

Sobre los grandes bóvidos pleistocenos (Bovidae, Mammalia) en el NO de la Península Ibérica

About large bovids (Bovidae, Mammalia) in the NW of Iberian Peninsula

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ABSTRACT

Large bovids (*Bos primigenius* and *Bison priscus*) bone remains from NW Iberian Peninsula sites are studied in this paper. Anatomic features in both species are highly similar, which makes difficult these bone fossils to identify.

Our main interest in being able to distinguish them is based in one fact: both species are indicators of different palaeoenvironmental conditions and they are bound to be represented in Galician sites. Thus, bison keeps a continuous presence in Cantabrian sites, being the aurochs dominant in Portugal. By analysing many morphological features and carrying metric comparisons out, we have confirmed the *Bison priscus* presence in Galicia, whilst the *Bos primigenius* one is still in doubt.

Key words: Biogeography, Bovidae, *Bison priscus*, *Bos primigenius*, Quaternary, Upper Pleistocene, NW Iberian Peninsula, Galicia.

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INTRODUCTION

Bovids family is the largest in the Artiodactyla order. Inside, we can find the Bovinae subfamily; this is a polyphyletic group which includes the Bovini tribe, composed by two groups: Bubaline and Bovine. The latter is represented by *Bos* and *Bison* genera (SALA, 1986).

Earliest individuals identified as *Bison*, were found in the Villafranchian from India and China (KURTÉN, 1968). Present bisons belong to this genus: *Bison bonasus* Linnaeus, 1758 (European warm forests) and *Bison bison* Linnaeus, 1758 (Southwest USA). Moreover, this genus included the fossil species *Bison voigtstedtensis* Fisher, 1965 (Central and West Europe) which was replaced in Medium Pleistocene by *Bison schoetensacki* Freudenberg, 1910; finally, it is found *Bison priscus* Bojanus, 1827 (KURTÉN, 1968; BRUGAL, 1984). The latter was frequent in Upper Pleistocene faunistic assemblages. It is a non arctic steppe species, able of standing hard climates; it formed large droves moving towards better habitats (KURTÉN, 1968; DELPECH *et al.* 1983; DELPECH, 1989).

Bos genus counts the following species: *Bos taurus* Linnaeus, 1758 (all around the world); *Bos indicus* Linnaeus, 1758 (India and South Asia) and *Bos primigenius* Bojanus, 1827 (KURTÉN, 1968; BRUGAL, 1984), extinct. *B. primigenius* lived in great part of Eurasia, but it was not really frequent during the Pleistocene: its presence increases from Postglacial. Its habitat would be meadow and open forest; it means, more stationary and meridional areas than bisons preferred (KURTÉN,

1968; BRUGAL, 1984; CARDOSO, 1993, 1996). This was because *B. primigenius* could not well support severe climate conditions (DELPECH *et al.*, 1983; DELPECH, 1989).

So far, probably due to few number of pleistocene large bovids remains found in Galicia (GRANDAL *et al.*, 1997), aurochs presence is in doubt. The only identified remains from this genus, belong to the present species *Bos taurus*. However, we will pay special attention to *Bison priscus* due to its relative frequency in the North of Iberian Peninsula, all along the Cantabrian region (ALTUNA, 1971, 1972, 1974, 1979) and South of France. However, it is hardly present at the peninsular Northwest, being not demonstrated in Portugal because all large bovids remains were identified as *Bos primigenius* (CARDOSO, 1993, 1996).

We must first refer that fossils of Galician Pleistocene fauna -not only large bovids remains- are not exactly abundant, and this is due to several factors. In one hand, a topic that is often argued is that of Hesperic Massif lithology, because weathering process yield sediments not very suitable, at all, for preserving bone remains. On the other hand, we should refer to a particular topography, which -during cold terms- led to form altitudinal and termic barriers, forcing fauna to migrate along a narrow corridor between the coast (sea level lower than nowadays) and the most occidental foothills of Cantabrian Mountains (GRANDAL *et al.*, 1997). Cool fauna species as reindeer (ALTUNA, 1996) or mammoth (TORRE ENCISO, 1962) could reach Galicia, as

bisons, precisely because of this narrow space, urged by climate hardening in all Eurasia.

