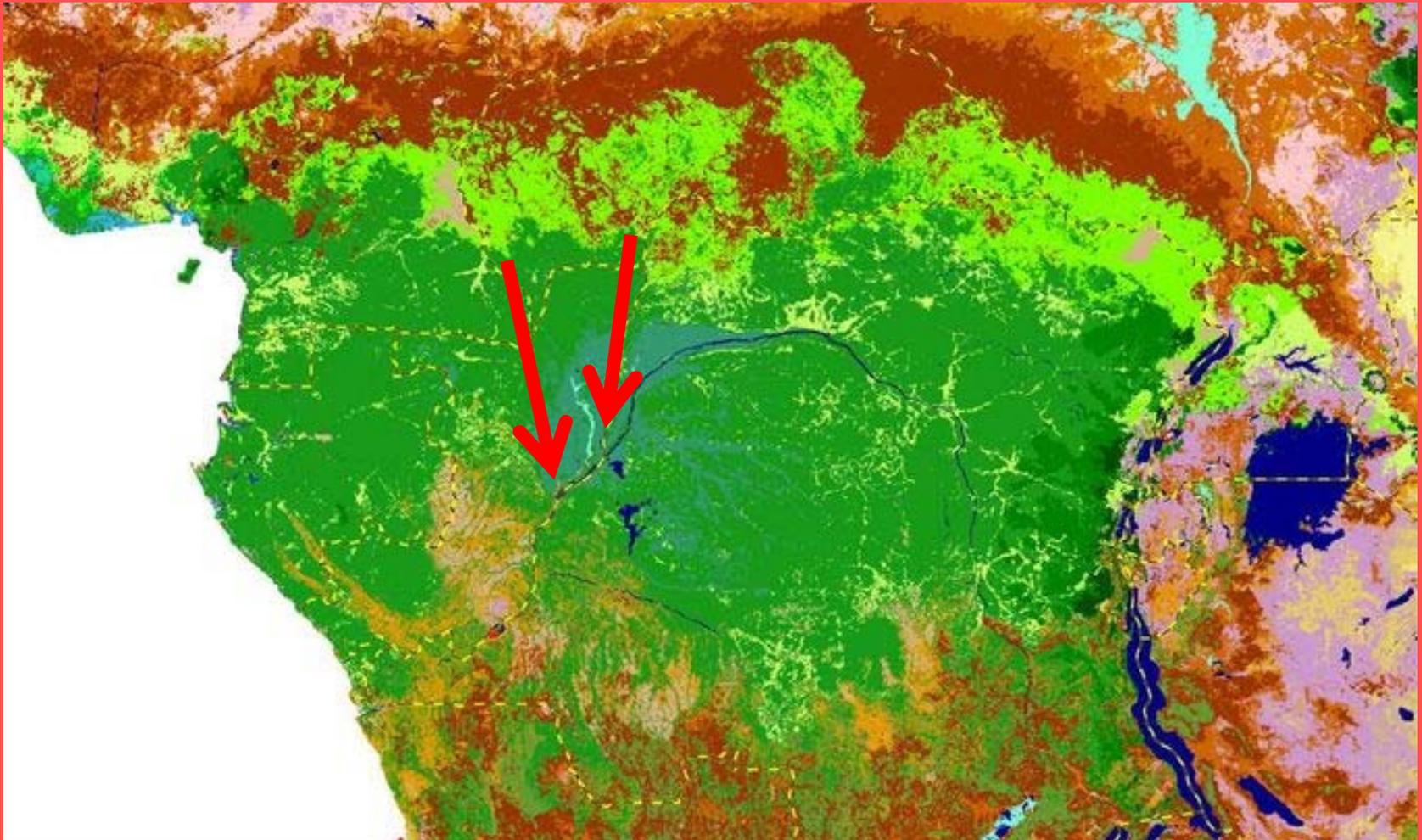
- Both archaeological and linguistic evidence suggests that there was also a primary dispersal down the coast, driven by a developing specialisation in pelagic and inshore fishing



