New data on the diversity of Elephants (Mammalia, Proboscidea) in the Early and early Middle Pleistocene of France

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SUMMARY: The remains of elephants are relatively scarce in Western Europe especially during the Early Pleistocene. The excavations of Ceyssaguet and Soleilhac (Haute-Loire, France) yielded a set of elephant teeth and bones, which belong to *Mammuthus* and *Palaeoloxodon* group. The majority of bones from Ceyssaguet (dated at 1.2 Ma.) are those of *Mammuthus meridionalis* but a very few bone legs belong probably to the *Palaeoloxodon* group. On the other hand the majority of elephant finds from Soleilhac belong to *Palaeoloxodon antiquus*. Nevertheless some teeth could be assigned to *Mammuthus meridionalis*.

1. Introduction

1.1 Review of Pleistocene Elephant species from Western Europe

Two groups of elephants are known from Western Europe: the *Mammuthus* group and *Palaeoloxodon* group. The first one contains three subgroups: *Mammuthus meridionalis* (with three subspecies: *Mammuthus meridionalis gromovi, Mammuthus meridionalis meridionalis* and *Mammuthus meridionalis vestinus*); *Mammuthus trogontherii* (which appears at the beginning of Galerian) and the later is *Mammuthus primigenius* (Palombo 1995). The group of *Palaeoloxodon* shows also many species and subspecies. However, Todd & Roth (1996) recognise the following three genus: *Loxodonta, Elephas* and *Mammuthus*.

2. Elephants species from France

2.1 Description of elephant remains from Ceyssaguet

Ceyssaguet is an important paleontological site localised on the outside of the Beneria volcano (Haute-Loire). Its excavation by Mrs M.F. Bonifay (1983-1997) yielded unfortunately only postcranials bones of elephants. The age of the site (by K/A) is estimated at 1.2 Ma. The most part of fossils provides from legs either found connected or partly dissociated. Our study of those fossils showed the possible presence of two elephants species: *Mammuthus meridionalis* in level 2 (the majority of bones) and probably *Palaeoloxodon antiquus* in level 3.

The humerus from level 2 are flattened transversely and present a triangular section, which characterised those of *Mammuthus*. On the fourth carpal bone the higher facet for pyramidal and the lower one for metacarpal bone V touched together along the external edge over a big length. Carpal bone III has a divided trapezoidal facet. Two complete tibias (both belong to adults animals) had the same morphology but they are different by measurements. This is due to the sexual dimorphism (Haynes 1991, Averianov 1996). In fact, male has the biggest total length of tibia (915 mm) and female has the smallest one: 694 mm (Fig. 1). Their proximal transverse diameter are respectively 313 mm /246 mm and their proximal antero-posterior diameter are 223 mm /199 mm. The distal ends have respectively the following dimensions: transversal diameter: 234/190 mm and the antero-posterior one: 214/167 mm.

This measurements are more close to those of *Mammuthus* from Aquila (total length: 860/850 mm) than to those of *Palaeoloxodon antiquus* from Upnor (which has a total length of 1020 mm). Our complete astragalus has the big height of 156 mm and the broad of 176.6 mm. The metatarsal III has a total length of 138 mm, however metatarsal IV is the biggest with 147 mm of total length.

The bones which belong to the *Palaeoloxodon* group are scarce (some fragments of posterior leg). Nevertheless they have similar morphology with the later group. A proximal fragment of tibia has a striking and straightforward crest. Moreover, some fibulas are different from those of the *Mammuthus* group of the site (Aouadi 1997; Aouadi & Bonifay 1998).

2.2 Description of elephant remains from Soleilhac

A lot of cranial and bone remains are yielded from the excavations of Soleilhac. The age of the site is 930000 years (Bonifay 1996).

Three complete tusks have their length between 1.87 and 2 m. They are straight which characterised *Palaeoloxodon* group. Measurements and features of molars are those of Lister (1996). Teeth are very height and narrow, the enamel is thin (Tab. 1).

Soleilhac teeth are similar in morphology with those of *Palaeoloxodon antiquus* from Chatelard (Beden 1969).

According to biometrics characteristics of teeth we could attribute the majority of them from Soleilhac to the species: *Palaeoloxodon antiquus.*

Metacarpal IV has the length of 205 mm and a proximal broad of 115.8 mm.

