

ZEBUS AND INDIAN WILD CATTLE

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Summary

The zebus represent a special group of domesticated cattle that is characterized by its elongated, very narrow skull, peculiar horn form, cervico-thoracic or thoracic hump, spinae bifidae on certain thoracic vertebrae, drooping rump, and a leggy conformation with long, slender metapodials.

As the wild form of zebu, the Indian wild cattle (*Bos primigenius namadicus*) can be taken into consideration. The area of distribution of namadicus wild cattle extends to the dry parts of India and possibly to Southeast Asia, and their westernmost limits are the Great Salt and Lut Deserts of Iran, particularly their eastern borderlands.

Lately, a Chalcolithic-Bronze Age site of Iranian Sistan (Shahr-i Sokhta) produced good evidence of the occurrence and local domestication of Indian wild cattle through characteristic, flattened, keeled horn cores and the presence of domestic zebu by figurines, bifid vertebrae and the relative length and slenderness of distal extremity fragments.

Obviously, zebu domestication happened in the Neolithic of the Indian Peninsula as well, the earliest attempt took place by our most recent knowledge in Mehrgarh, Middle Pakistan. Nevertheless, in India, taurine and humped cattle coexisted very well, though the swift-legged zebu had an advance as draught animals of peasant households.

Zebus reached Mesopotamia in the 5th millennium bc and Africa through southern Arabia and the Horn of Africa in the early 2nd millennium bc, and a little later via the Levant as well. They arrived in Europe quite late, in the time of the Roman Empire.

Résumé

Zébus et bovins sauvages d'Inde.

Les zébus représentent un groupe particulier de bovins domestiques caractérisé par un crâne allongé et très étroit, une forme particulière des cornes, la présence d'une bosse cervico-thoracique ou thoracique, des apophyses épineuses bifides pour certaines vertèbres dorsales, une croupe tombante et des membres longs avec des métapodes élancés.

Pour trouver l'ancêtre des zébus, il convient d'examiner le bœuf sauvage d'Inde (*Bos primigenius namadicus*). Son aire de répartition s'étend aux régions plus sèches de l'Inde et peut-être de l'Asie du Sud-Est, et sa limite occidentale se situe sur les bordures est du Grand Désert Salé et du Désert de Lut, en Iran.

Récemment, un site daté du Chalcolithique et de l'Âge du Bronze du Sistan iranien (Shahr-i Sokhta) a livré de bons arguments pour la présence et la domestication locale du bœuf sauvage d'Inde, sous la forme de chevilles osseuses carénées et aplaties, de figurines de zébus domestiques, d'apophyses vertébrales bifides et d'éléments osseux des extrémités élancés.

Il est clair que la domestication du zébu a eu lieu au Néolithique dans la Péninsule indienne, la plus ancienne attestation venant des récentes découvertes de Mehrgarh (Pakistan). Des bovins de type taurin et de type zébu ont cependant très bien coexisté en Inde, en dépit du fait que les zébus, plus rapides, étaient préférés par les fermiers pour la traction.

Les zébus ont atteint la Mésopotamie au Ve millénaire bc et ont gagné l'Afrique au début du II^e millénaire av. J.-C., en passant par l'Arabie et la Corne de l'Afrique et, un peu plus tard, par le Levant. Ils ont fait une apparition plus tardive en Europe, avec l'Empire romain.

Zusammenfassung

Zebu und indisches Wildrind.

Die Zebus repräsentieren eine spezielle Gruppe der Hausrinder, die durch einen verlängerten, schmalen Schädel, eine eigenartige Hornform, einen cervicalen oder thoracalen Buckel, gespaltete Dornfortsätze (spinae bifidae) bestimmter Brustwirbel, einen muskelarmen Rumpf und lange Beine mit besonders langen und schlanken Metapodien charakterisiert wird.

Heutzutage sind die meisten Autoren darin einig, daß der wilde Ahne der Zebus nur die indische Unterart des Ures (*Bos primigenius namadicus*) sein kann. Das Verbreitungsgebiet des indischen Wildrinds erstreckte sich neben den trockenen Teilen Indiens wahrscheinlich auch auf Südostasien und seine westlichen Ausläufer waren in der Grossen Salzwüste bzw. in der Lut-Wüste Irans zu finden.