Specialised sea-fishing communities in Cameroun

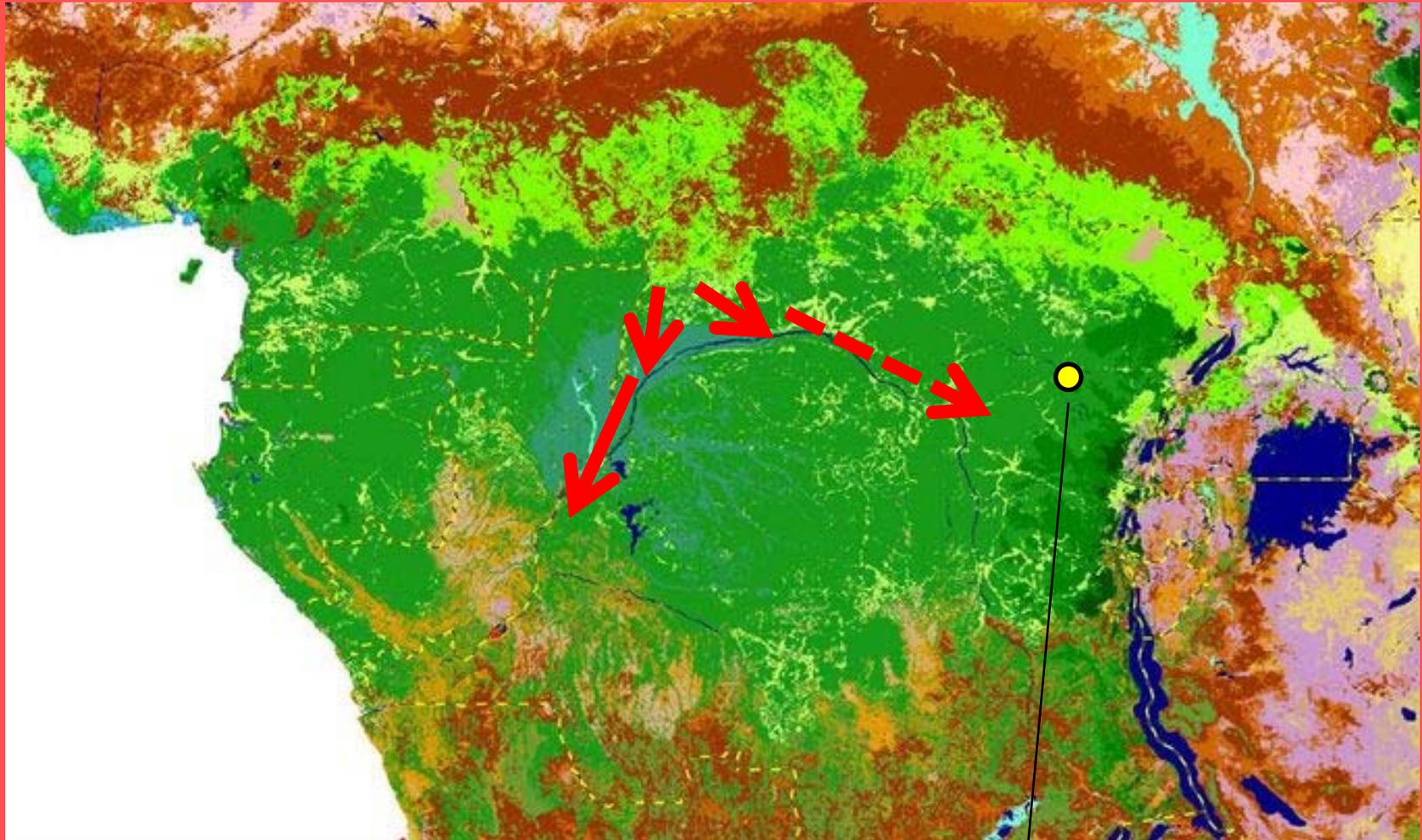


The interior route: Sangha and Oubangui





Down the Congo



Ituri

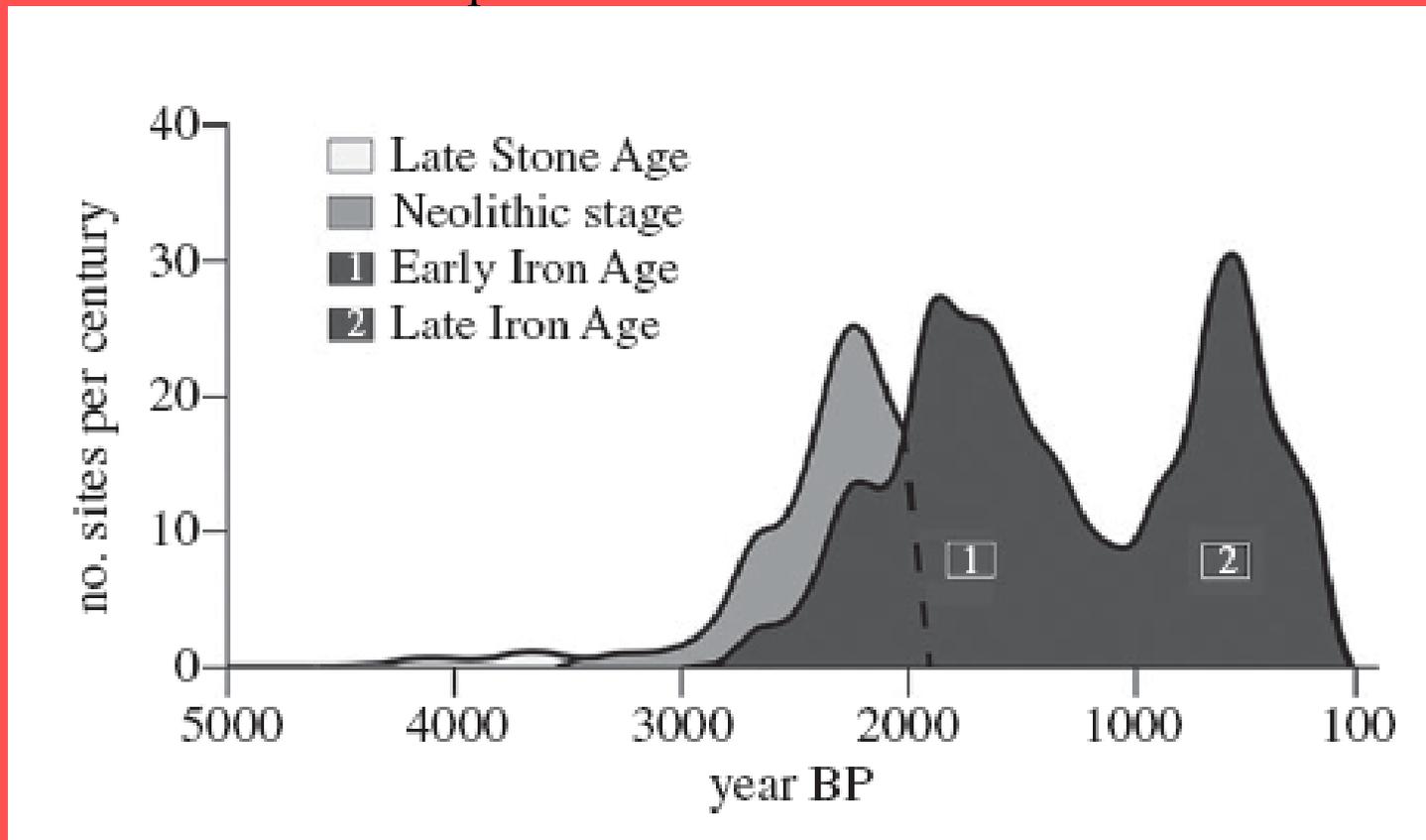