Pleistocene climatic changes in Europe are reflected in sites due to different faunistic assemblages found in them. Those changes have largely determined the distribution area of many species (DELPECH, 1984a; DELPECH, 1988). As cold events meant a decrease in sea level, formation of steppe habitats and creation of large open spaces (herbaceous type) in continental shelves, those animals adapted to open spaces and resistant to severe conditions (i.e.: bisons, horses, deers and even saiga and reindeer, typical from cold climates) would use these new habitats as refuge. Afterwards, under warmer conditions, this fauna would move again to northern latitudes and species from meridional origin would colonize these areas (DELPECH, 1989).

The Iberian Peninsula followed this pattern: climatic cooling and the logical advance of glaciers made peninsular North to operate as distribution limit for many species, both cold and warm faunas (DELPECH, 1989; ALTUNA, 1996). Fauna inputs happened by two different ways: either by the Cantabrian region or via Mediterranean. Even when northern corridor is considered as the most important, limits of both paths are not clearly defined. In fact, there is a possibility for some species, as mammoth, to reach Central Portugal (CARDOSO, 1993). However, presence of cold fauna in the Mediterranean corridor is confined to its northern zone (ESTÉVEZ ESCALERA,

1978, 1979; DELPECH, 1989; ALTUNA, 1996).

As it has been suggested before, warmer conditions forced a movement towards Northern Europe of these same species and their substitution by warm fauna assemblages (always joint with other species considered as indifferent to climatic changes). Due to geographical location of Galicia -terminus of the northern path- this country played an important role in these migrations patterns caused by climatic changes during Ice Age.

Distinguishing Bos from Bison

Many authors proposed different criteria in order to make distinction between both genera. This fact is easy when talking about rupestrian art (ALTUNA, 1971), but it is quite difficult at osteological level due to the great ambiguity shown by the most diagnosis keys. In order to get a reliable distinction, sample size enough becomes a really essential requirement (DELPECH, 1983, 1984b; GEE, 1993). As because of phylogenetic nearness, metric values often overlap in both genera (which difficults any comparison), it is very common to get anatomic features for any approximation and even to combine different criteria for diagnosis (DELPECH, 1984b).

For this, horns are the most common remains used in determinations, even taking into account their high variability inside and between populations (BRUGAL, 1984). Astragali and metapodials are widely used too. Distinctions at generic level made with teeth cannot be carried

out with an only criterion, but a combination of several features. Nevertheless, third upper molar is the most used remain for it (RÜTIMEYER, 1862, LEHMANN, 1949; STAMPFLI, 1963).

By the moment, no remains enough were found in Galicia in order to carry this study out. So this work is focused in distinguishing large bovids bones by using all available criterions. There are some previous works that mention both genera existence in Galicia. ALBERDI (1985) made a first study with a piece of horn and a left maxillar fragment, both found in Praducelos site (Suegos, Lugo), but it was no possible to distinguish them unequivocally. Afterwards, more remains were excavated in the same site, reviewing those studied by Alberdi, which gave rise to the possibility of both genera presence in Praducelos: a few specimens belonging to *Bison*, being the rest -even the horn studied by ALBERDI (1985)- classified as modern *Bos taurus* (GRANDAL & VIDAL ROMANÍ, 1991).

Paleontological study

Following the discovery of some large bovid remains in Liñares cave and this identification as *Bison priscus*, this brought us to the question of whether Praducelos remains came really from this species or not. For this, we have considered a higher number of key features, always taking into account the limits due to low sample size.

Another problem is the absolute age of the sample. Neither Praducelos nor

Liñares bovids show any radiocarbon dating, though they exist for other species found in Liñares, which can approach to the sample antiquity (GRANDAL *et al.*, 1997). These sites do not show a clear stratigraphy and even when it was so, it is unlikely a correlation with other sites (GRANDAL, 1993).

1.- Praducelos site

The following remains were identified as belonging to *Bison priscus*: a piece of left upper maxillar studied by Alberdi (1985), a fragment of humerus, a second upper molar and a lower molar series.

1.1.- Horncore.

