Climatic changes in Holocene Horn of Africa and animals exploitation by human societies

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Ethiopia and more generally the Horn of Africa shows a great diversity of landscape and environments. This region is shared between mountainous areas, the Ethiopian and Somali highlands, and arid plains with the coastal plains, the Danakil depression and the Rift Valley. Moreover the position of the Horn in tropical latitudes and the great altitudes variations have favoured the development of a great diversity of landscape going from the afro-alpine steppe to desert with also mountain forest and different types of savannah. The region is isolated from other parts of the continent by natural barriers such as the highlands and from Arabic peninsula by the Red Sea. All those elements have influenced the development and the mobility of past and present human cultures.
Many recent studies on the lacustrine sediments, pollen sequence and geomorphologic data contributed to the reconstruction of the paleo-climate of the Horn of Africa, especially of the lakes of the Rift Valley (Gasse 1975; Grove et al. 1975; Williams & Adamson 1980; Beraki et al. 1998; Mohammed & Bonnefille 1998; Chalié & Gasse 2002; Lamb et al. 2002). These data show that, until around 7,000 BC, humid conditions prevailed in the region. Then a dry phase began with an optimum around 5,500 BC. It is followed from 5,000 BC by a new wet phase which ended around 3,000 BC. From that period starts the aridification that continues until today. Only a short lake episode is noticeable during the 1st millennium AD.

Those different paleoclimatic phases provoked recompositions of biodiversity and different ecological pressure according to environmental conditions. The evolution of human societies during the Holocene shows therefore many different patterns characterized by changing and restrictive environmental conditions.

References:


To illustrate these evolutions and human adaptations, we will present archaeozoological results from 3 archaeological sites occupied during the second half of Holocene. Moche Borago is a large rock shelter, located in the Wolayta, on the south-west edge of the Ethiopian highlands.
It is 2300 m a.s.l., on the western slope of Mount Damota, a volcanic complex that reaches its highest point at 2908 m. The site is located halfway up a 20 m high cliff, which is the abrupt starting point of a steep-sided valley.
The site is a 600 m² shelter with a high ceiling opening on the west side and naturally well lightened. Its floor is relatively flat and allows a large human group. The site was discovered during a 1995 survey of the Sidamo region. Four excavation seasons were undertaken between 1998 and 2001 (Gutherz et al. 1998, 2000a, 2000b and 2001). Three areas were chosen for excavating test pits of between 4 and 10 m². These pits all contained archaeological remains and pits 1 and 3 were especially rich. These last two have been linked by an intermediate trench during the 2001 season (Gutherz et al. 2002).

References:
The stratigraphy shows Pleistocene and Holocene occupation levels. This last sequence, on which this presentation will focus, shows an occupation going from the 6th millennium BC until 5th century AD. All the archaeological levels alternate with tephra layers suggesting a periodic but strong volcanic activity until the first millennium AD (Gutherz et al. 2002).

References:
In all phases, faunal spectra are clearly dominated by bovid and especially by the African buffalo which represents 35 to 80% of the Number of Identified Specimens (Lesur 2007; Lesur et al. 2007). Other bovids consist of one species of Neotragini, one of Gazelle, two of Tragelaphini (a bushbuck and probably a mountain nyala) and waterbuck.

Aside from bovid, we find many remains of warthog, bush pig and hare. In a more sporadic way, we determined remains of Procavidae like rock hyraxes, of Primates like galago, baboon, colobe and grivet, and of Carnivores like spotted hyena, serval, leopard and Vivveridae. Faunal spectra are therefore highly diversified but dominated by buffalo. One notice also the complete lack of domesticate even during the very recent phases.

References:
The location of the shelter on the slopes of a volcano and at an altitude of 2,300 m provided a wide range of exploitable biotopes. Even though most of the volcano is now under cultivation, remnants of former biotopes are still visible today. Around the shelter and generally up to 2,200 m elevation, there are still patches of the dense and evergreen mountain forest with many tropical species that characterize the Ethiopian Woina Dega (Getahun 1978). The mountain savannah and the deciduous open forest spread on the lower slopes of the volcano and on the plain between 2,200 and 1,000 m, i.e. the upper Kwolla (Getahun 1978). Below this level, stretches the grassy savannah with trees and dense bush that extends down to Lake Abaya, 30 km away south of the site.

References:
In order to reconstruct the diversity of the ecosystems exploited by the hunters of Moche Borago in the course of time, we have allocated each species of the bone accumulation to one or several natural environments in which they live today, based on the data of Yalden *et al.* (1996), Kingdon (1997) and Stuart & Stuart (1997). Five main environments have been defined: semi-arid savannah, mountain savannah, rocky environments, open forest and dense forest. The relative importance of the different environments for each phase of occupation of the site has been estimated by the addition of the Number of Identified Specimens (NISP) of their respective taxa; for two environments, NISP have been divided equally between them (Lesur 2007; Lesur *et al.* 2007).

We see that, in all the phases, the mountain savannah was the main environment exploited (54 to 70% following the different phases), followed by the open forest (18 to 24%). The percentage of the semi-arid savannah is very variable, from 2 to 27%. Dense forest and rocky environments are always very under-represented.

It appears that the inhabitants of Moche Borago exploited mainly the environments around the shelter, i.e. mountain savannah and open forests from which they obtained the major part of their animal resources.

References:
Moreover we notice very few changes during the 6 millenniums of occupation. If we compare with the different climatic phases presented previously, it seems that the strong fluctuations of the climate during the Holocene didn’t affect much the natural conditions of this mountainous area. Only the fluctuation of the semi-arid savannah is statistically significant (Chi²= 53.6; p= 8.8 10⁻⁹) and mainly during the early phase I, that is to say, during the very dry phase at the first half of the Holocene.