Some archaeology

We now have as many as 586 radiocarbon dates relating to Atlantic Central Africa (Oslisly et al. 2013)

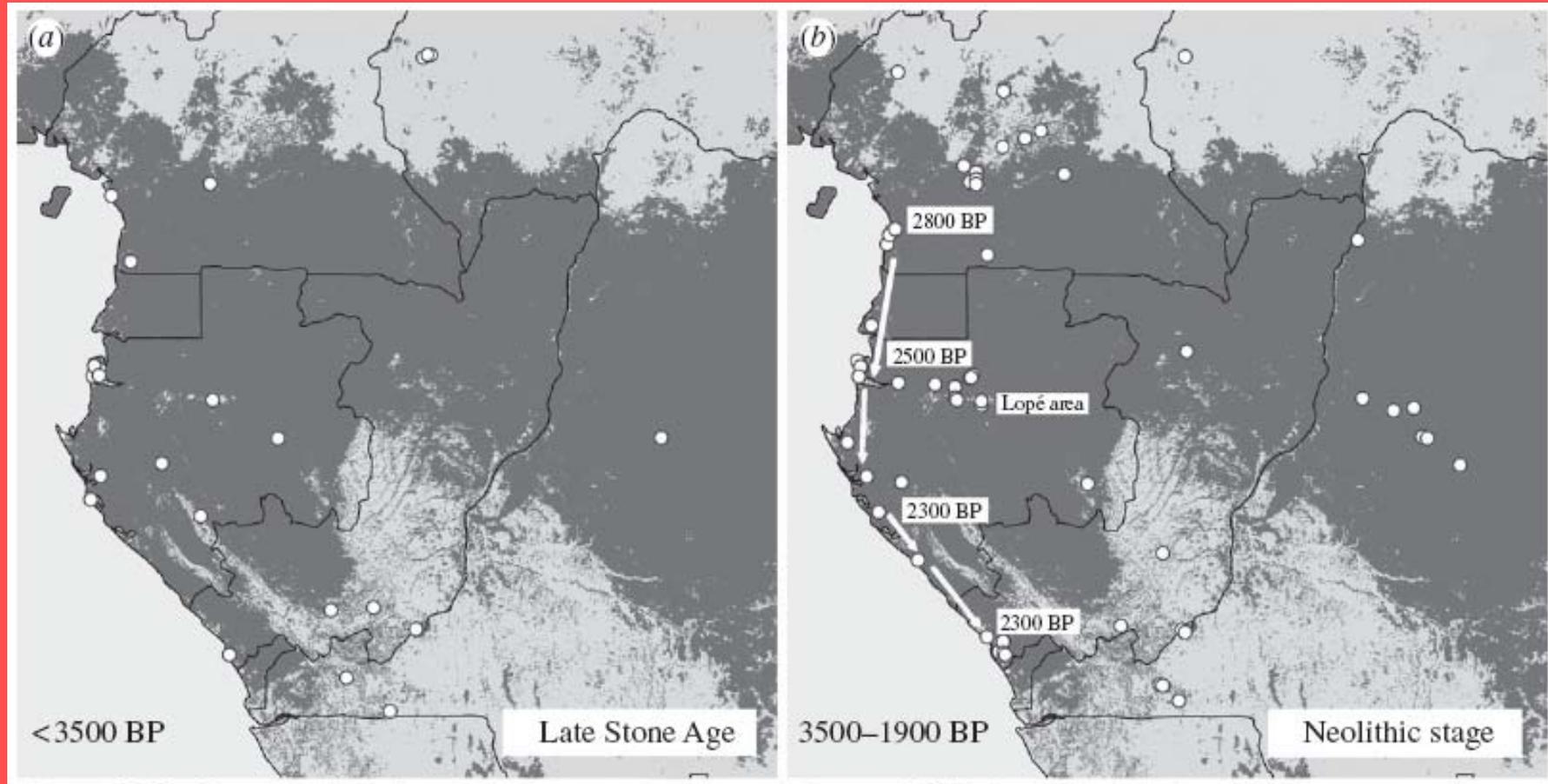
These show;