This is a right horncore joint to a frontal fragment. Thought it was firstly thought as *belonging to a large bovid* (ALBERDI, 1985), anatomic and metric data have confirmed that it comes from a subadult individual modern *Bos taurus*. The fundamental reason for believing this assumption to be true is that its basement shows an anteroposterior flattened section and does not show any furrows which are typical from *Bison* (CLOT & MARSAN, 1986; SALA, 1986). All metric data are lower than bison and aurochs ones; these measurements could only agree with the interval defined for female aurochs (figure 1), though they are really much closer to *Bos taurus* reference individuals (from Chan do Lindeiro site, Lugo, Galicia) than to large pleistocene bovids (figure 2).

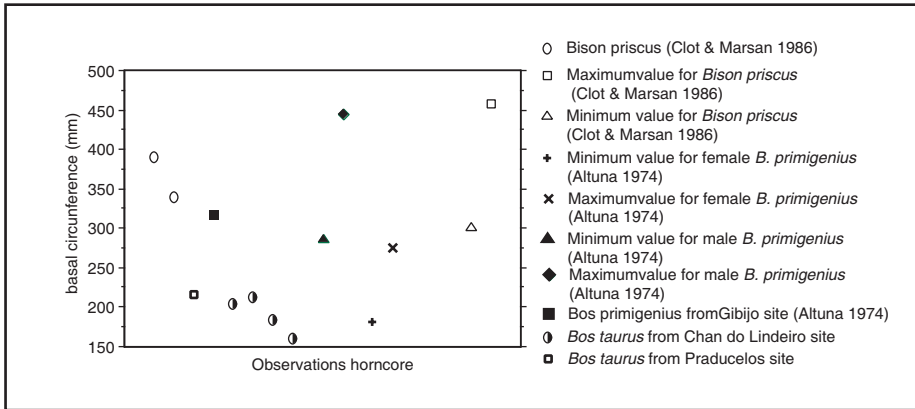


Fig. 1.- Basal circumference of *Bos taurus* horncore from Praducelos

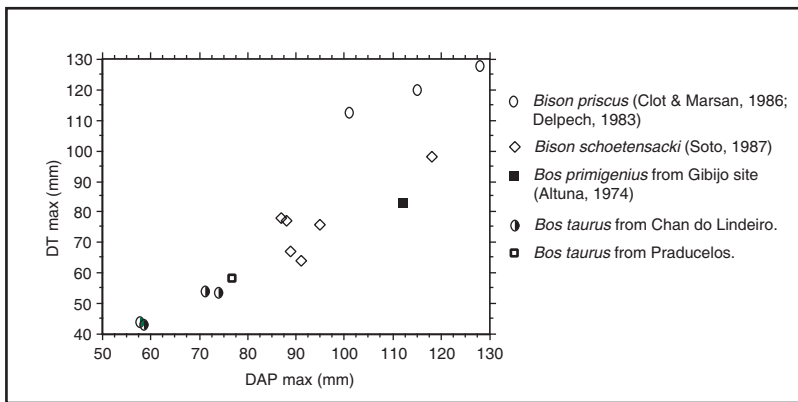


Fig. 2.- Anteroposterior diameter (DAP) versus transversal diameter (OR) of *Bos taurus* horncore from Praducelos.

1.2.- Maxillar.

It is now time to discuss the fragment of left maxillar, joint to a part of palate. In its upper part reaches the nasal bone insertion and in its base, it preserves part of the palatine processus. It is broken in the back part, just after the fourth premolar. It shows a wide infraorbital foramen over the second premolar, whose diameter is bigger than in *Bos taurus*.

This Praducelos maxillar has preserved three premolars, and it is worth stating at this point that identification process is based on this kind of teeth. By carefully observing their morphology at the same time that because of measurements (at neck level), it is possible to ensure that this piece belongs to *Bison priscus*.

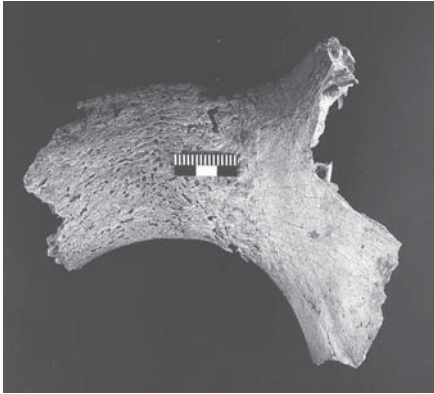


Fig. 3.- Horncore of *Bos taurus* from Praducelos site.