Besides the enormous remains of the *Palaeoloxodon* group, some tusks, milk teeth and legs present the type morphology of the *Mammuthus* group. Tusks are strongly curved and twisted. Teeth are broad (width of upper M2=93,8 mm) with low-crowned and thick enamel (thickness of enamel of upper M2=3.52 mm). These are characteristics of *Mammuthus meridionalis* (Lister 1996). The glenoid cavity of scapula, not very deep, has the dimensions of 189 mm (long) and 122.6 mm (wide). The radio-cubitus presents the morphology of *Mammuthus* genus with a regular surface of olecrane and with bowed olecranon on the lateral side. Its length (measured between the distal end and the olecrane) is about 87.5 cm. Hence we can confirm the presence of an evolved form of *Mammuthus meridionalis* at the site.

Tab.1 - Dimensions (in mm) of teeth of *Palaeoloxodon antiquus* from Soleilhac. (-): broken tooth.

***Palaeoloxodon antiquus* from Soleilhac**	M3 N=3 N=3	M2 N=3 N=2	M1 N=1 N=1	ML4 N=2 N=1
Lamellae number	13-21 8-14	14-16(-) 10-11	10 7(-)	10 3(-)
Length	221.1-334 175-231	179.2-229.1 189.8-197.9	175 100	129.3-135.3 55
Width	84.3-101.2 77.2-80.6	74-79 68.2-70	70.4 53.5	58.5-58.8 49.2
Height	180-212.7 146-161	145-149.5 (-)	(-) 98(-)	75.4-90 30(-)
Laminar frequency index	5.75-6 5-6	6-7 5.5-6	6 7	8 8
Thickness of enamel	2.6-2.72 2.5-3.04	2.64-2.92 2.21-2.35	2.58 2.92	2.16-2.21 1.42

Fig.1 - *Mammuthus meridionalis* from Ceyssaguet: Tibiae in dorsal view
a: left tibia of male, b: left tibia of female.

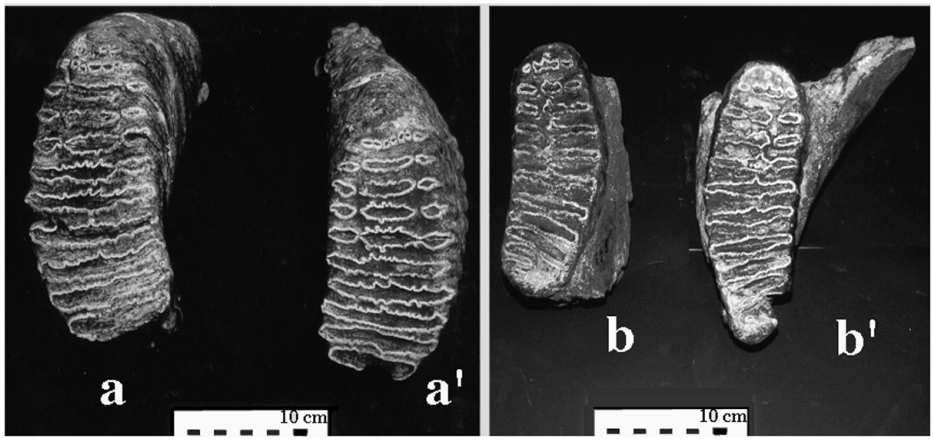

Fig.2 - *Palaeoloxodon antiquus* from Soleihlac: Teeth Upper M3 (a and a'), lower M2 (b and b').

3. Conclusions

To sum up we may state that the group of *Mammuthus* and the group of *Palaeoloxodon* lived together during the end of early and early middle Pleistocene but with the dominance of the first group during the end of the lower Pleistocene then by the second during the beginning of the middle Pleistocene in France. The lack of teeth don't allow us to give a specific level to the elephants remains from level 2 from Ceyssaguet site but we can confirm that they belong to the *Mammuthus* group whilst elephants' remains from level 3 belong probably to the group of *Palaeoloxodon*. The majority of elephants' fossils from Soleilhac are those of *Palaeoloxodon antiquus*. Nevertheless some tusks and teeth belong to *Mammuthus meridionalis*.

4. References

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