Neuestens hat man eine chalcolithisch-bronzezeitliche Siedlung (Shahr-i Sokhta) im nordost-iranischen Sistan ausgegraben. Dieser Fundort hat gutes Beweismaterial für das Vorkommen und die örtliche Domestikation des indischen Wildrinds in Form von: seinen charakteristischen, gekielten Hornzapfen und für das Vorkommen von domestizierten Buckelrindern durch Figurinen, bifide Dornfortsätze bzw. durch lange und schlanke Metapodien geliefert.

Die früheste Zebu-Domestikation hat auf der Indischen Halbinsel in der Jungsteinzeit stattgefunden, die frühesten domestizierten Zebu-Rinder gehen bis 6 000 B.C. in Mehrgarh, Mittel-Pakistan zurück. Domestizierte taurine und Zebu-Rinder lebten gut zusammen, jedenfalls waren die Buckelrinder schnellere Zugtiere als die taurinen Rinder und das bedeutete einen Vorteil in einer Region, wo Ochsen auch bis heute die wichtigsten Zugtiere der Bauernwirtschaften sind.

Buckelrinder haben Mesopotamien schon im 5. Jahrht. v. Chr. erreicht, in Afrika sind sie doch erst am Anfang des 2. Jahrht. v. Chr. durch Südarabien und das Horn von Afrika und ein bisschen später auch durch den Levant angekommen.

Die frühesten Zebus sind in Europa viel später, erst in der Periode des Römischen Reiches erschienen.

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The zebus make out a considerable part of domestic cattle. They prefer hot and arid climates; nevertheless, aridity is more essential for them than heat, a fact that enables them to survive in arid plains of Central Asia that are hot only in summer time whereas they can have cruelly low winter temperatures.

Their original homeland is the southern half of Asia, from where they first penetrated neighboring territories and they became widespread in remote areas such as Africa and the southern fringes of Central Asia. In modern times they were carried over to further continents (North and South America and Australia) as well, and they have been feeling well and were consequently breeding successfully both in a purebred form and also in crossings in their new homelands.

The zebus' main and foremost distinguishing characteristic is that they are humped. The zebu hump is not equivalent with the hump of the camel, the fat rump of the short-tailed sheep or the fat-tail of the long-tailed sheep. Whereas the latter are simple fat accumulations, the hump of the zebu can be regarded as an enlarged muscle, however, it is also possible that the zebu's hump contains some fat as well; this could be even an adaptation to a climate with a marked seasonal difference (Slijper, 1951, 6ff.)

In agreement with Curson and Bisschop (1935: 18), Epstein (1971: 328) classified the zebu humps according to cervico-thoracic or thoracic body regions, and according to muscular structure and fatty. Zebu sometimes have divided humps. Epstein found artistic representations of such zebus from Susa, 3000 bc (Epstein, 1971: 508) and from Elam (Epstein, 1971: 510, fig. 607), nevertheless, it is not certain that such divided humps can osteologically be determined.

Mason (1963: 17) suggests that the hump is a product of domestication. In his opinion it would be impossible to determine from fossil (and also subfossil) skeletal remains whether a hump was already present in the zebu's wild ancestors. This is certainly true, nevertheless only the presence or absence of bifid vertebrae would help us to decide this question. Bifid vertebrae are an important, although not indispensable characteristics of zebus. Such bifid thoracic vertebrae can generally be found in the thoracic segment of the rachis, though they can also be missing and they can rarely be occurring in humpless cattle. Such cases have been described by Noddle (1976: 287, pl. VIII) in a Saxon-Norman site and by Stallibrass (1983: 265) in a 3rd

to 4th century AD Roman site of Britain and by the author from the Late Neolithic of Southwest France, thus from regions where the occurrence of zebus or their crossings were quite improbable in the given time periods.

An original idea was suggested by Mason (1963: 18). According to him, the hump mostly along with the long horns and the envelopped dewlaps is a product of deliberate selection by man. As he explains, the early cattle breeders breeding their sacred bulls wanted the most imposing, the most "bullish" bulls as possible. Since the hump is primarily a secondary sexual character, its size being larger in bulls than in cows, this fact also drew the breeders' attention, resulting in a selection toward this direction.