According to SLOTT-MOLLER (1990), *Bos* premolars are less strong than

Bison ones. Although there are few data for comparing, it can be noted that the Praducelos upper second third and fourth premolar is really wider than those ones from aurochs studied in Livernon, and even than bisons from Marcamps. Differences with *Bos taurus* specimens are significant (figure 4), moreover, p+4 morphology is really similar to the SLOTT-MOLLER (1990) description, that proposes convergent lingual and vestibular edges till the free extremity (mesial view) for bison, whilst these edges are parallels or subparallels in aurochs (figure 5).

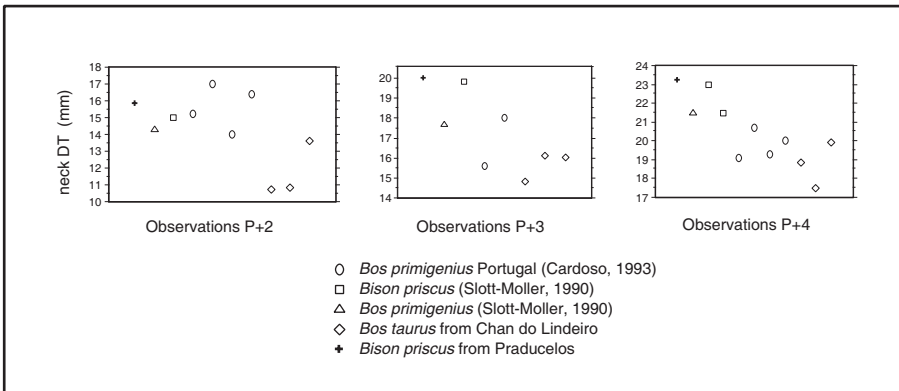


Fig. 4.- Transversal diameter (DT) at neck level for the second, third and fourth upper premolars.



Fig. 5.- Fourth upper premolar -distal view- of *Bison priscus* from Praducelos.

1.3.- Upper second molar.

Dealing with metric features in bison molars, it should be remarked that they are shorter (mesiodistal view) than aurochs

ones (DELPECH, 1984b; SLOTT-MOLLER, 1990), which seems to be true in Praducelos specimens (figure 6).

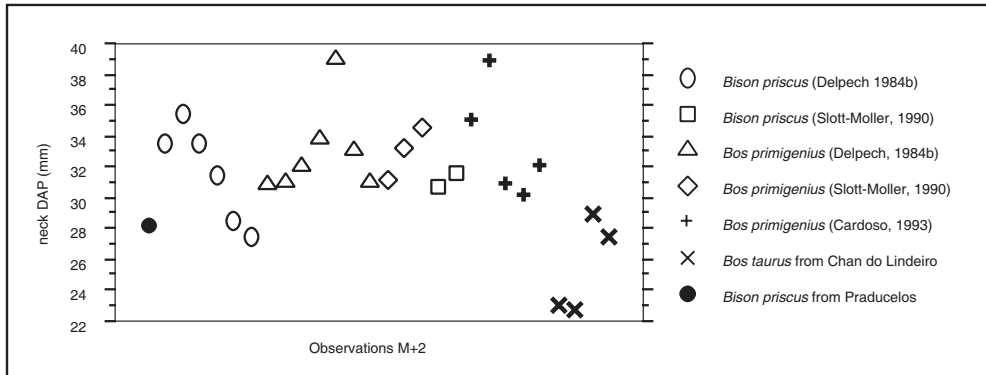


Fig. 6.- Mesio-distal diameter (DAP) at neck level of the second upper molar from Praducelos *Bison priscus*.

Concerning its morphological features, its attribution to a specific genus is more doubtful due to these characteristics are medium between *Bos* y *Bison*. Its section at neck level does not reach trapezoidal shape, and shows a central enamel islet between the two lobes and an entostyle which, though almost short, displays a morphology closer to aurochs (DELPECH, 1984b; SLOTT-MOLLER, 1990).

1.4.- Mandible.

It has been preserved a part of the jawbone: the part ranging from first to third molars, including these dental pieces.

From metric analysis of these three specimens, it follows that Praducelos molars could belong to *Bison* genus, both concerning the vestibulo-lingual diameter as well as the mesiodistal diameter, which for the lower third molar is usually higher in aurochs than in bisons (DELPECH, 1984b; SLOTT-MOLLER, 1990) (Figure 7).