Therefore, in this area, altitude and developed hydraulic systems limited draught effects. The occupants of the site have kept a stable exploitation of animal and the general faunal spectrum remains the same for millenniums. Buffalo is always the dominant species and some animals that need humid environment such as the colobe or the bushpig are still represented during the dry phases. In a general way, the site is characterized by a strong inertia even in cultural features since occupation patterns as well as the lithic industry show a very strong consistency trough the all occupation (Lesur 2007; Lesur et al. 2007).

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Let’s see now the situation in another part of the Horn of Africa, the Gobaad’s plain in west part of Djibouti. We are this time in a plain environment nowadays arid located at around 30 km from the Lake Abhé. In that plain, several archaeological sites dated from the Holocene have been excavated and we will present today the results from two them: Ali Daba and Asa Koma that are located 5 km from one another.
The site of Ali Daba contains 3 loci separated by 30 m each. Each locus presents small pits or spreading that contains humans and animal bones, fractured, burnt and sometimes worked like this pierced crocodile tooth. We will not discuss today the meaning of those sites as analyses are not finished. We can only say that those accumulations don’t seem to be consumption refuses but funerary structures (Duday et al. 2002, 2004, 2006).

In any case, one of these sites is dated from the beginning of the 4th millennium BC and present a faunal spectrum very diversified with large representation of crocodile, hippopotamus and fishes such as cat-fish and tilapia. If we see then clearly a preferential exploitation of aquatic environments, other terrestrial species vouch for hunting in wooded and grassy savannah, like African buffalo, hartebeest, lesser kudu, kob or Grevy’s zebra, black rhinoceros, lion and leopard (Lesur 2007).

References:


Asa Koma is an open air site located at the top of a small volcano. Excavations unearthed different occupation structures that testify of seasonal occupation around the beginning of the second millennium BC (Gutherz et al. 1996, Gutherz & Joussaume 2000). Faunal spectrum is dominated by fishes that represent 96% of the remains and are represented by tilapia and cat-fish. Among other taxa, we see two domestic species: cattle and probably donkey but also wild bovids such as dik-dik, dorcas gazelle and bushbuck, and side-striped jackal and hare (Guérin & Faure 1996, Lesur 2007). The domination of fish remains testify of the particular interest for fishing that must have taken place in the lake Abhé or in the wadi flowing at the foot of the site. A detailed study for the reconstitution of fishes sizes highlighted the presence of large size specimens that could suggest fishing during the rainy season when adults spawn on the lake or wadi shores (Van Neer & Lesur 2004). Besides this strong exploitation of aquatic resources, the presence of other animals testifies of hunting in the semi-arid savannah and, to a lesser extent, in a more humid environment developing along wadis (Lesur 2007).

References:
Van Neer, W. & Lesur, J. 2004 - The ancient fish fauna from Asa Koma (Djibouti) and modern osteometric data on 3 Tilapiini and 2 Clarias catfish species, Documenta Archaeobiologae 2: 141-160.
If we now compare data from those two sites, it seems that Ali Daba, dated around 3800 BC was occupied during one of the humid climatic phase of Holocene. According to Gasse’s study on the evolution of the Lake Abhé at that time, it seems that the lake was then nearby the site and wadis were flowing all year round. Those data correspond absolutely to the fauna from the site that gives the image of a more humid environment and of developed wooded vegetation. Unfortunately, on this site, no plant remains have been found to inform us more precisely on the plant species present at that time. 

1800 years later, during the occupation of Asa Koma, we are now at the beginning the arid phase from the second half of the Holocene. Lake Abhé started to recede and wadis were flowing only seasonally. It is precisely during the rainy season that humans came at the site for fishing but also probably for cattle pasture. We see then a terrestrial fauna more adapted to drier environment than at Ali Daba with the presence of side-striped jackal, dorcas gazelle and dik-dik (all those species are still present in this area nowadays). Those results are confirmed by botanical data since arid steppes plant formations prevailed in the spectrum (Newton et al. 2008).

Unlike the Ethiopian highlands, we notice this time a great change in the landscape and therefore in the faunal diversity in a relatively short time, less than 2 000 years.

References:
In conclusion, in the Horn of Africa during the Holocene, there was alternation of dry and humid climatic phases that provoked the reconstruction of animal and plant diversity. However, its impact varied according to areas. Thus on the Ethiopian highlands, the site of Moche Borago show no noticeable change in the faunal spectrum during the major part of the Holocene. Conversely, in the Gobaad’s plain in Djibouti we notice a deep upheaval in biodiversity from 2 000 BC with the presence of fauna and flora typical of arid environment. We notice therefore an evolution in the exploitation of the faunal diversity in this region with seasonal occupation of the sites and an intensive exploitation of few species such as fishes at Asa Koma (Van Neer & Lesur 2004). Finally, it is probable that those climatic changes have also provoked economic and cultural evolution with especially the beginning of husbandry at Asa Koma since the beginning of the 2d millennium BC, which is the oldest evidence of husbandry in the Horn of Africa (Lesur 2007).

On the opposite, some mountainous areas with abundant natural resources and where climatic changes had little impact, such as Moche Borago, were natural refuges where people had a late interest to adopt an economy of production (Lesur et al. 2007).

In conclusion, the Horn of Africa because of its geographical and environmental diversity has been affected in many different ways by the climatic changes during the Holocene. Human communities living in these regions had to adapt to those variations partly by a strong mobility to find necessary resources to their survival but also by the adoption of new way to exploit animal such as husbandry.

References:
Van Neer, W. & Lesur, J. 2004 - The ancient fish fauna from Asa Koma (Djibouti) and modern osteometric data on 3 Tilapiini and 2 Clarias catfish species, Documenta Archaeobiologiae 2: 141-160.