The zebu skull is very elongated and narrow. This is particularly so in the aboral part of the frontal region showing a very narrow intercornual ridge between the horn cores. The forehead is commonly convex, particularly in bulls and oxen, less in cows. As Epstein (1971: 198) points out "the typical zebu skull is remarkable for its lack of elevations and cavities". The highest point of a zebu skull can generally be found right behind its eye sockets. The latter are less protruding than those of taurine cattle and are situated more outwards and less forwards. Another interesting zebu feature is the absence or at least the reduction of supra-orbital ridges. The horns vary in size and form. Both long-horned and short-horned zebus exist and hornless animals also occur. Their horn form basically differs from that of the taurine cattle: their typical direction is lateral or upright with a backward tendency (this is the so-called "auchenokeros" type) and in profile they are well behind the plane of the face. These features of the horns were observed already by Rütimeyer (1878: 47) who also stressed the vaulting of the forehead in all directions that can particularly well be seen on skulls of zebu oxen.

Nevertheless, the presence of hump and the special skull and horn forms are not the only features that identify zebus. The general slenderness of the long bones of the extremities, particularly that of the metapodials, and the conspicuously long metapodials themselves can already give some hints of the occurrence of zebu remains in prehistoric settlement samples. This possibility could be first observed in the cattle bone assemblages of the Middle and Late Bronze Age and also of the Early Iron Age of Kamid el-Loz, Lebanon (Bökönyi, 1990: 37 ff.) where not only whole metapodials

but also *spinae bifidae* and typical skull and horn core fragments also occurred. As a matter of fact, not all cattle were zebus at this site, nevertheless humped cattle made out an essential part of the cattle population. In the Kamid el-Loz cattle sample, it could also be determined that the slenderness of the zebu metapodials reached such a level that the Nobis indices (Nobis, 1954: 168 f.) could not be used for sex determination because of their unusually low values.

The slenderness and the length of the distal segments of the extremities in zebus make them fast moving draft animals, and their oxen can reach a considerable speed (races of light vehicles pulled by galloping zebus are well-known both in India and in other parts of Southeast Asia as well). It is true that zebu oxen cannot compete with draft horses, though taking the small size of Indian horses into consideration, the difference between horse and zebu ox speed is not as big as between European horses and oxen. Moreover, if one adds to it that zebus can stand not only hot climate but can also easily get used to dry and humid environments alike, one will be able to understand the widespread use of zebus as draft animals in tropical and subtropical agriculture.

The descentance of the zebu has been a long debated question in the zoological literature. Linné described the

zebu as *Bos indicus*, thus a species independent from the European domestic cattle, *Bos taurus* (this term has been widely used in the Anglo-Saxon literature). In the light of our present knowledge it is not correct because Indian and European cattle represent one natural breeding community, their crossings are fertile and according to the modern, biological determination, they represent one single species.

At any rate, the question of the wild ancestor of the zebu should be solved. The essence of the discussions on this subject has been whether the zebus represent the domestic form of the European aurochs, *Bos primigenius primigenius*, that of its Indian subspecies, *Bos primigenius namadicus* (or if one puts the latter one on species level, *Bos namadicus*; in fact, Clutton-Brock (1980: 40) still raised the question in this way), or of some other wild bovid species of Southeast Asia.

The last supposition could already be very early eliminated. Rüttimeyer (1878: 45) and Lydekker (1912: 28) suggested the banteng (*Bibos javanicus*) as the wild ancestor of zebu but essential differences in craniology and hump structure strictly contradicted this theory (Antonius, 1922: 186; Grigson, 1980: 4).

As for the descentance from the aurochs, J. W. Goethe

who was not only a poet and writer but, as a polihistor, was interested in natural sciences too, expressed his view as early as in 1831 and 1840, that both the European and Indian cattle had derived from the aurochs.

In this respect, the opinion of Antonius (1922: 186) was very interesting and reflected his sharp mind because he was able to outline zebu ancestry at such an early time when detailed studies on the Indian aurochs did simply not exist: "... ist der wilde Ahne der Zebus zweifellos in einer dem echten Ur ganz nahestehenden Form, vielleicht einer Lokalrasse desselben, wie sie etwa der *Bos namadicus* darstellt, zu suchen".

The subject of the descentance of zebus has again appeared when, after World War II, Herre, along with his students, began to create a systematic order in the jungle of the origin and domestication of domestic animals. Concerning cattle origins, the process started with Requate's study on the classification of aurochs.