Morphological criterions such as ectostyle length also coincide, showing a highness quite similar to other bison specimens, whereas this ectostyle is often higher in *B. primigenius* (DELPECH, 1984b) (figure 8). The canal formed between the metacone and entocone in lingual view, which is deep and straight in the three

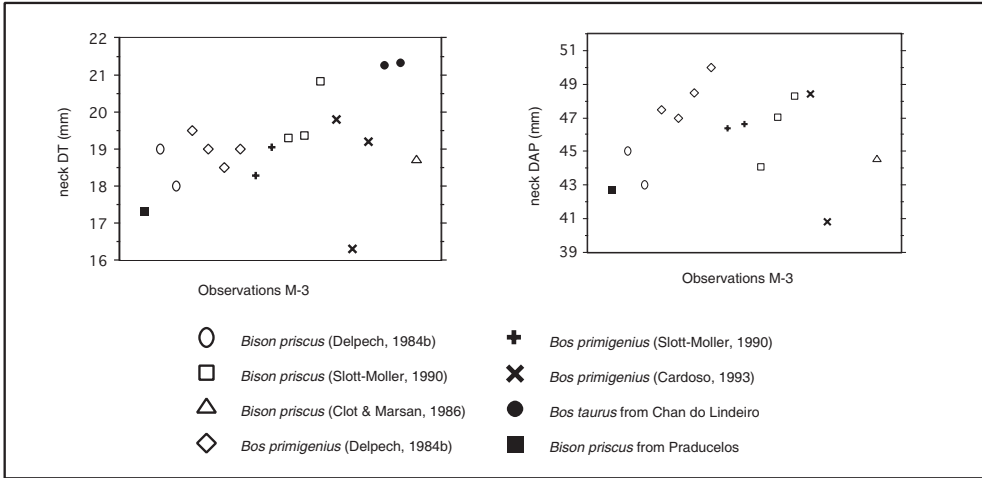


Fig. 7.- Transversal diameter (DT) versus mesio-distal diameter (DAP) at neck level for the lower third molar in some bovids.

molars of the Galician site as usual in bisons (DELPECH, 1984b). The vestibular edge morphology (mesial view) for the third molar also coincides with those

reported for *B. priscus* and the absent of the spine between the second and third lobe of third molar, that aurochs show in most cases (SLOTT-MOLLER, 1990).

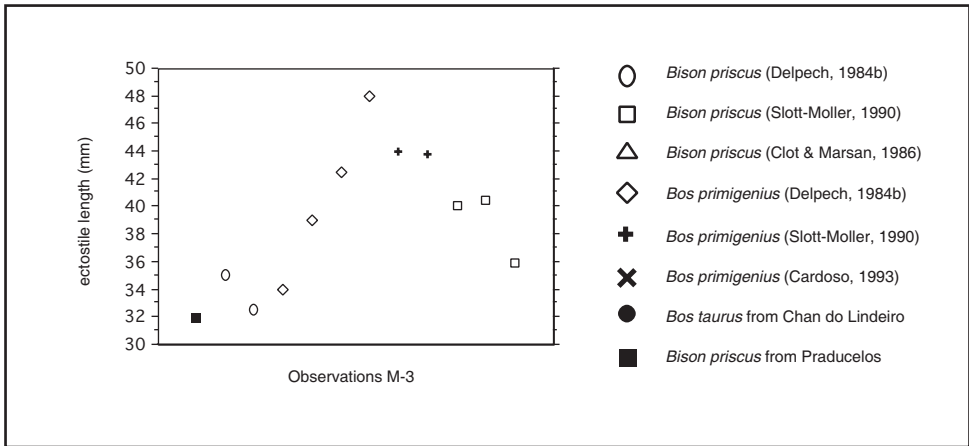


Fig. 8.- Ectostyle length for the lower third molar in some bovids.

The last considered key for classification, deals with the posterior extension of M-3. Praducelos M-3 does not fit clearly to bison description. It follows (in *Bos*) the same direction that molar main axe,

whilst it is oblique in *Bison* (STAMPFLI, 1963). Anyway, DELPECH (1984b) doubts about this criterion and SLOTT-MOLLER (1990) finds many exceptions.

1.5.- Humerus.