Takeoff at ca. 3500 BP

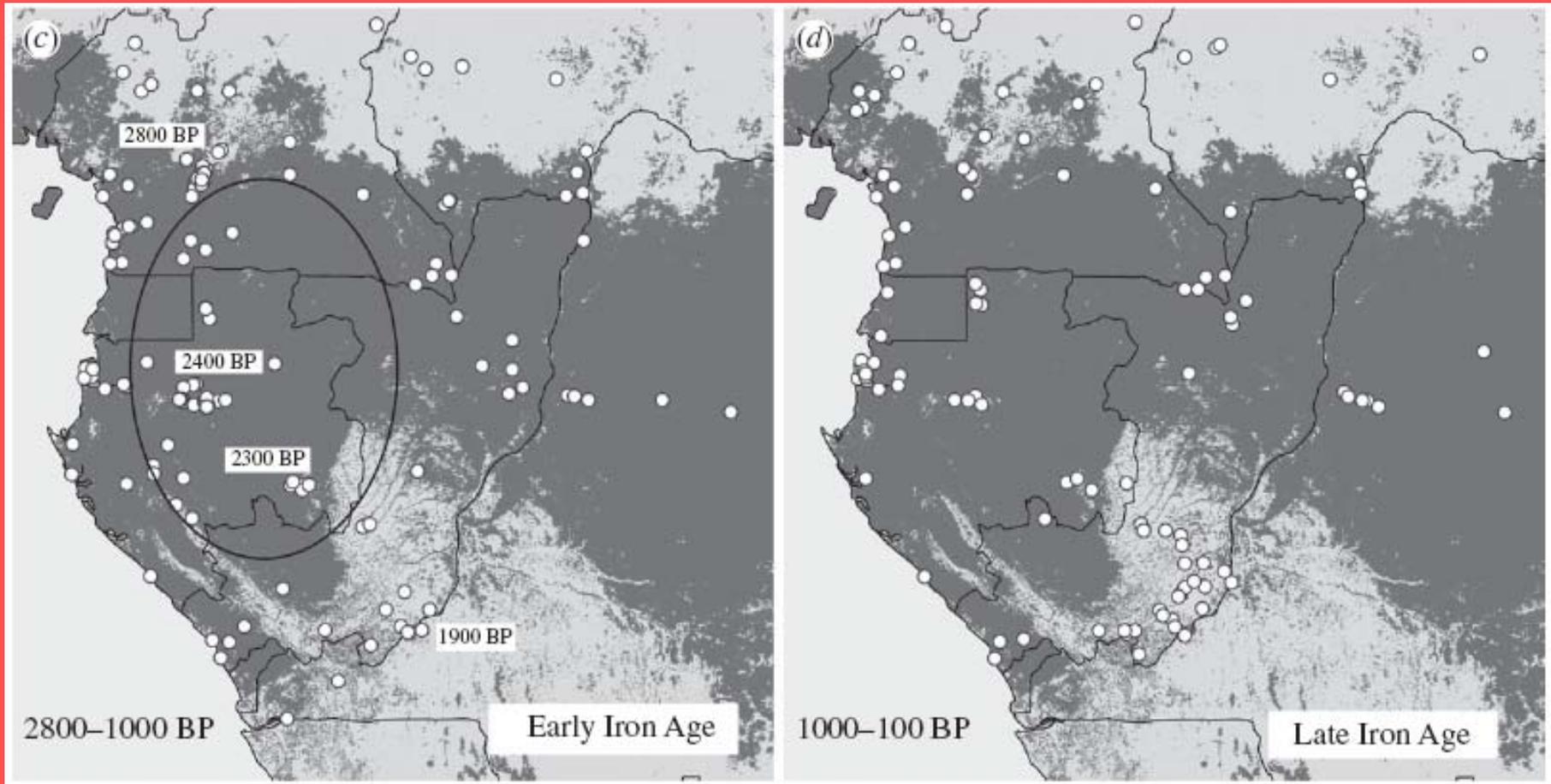
Two clear peaks



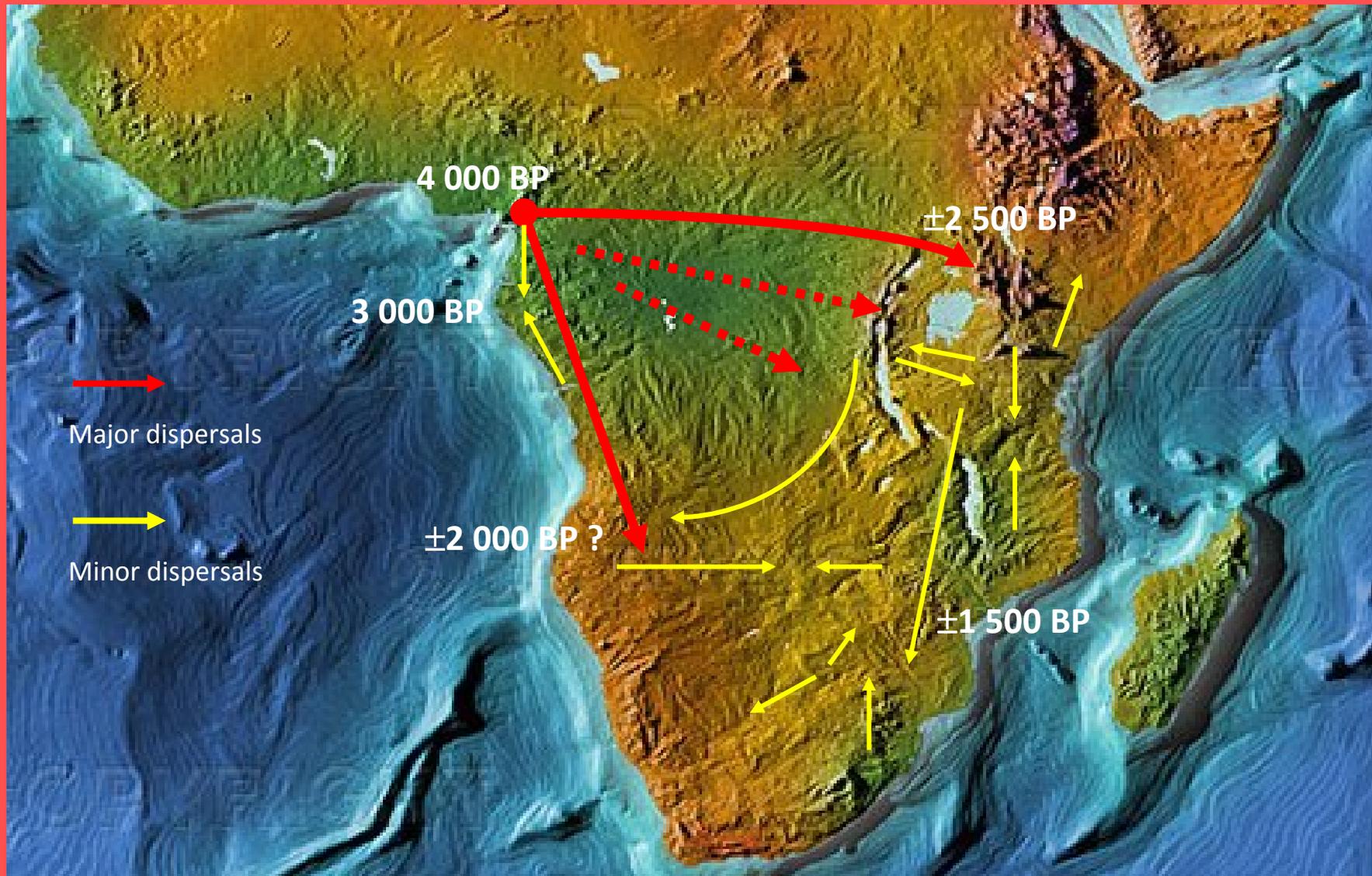
Evolution of sites I



Evolution of sites II



A synthesis of the Bantu expansion



So what does all this come to?

- The archaeological and the palynological data and point to two major peaks, roughly 3800-3500 and 2500-2000 BP, where we get forest disturbance and expansion of archaeological sites
- However, these show an important difference, as the second phase of disturbance seems to be associated with the appearance of pioneer species and (possibly) the elimination of some tree species
- The first phase of the Bantu expansion is probably related to climate change, the opening up of savanna corridors made access to new territories easier and provided zones for a mixed hunting/fishing/agriculture, in particular access to 'naive' megafauna isolated by prior episodes of forest recolonisation
- It would be perverse not to identify these with the early migrations of Bantu populations out of Cameroun

So what does all this come to II?

- The earliest threads follow three major corridors, one of which, down the coast, suggests a subgroup with expertise in pelagic fishing (confirmed by early settlement of Bioco)
- Incipient agriculture only (goats, yams (*D. dumetorum*, *D. bulbifera*), *Vigna subterranea*, *Elaeis*)
- In equatorial forest, can only really access rivers due to difficulty in cutting vegetation on a larger scale
- And indeed we see fish names spread along rivers (i.e. longitudinally) rather than areally

So what does all this come to III?

- The second phase of the Bantu expansion is almost certainly related to the introduction of iron. We know iron-smelting is attested in nearby Nigeria around 2800 BP and it is likely it had begun to reach Southern Cameroun shortly afterwards
- Iron tools transform the ability to cut down vegetation, and made it possible to expand across the equatorial forest
- We know there is a major expansion of iron-smelting on the Teke Plateau from about 0 AD onwards. Presumably tools are being traded to non-smelting communities.
- Hence the new surge of forest disturbance, further extension of sites, the distinctive profile of the Sangha gap

This is... the... distribution of...

So what does all this come to IV?