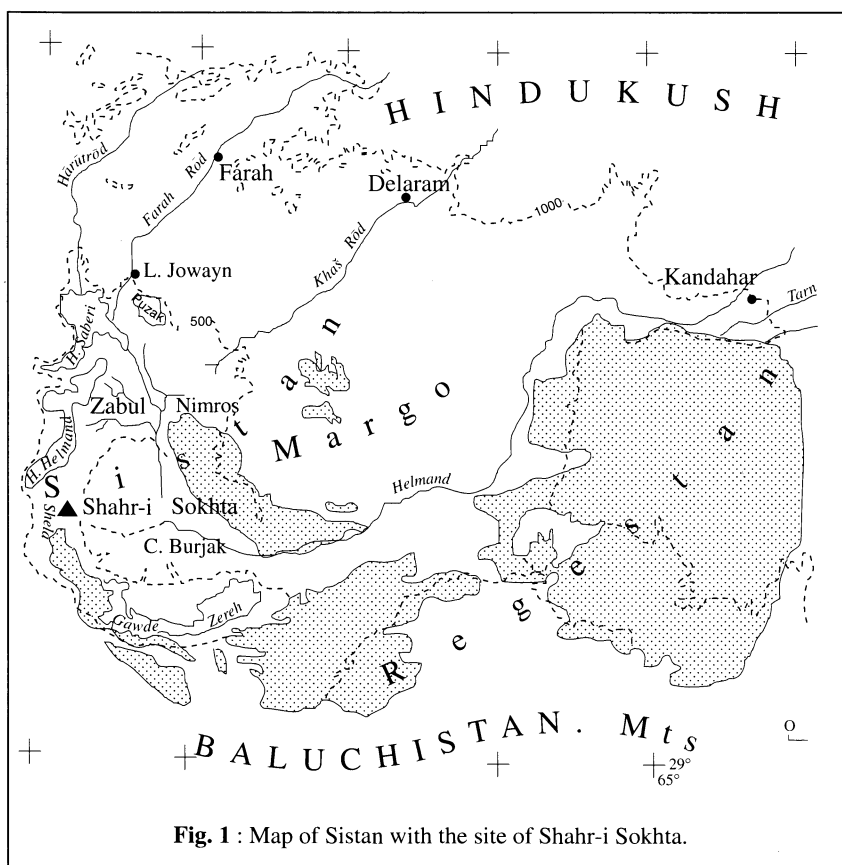
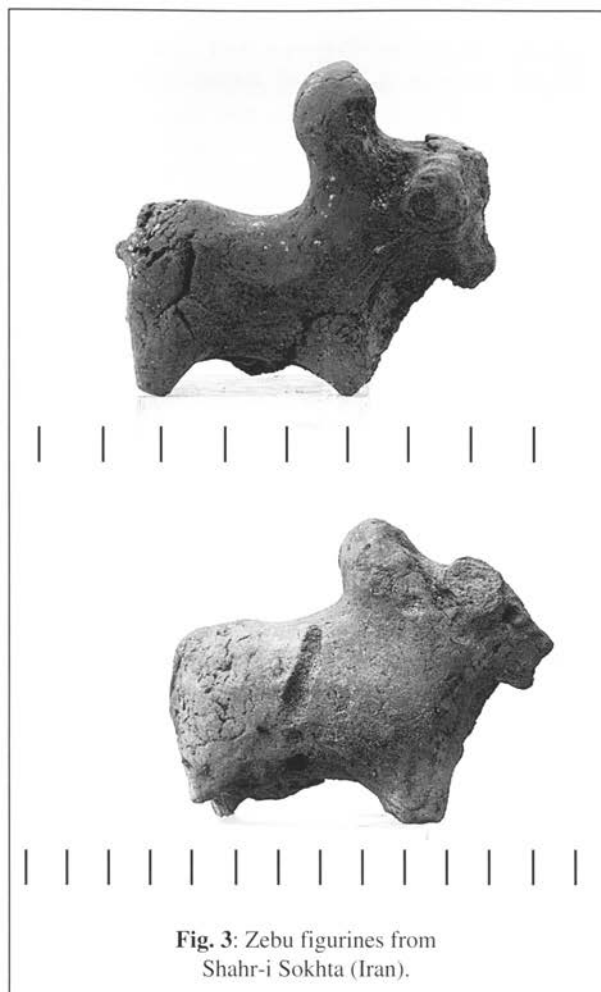


Fig. 1 : Map of Sistan with the site of Shahr-i Sokhta.



