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Criteria for identifying the African origin of early Pleistocene mammalian fauna in Eurasia

Critères pour l'identification de l'origine africaine d'une faune mammalienne du Pléistocène inférieur en Eurasie

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ABSTRACT

The "Migratory Wave Hypothesis" suggests that early Pleistocene *Homo* dispersed from Africa together with a suite of other large mammals. Support for this hypothesis has been found primarily at the sites of 'Ubeidiya, (Israel) and Venta Micena (Spain) where a high number of African taxa have been identified. This paper presents a critical evaluation of how we can identify these taxa and suggest criteria for the identification of taxa of African origin present in Eurasia during the early Pleistocene. Biogeography, taxonomy and chronology are used to develop criteria that have an effect on how we defined or identify African taxa. By critically evaluating the number of African taxa in Eurasia through the lens of these criteria, the number of African taxa may be reduced from a maximum of 30 to a minimum of six. The actual number may be either one of these two numbers, or any number in between, depending on how rigorous we are in applying the criteria. Thus, while the criteria presented in this paper have face value, they are not in any way more "correct" than other criteria, but are heuristic in presenting the difficulties in assigning an African origin to fauna found in early Pleistocene sites. This points to the need to be cautious when making inferences about the relationship between the dispersal of *Homo* with that of other African taxa.

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RÉSUMÉ

Les « hypothèses de migration par vagues » suggèrent que l'*Homo* du Pléistocène inférieur s'est dispersé à partir de l'Afrique avec une série d'autres grands mammifères. Ces hypothèses trouvent leur fondement principal aux sites d'Ubeidiya (Israël) et de Venta Micena (Espagne), dans lesquels un grand nombre de taxons africains ont été identifiés. L'article présente une évaluation critique de la manière dont ces taxons peuvent être identifiés et suggèrent des critères pour l'identification des taxons d'origine africaine présents en Eurasie au Pléistocène inférieur. La biogéographie, la taxonomie et la chronologie sont utilisées pour développer des critères ayant un effet sur la manière dont les taxons africains sont définis ou identifiés. Par évaluation critique du nombre des taxons africains présents en Eurasie, à la lumière de ces critères, ce nombre peut être réduit d'un maximum de 30 à un minimum de six. Le nombre actuel peut être, soit l'un de ces deux nombres, soit n'importe lequel situé entre les deux extrêmes et dépendant de la rigueur avec laquelle ces critères

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ont été appliqués. Ainsi, bien que les critères présentés dans cet article aient une valeur nominale, ils ne sont en aucune façon plus « corrects » que d'autres, mais sont heuristiques, dans la mesure où ils montrent les difficultés qu'il y a à assigner une origine africaine à la faune trouvée dans les sites du Pléistocène inférieur. Ceci met en évidence la nécessité d'être prudent à propos des déductions que l'on peut faire quant à la relation entre la dispersion d'*Homo* et celle d'autres taxons africains.

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1. Introduction

One of the main questions in paleoanthropology and human evolution is the how, what and why of early Pleistocene hominins dispersal from Africa into Eurasia (Palombo, 2013). The Southern Levant (sometimes known as Southwest Asia) has been suggested as one of the corridors through which hominins dispersed (Tchernov and Belmaker, 2004; Thomas, 1985). This unique and isolated province, with its elongated highlands and valleys, is bounded by the Mediterranean coast on the west, the Zagros and the Taurus mountains on the north, the isthmus of Suez and the Nile system on the southwest; the Arabian desert on the south and, the steppes of Syria and Trans-Jordan on the east (Bar-Yosef and Belmaker, 2011).

Several hypotheses have been developed to explain the dispersal of *Homo*. It has been hypothesized that large mammals expanded their range due to the expansion of a grassland environment stretching from northern Africa to central Asia because of a late Pliocene climate change. The term “Savannastan” (Dennell, 2003) refers to the expansion of savanna from East Africa through Asia, an expansion which would have created an ecological corridor enabling the dispersal of hominins along with other savanna-adapted taxa.

Climatic change, viewed as the ultimate driver for human evolution, has been interpreted as pulsed events in which tectonic, climatic and sea level changes altered the “permeability” of the southern Levantine land bridge. The Bab-el-Mandab Strait became a potential land bridge for the passage of fauna during cold periods, when the level of the sea decreased and more land was exposed. The Taurus–Zagros mountain chain became open to the passage of fauna during warm periods, when the mountain top climate was not too extreme. These passages functioned as a barrier or possibly a selective filter for fauna, through which only specific species could spread or pass (Tchernov, 1988).

Empirical support for the above scenario rests upon our ability to correctly identify African taxa in non-African environments. However, identification of taxa of African origin is not straightforward. This is particularly a problem as many researchers do not conduct the identification themselves, but use published reports and faunal lists (many online sites provide easy access to lists of fossil faunas across time and space) to analyze and study biogeographic patterns. Thus, the ability to critically assess what is or is not an African taxon or more accurately, what has a higher probability of being an African taxon, is the foundation for subsequent meta-analysis and reviews.

The aim of the paper is to raise awareness of inconsistencies in the literature, and to illuminate how this discord

affects the interpretation of what is an African taxon. Indeed, a reading of the current literature often obfuscates what precise definition is used by each author. I review the definition of an African taxon across the literature, and show that applying different definitions may affect the number of identified African species in Eurasia, and hence affect our interpretation of the ‘Migratory Wave Hypothesis’. While I do not side with any particular researcher on the identification of a given taxa, I draw attention to issues we need to be cognizant of when conducting literature overviews.

2. Identification of African taxa in Eurasia

Three main issues contribute to the multiple definitions of African taxa in the literature, and are variations in the definition of biogeographic regions, taxonomy, and chronology.

2.1. Biogeographic regions

It is a known axiom that the current political definitions of regions do not have any meaning in paleontological studies. Thus, the identification of an “African” taxon does not refer to the current geopolitical borders of the African continent. The geographic extent of biogeographic regions varies if you consider the entire continent vs. a smaller region thereof. The definition of what constitutes an African taxon differs between species and genera, and whether we are studying plants or animals, and if the latter are mammals, birds or amphibians (Holt et al., 2013; Udvardy, 1975), and the analytical and statistical methods used to produce biogeographic regions. Indeed, a reading of the current literature often obfuscates what precise definition is used by each author.

Since the original publication of the biogeographic realms by Sclater (1858), different scholars have defined biogeographic realms differently, producing different maps (Fig. 1). Furthermore, studies by researchers of fauna and flora often do not use a common terminology (Udvardy, 1975). The different definitions used by various scientists to define the African biogeographic realm are important to the topic of this paper.

The original definition of biogeographic realms was published by Sclater (1858) based on the distribution of birds, followed by Alfred Russel Wallace in 1876 (Wallace, 1876), who expanded on the original study. Wallace identified three main regions within the old world: Ethiopian, Palearctic and Oriental. Subsequent analyses such as those developed by Takhtajan (1969) and Udvardy (1975)

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