- And at a large-scale may be associated with the spread of the Mongo languages
- It is highly likely that this second expansion is associated with a more focused vegeculture, not unlike that in use today
- However, could it be that the agronomic engine of this second expansion was the arrival of the SE Asian 'food kit', Musa triploids, taro and *Dioscorea esculenta*?
- Hard archaeobotanical evidence for this event is largely absent and even the route by which such cultigens might have reached West Africa is mysterious
- But this is basically what is grown today and we would need to explain just what other plants constituted the base of agriculture

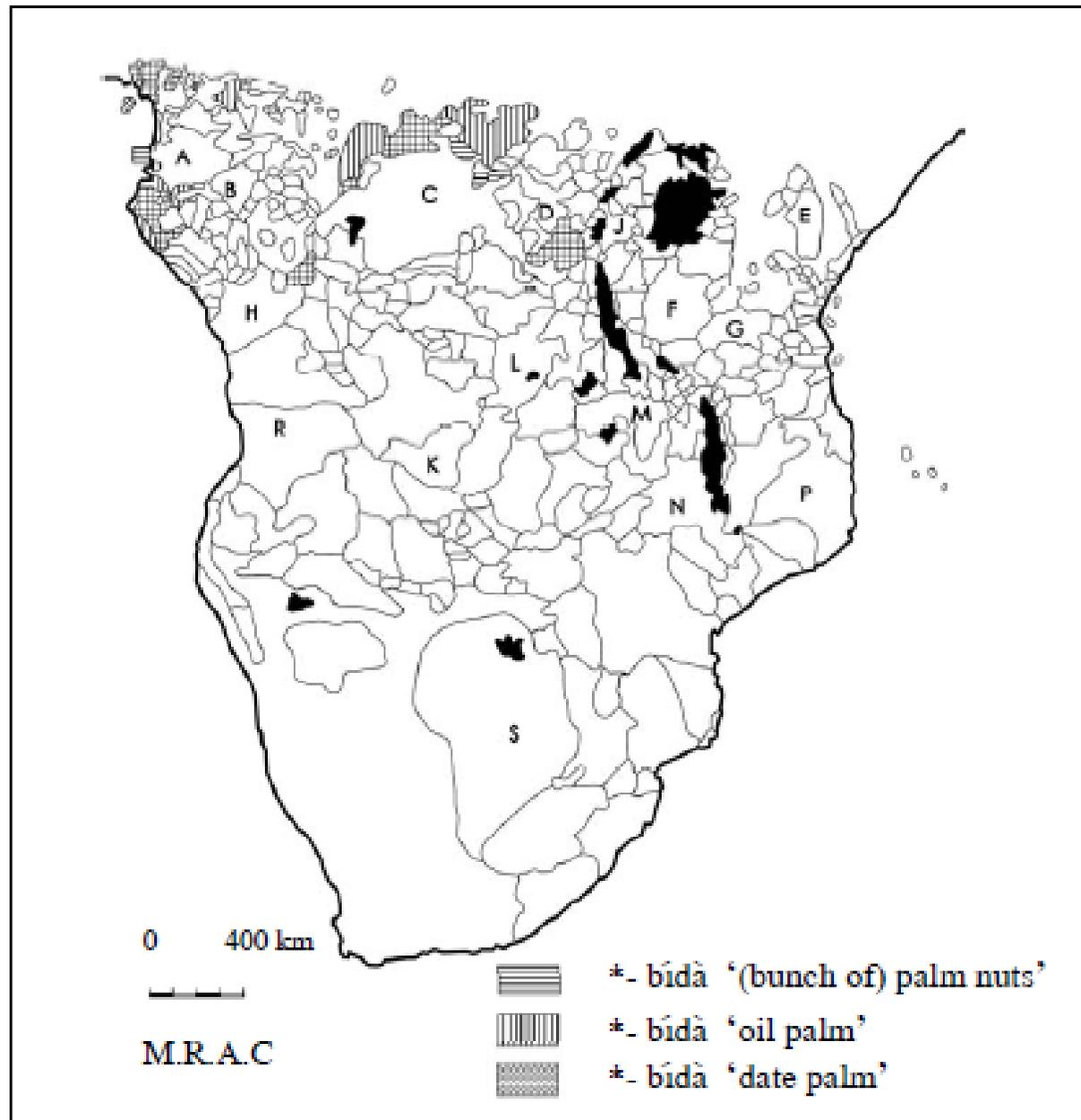
The Bantu expansion I

- The Bantu expansion represents one of the major movements in African prehistory
- Its dating and direction have been the source of much debate
- But it is probably now the best reconstructed African language subgroup and much of this material is available online
- However, a key new element is the availability of palynological data on forest disturbance.
- We now know that there was a major episode in southern Cameroun/northern Gabon ca. 4000 bp and another episode at 2800 bp
- Almost certainly these correlate with the primary expansion of Bantu (pre iron tools) and the first acquisition of iron tools (which allow you to chop down the forest)

The Bantu expansion II

- The question is then what were the subsistence strategies of the early Bantu? One plant of major importance is the oil-palm
- Bostoen (2005) gives the major reconstructions for the oil-palm as **-bá*, **-bídà*, **-tende*. We know from palynology that spores of *Elaeis guineensis* are known from as early as 5000 bp.
- The map from Bostoen shows the distribution of the major roots for oil-palm, spreading outwards from the northwest
- We can therefore conclude in principle that the Bantu expansion was later than 5000 bp and that exploitation of the oil-palm was a key subsistence strategy