In this article Requate (1957: 330) divided the aurochs (*Bos primigenius*) into three subspecies, the European (*B. p. primigenius*), the Egyptian (*B. p. hahni*), and the Indian one (*B. p. namadicus*). This division wasn't entire without any antecedents because *Bos p. hahni* had already been described by Hilzheimer (1917: 87) and was raised by Lehmann (1949: 165) to the rank of a species which, in his view, may have constituted a link between the European *Bos primigenius* and the Indian *Bos namadicus*.

Since Herre's approach was strictly monophyletic, he could only suppose the aurochs as the only wild ancestor of all domestic cattle, nevertheless, he admitted that in the case of the Indian cattle *Bos primigenius namadicus*, a geographical subspecies could be accepted as the wild form (Herre and Röhrs, 1990: 167).

In the meantime, Zeuner (1956: 2 f.) supposed that a humped aurochs had been living in the dry regions of India once but it became extinct after certain time. Nevertheless, he gave up this idea soon, stating that the zebras were the

descendants of the Indian subspecies (*Bos primigenius namadicus*) of the aurochs (Zeuner, 1963a: 239, 1963b: 160, 1963c: 15). Epstein (1971: 518), Grigson (1980: 30), the author (Bökönyi, 1985: 426-429) and lately Benecke (1994: 261) share this opinion. Epstein also stressed that no race of wild aurochs had ever existed that would have had either a hump, bifid vertebrae or any other zebu characteristics because the latter are clearly changed under domestication.

As regards the domestication of the zebu, one has to look for it in the post-pleistocene area of abundant distribution of its wild ancestor, the Indian aurochs (*Bos p. namadicus*). It is not very well known, however, to which regions of India and Southwest Asia in general, this area of distribution extended. There is no doubt that wild *namadicus* aurochs lived in the dry parts of India, and in fact there are more and more finds proving that the Indian aurochs survived the end of the Pleistocene and reached the early post-pleistocene time, the period of cattle domestication in India itself (Zeuner, 1963a: 239), and the local



Fig. 4: Bifid thoracic vertebrae from Shahr-i Sokhta (Iran).

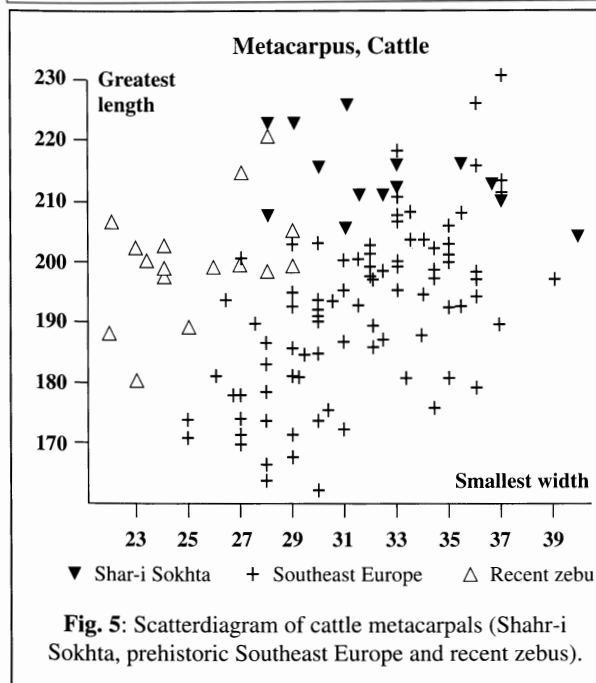


Fig. 5: Scatterdiagram of cattle metacarpals (Shahr-i Sokhta, prehistoric Southeast Europe and recent zebu).