The last specimen identified as *Bison priscus* is a proximal fragment of a right humerus. As before, there is not sample size enough in order to establish any comparison. Moreover, its bad preservation condition does not allow any significant measurement. Some subjective features as specimen size, nearness inside the site with other bison remains, colour and porosity made GRANDAL & VIDAL ROMANÍ (1991) to include it inside the *B. priscus* group and not in *Bos taurus* as the rest of bovids remains from Praducelos.

2.- Liñares Sur site.

By the moment, almost all its fauna was identified as *Cervus elaphus* and *Ursus spelaeus*, but the discovery of a large bovid left tibia and left astragalus with a perfect preservation condition, makes possible to demonstrate the *Bison priscus* presence in the NW of Iberian Peninsula.

2.1.- Tibia.

Usual criterions to distinguish both genera lead to the distal epiphysis. BRUGAL (1984) holds that differences in the proximal part are also important, though other authors consider them as caused by different age class of individuals (KOCH, 1932 *In* SALA, 1986).

The proximal epiphysis description (figure 9) is very similar to BIBIKOVA's (1958) and BRUGAL (1984): it displays triangular section; a sharp tuberosity in

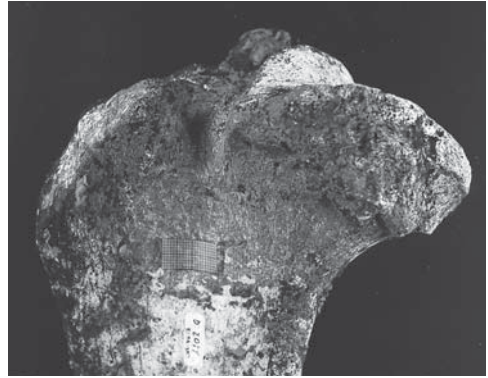


Fig. 9.- Proximal extremity of the *Bison priscus* tibia from Liñares site.

the anterior face whereas medial and lateral articular surfaces show rounded edges; intercondylid eminences are important; show foramens quite marked in the anterior part of the intercondylid area over a more or less wrinkled surface and the furrow in the posterior intercondylid area does not exist in Liñares tibia (which always appears in aurochs).

Other arguments can be shared by both genera: a slightly leant (which is typical from aurochs) of the extensor furrow, the tibial crista length, the development for each crista following the diaphysis and the existence of the groove for *flexor digitalis longus* muscle (BIBIKOVA, 1958; BRUGAL, 1984; GEE, 1993).

The degree of junction between articular facets from tibia and malleolus (figure 10) (distal extremity) is often used as distinguishing key: they are joint in aurochs and separated in bisons (LEHMANN, 1949; BIBIKOVA, 1958; STAMPFLI, 1963; SALA, 1986) despite the great variability this feature may show (STAMPFLI, 1963; BRUGAL, 1984). In

Liñares tibia, both surfaces are together, though there is a well marked groove between them and the morphology of the anterior facet agree with that described for *Bison* -circular and convex- (STAMPFLI, 1963; BRUGAL, 1984).



Fig. 10.- Distal extremity of the *Bison priscus* tibia from Liñares site

The most frequent metrical criterion for *Bos-Bison* distinction is (in the distal articular surface) the ratio anteroposterior diameter / transversal diameter. LEHMANN (1949) proposed some intervals for *B. priscus* (71.9-76.9) and *B. primigenius* (67.1-81.9). STAMPFLI (1963) showed different values for both genera: *Bison* (70.9-80.7) and *Bos* (70.1-85.5). As over-

lapping is large enough in both cases, Liñares value (73.59) can be included in any of them.

2.2.- Astragalus.

Astragali and metapodials are the most used specimens for distinguishing *Bos* from *Bison*, based on both morphological and metrical data. Even when we are dealing with only an individual, data point to the same conclusion: *Bison priscus*.

Astragalus is considered larger and narrower in bison than in urus (RÜTIMEYER, 1862; SALA, 1986). Liñares piece shows indeed a higher length, though its transversal diameter does not fit properly. Thus, we have appealed to several index -used by other authors- which combine both measurements. SCHERTZ (1936) proposed a lateral and mesial index with measurements from different sites, though Liñares only fits the first. LEHMANN (1949) and STAMPFLI (1963) debated these index and proposed new values, though too much overlapping exists again between both genera and they are difficult to use (figure 11).