Map 3: The distribution of **-bíḍà* inside the Bantu domain



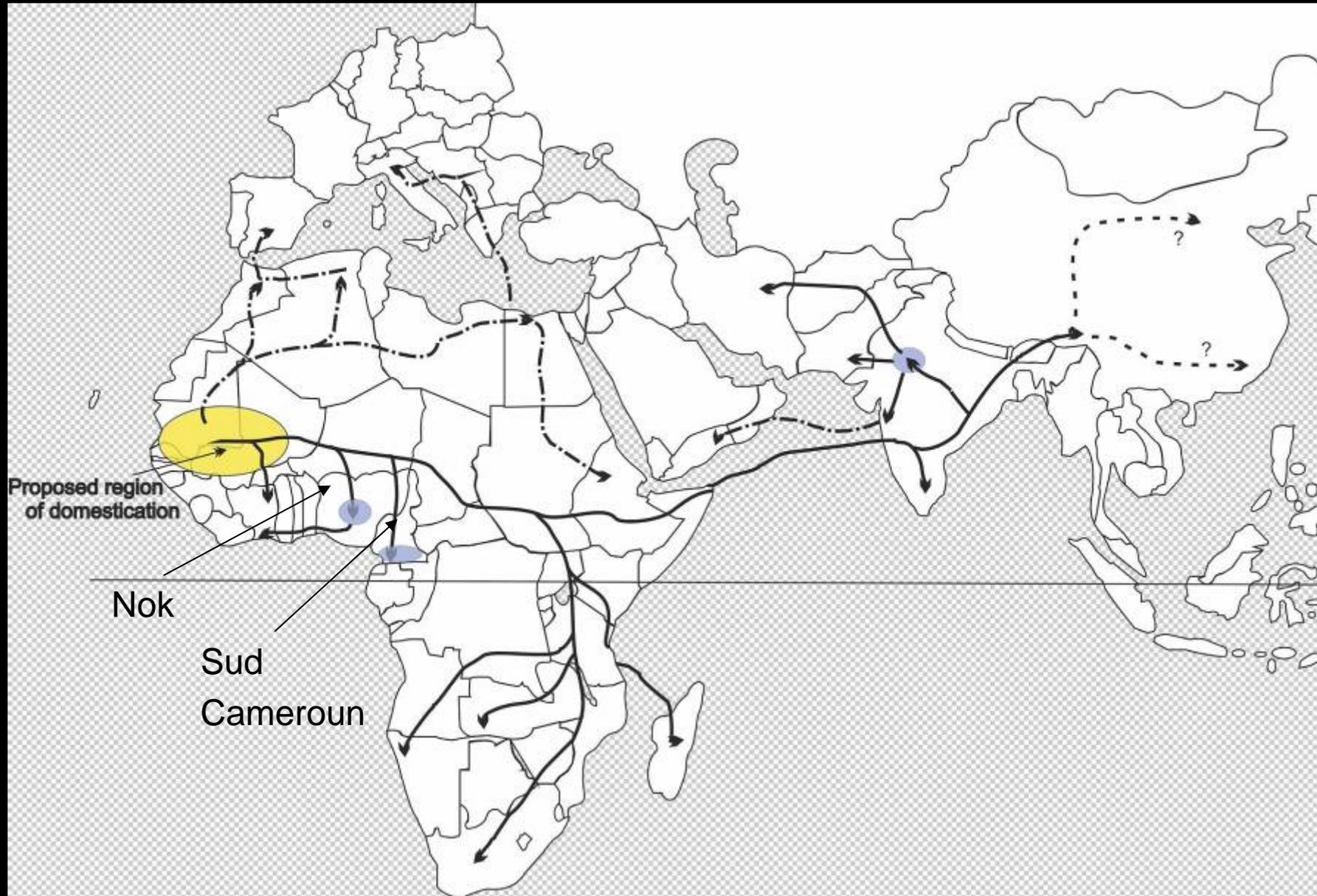
**Tracking the diffusion of
cultivated plants using
linguistics, agronomy
archaeobotany and historical
records**

Bulrush millet, *Pennisetum glaucum*

- Millet, *Pennisetum glaucum*, is a plant of African origin, apparently first domesticated in the Sahel in Maurétanie/Mali around >4000 bp.
- But confusingly, we find carbonised seeds in India at around the same period. Are we wrong about Africa, or was it domesticated twice?
- It apparently arrived in the Himalayas and then on to China ? At what date
- In Africa, it seems to have crossed the equatorial forest and then on to southern Africa
- Going north, it appears in Saharan oases by around 200 BC, and then goes on to the Maghreb and into Southern Spain
- The map shows this global diffusion



Pennisetum millet and its global diffusion



Using loanwords to reconstruct history

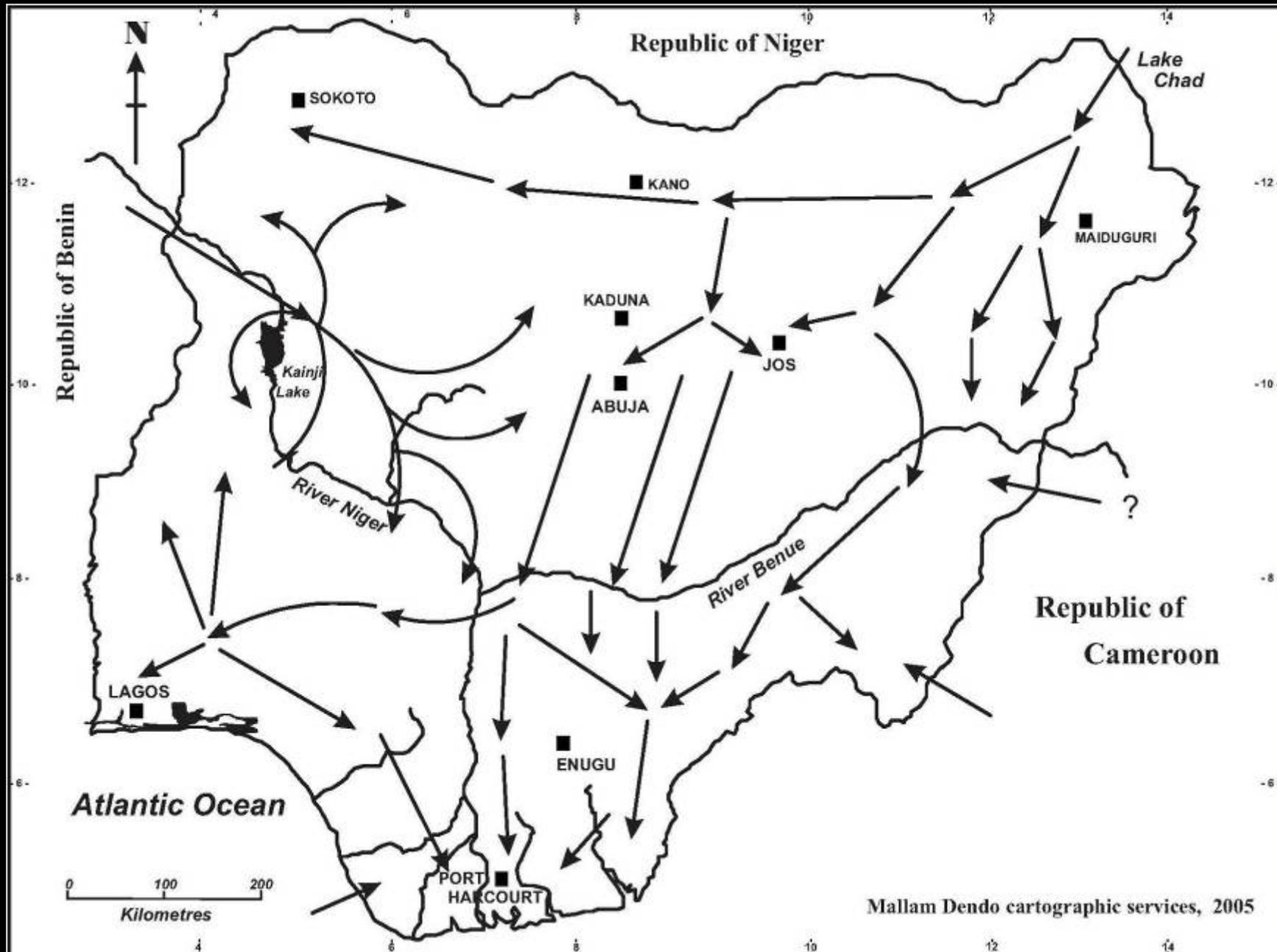
Maize, *Zea mays* L

- Loanwords allow us to trace the diffusion of individual items as well as determining trade and political aspects of social change
- Obviously if something has been transferred between continents this is easier. After contact with the New World post 1492, a large suite of crops was brought to the Old World. These included, tobacco, potatoes, cassava and maize.
- These transformed the societies into which they were introduced
- We can, for example, track the diffusion of maize into West Africa.
- Maize was domesticated in South/Central America more than 7000 bp. It became the single most important cereal in the New World
- In the sixteenth century, the Portuguese began to import cultivated plants from the New World as a staple to feed slaves

Maize, *Zea mays* L

- Cassava and maize are the best known, but the list includes the potato, the tomato, the chili, the pineapple and the guava
- These plants were rapidly adopted by African farmers and spread quickly into the interior, apparently transmitted from one farmer to another
- If we compile lists of vernacular names in the different languages, we quickly see how names were borrowed from one language to another, tracing the routes of diffusion
- If we conduct this exercise for Nigeria (nearly 400 languages) we see that maize arrived from two directions, both across the Sahara from the Maghreb and from the coast, via Portuguese traders

The diffusion of maize in Nigeria



Some conclusions

- ❖ Currently, there are opportunities as never before for linguists to engage with other scientific communities in the study of the past
- ❖ Scientific data from many disciplines is more readily available than ever before
- ❖ What this data allows us to do is approach the past from multiple perspectives rather than, say linguistics + archaeology
- ❖ This might reverse the usual intellectual process of piling up the data and seeing what it tells you to framing the goal and seeking out the sources that contribute towards a model of the past

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