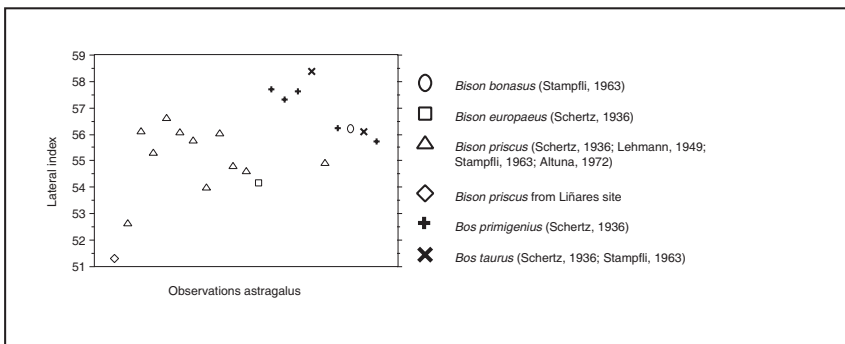


Fig. 11.- Lateral index (mesio-distal diameter . 100 / lateral length) for bovid astragalus.

Schertz also held that *Bison* shows a groove in the plantar face, which separates articular facets for centrotarsal and calcaneous. This was confirmed by DELPECH (1972, 1984b) and STAMPFLI (1963) and used later by SALA (1986) and CARDOSO (1993), despite all exceptions found by other authors (LEHMANN, 1949); LÜTTSCHWAGER, 1950; CHAUVIRÉ, 1962). Liñares specimen confirms the existence of such a groove (described for *B. priscus*), and also its trajectory all along the

plantar face and the angle that this groove forms when reaching the lateral facet (LEHMANN, 1949; STAMPFLI, 1963), the existence of a very marked flange rounding the posterior nutrient foramen and following the plantar groove (BIBIKOVA, 1958; GEE, 1993), and the morphometric characteristics of the little articular surface with calcaneus (lateral view) (BIBIKOVA, 1958; STAMPFLI, 1963; SALA, 1986) (figure 12).

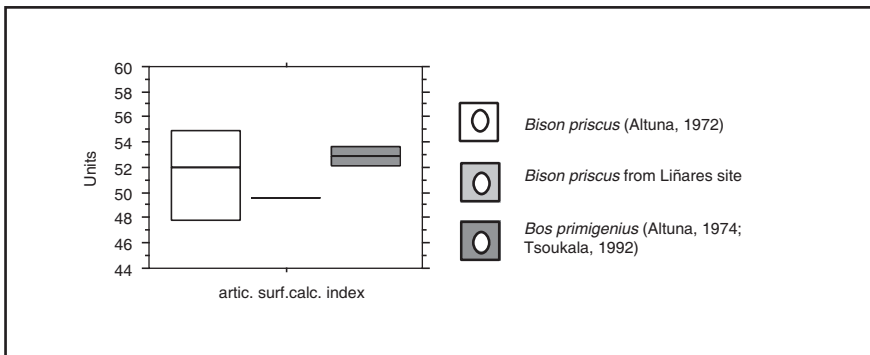


Fig. 12.- Index for the articular surface of bovid astragalus with calcaneus.

Otherwise, it does not fit other criteria described for *Bison*, above all at head level in the astragalus; i.e.: the ratio wideness of the internal part divided by the external one and the valley deepness between them (BIBIKOVA, 1958; STAMPFLI, 1963; SALA, 1986).

CONCLUSIONS

Bison priscus presence -already mentioned by other authors when studying bones from Praducelos site- seems to be confirmed by new bone remains found in Liñares site.

Although our identifications tried to take into account the highest number of features, it is worthy of note that definitive outcomes need a much more available sample size.

It is confirmed that the horn remain found in Praducelos belongs to *Bos taurus*, whereas the maxillar fragment, the second upper molar and the lower molar series might fit *Bison priscus*. The humerus fragment was not taken into account because of its bad preservation.

When using same diagnosis criterions in Liñares site, it is not possible to reject its tibia and astragalus to belong to *Bison*

priscus. These data, together with those from Praducelos, could demonstrate the existence of this species all along a north corridor in the Iberian Peninsula. Through this corridor, fauna from cooler European latitudes could reach Galician ones during the hardest climatic conditions of Pleistocene.

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