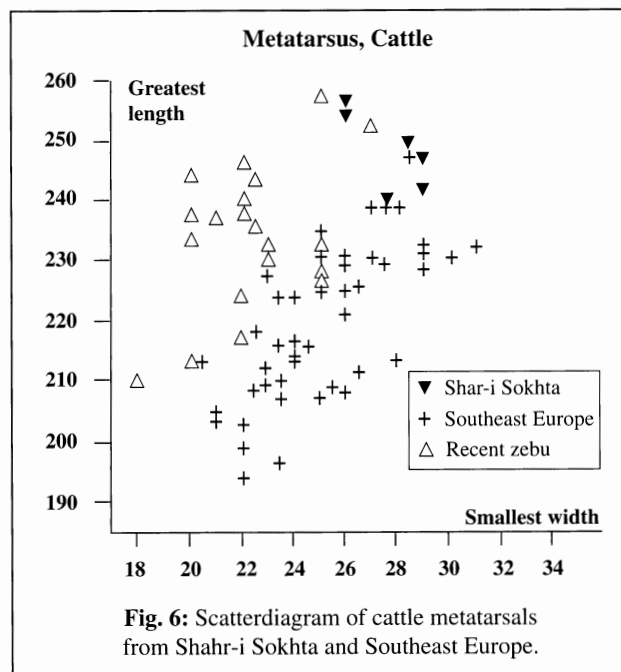
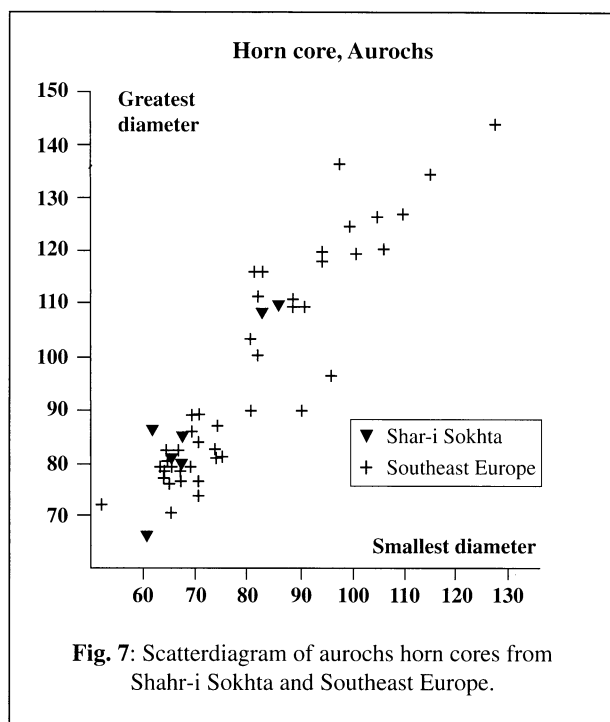


Fig. 6: Scatterdiagram of cattle metatarsals from Shahr-i Sokhta and Southeast Europe.

zebus were its direct descendants. Allchin (1963a: 149 f.) also supposes that the humped cattle were a result of a local, Indian domestication.

Nevertheless, according to Epstein (1971: 511), Indian aurochs could have extended to the West as far as the Great Salt and Lut Deserts in East Iran because these regions seem to be one centre of domestication of zebu with cervical humps. This assumption can be confirmed by the author's own observation in Shahr-i Sokhta (Sistan, Iran) in the semi-desert where the frontiers of Iran, Pakistan and Afghanistan meet (fig. 1). At that site, horn cores and a horn sheath of Indian aurochs (fig. 2) could be found together with a number of zebu figurines (fig. 3), a few bifid vertebrae (the best ones can be seen on figure 4), and finally a good sample of extremely slender extremity bones (fig. 5 and 6). The horn cores attributed to *Bos namadicus* are smaller than those of European aurochs (fig. 7). Their form is less curved, their cross-section is oval, their conspicuously thick walls that clearly distinguish them from the horn cores of domesticated cattle reveal several longitudinal furrows, and -at last but not least- every horn core shows two well-expressed keels, each one on the dorsal and on the ventral side (fig. 8). These finds can be dated to the 4th and 3rd millennia bc (Bökönyi, 1985: 428, 1989: 63). Shahr-i Sokhta certainly lay within the area of distribution of Indian wild cattle as supposed by Epstein (1971: 511) and one can rightly suppose that in the region actually happened *namadicus* domestication that produced humped cattle. The occurrence of the two keels on the horn cores of Shahr-i



Sokhta is of outmost importance regarding the *namadicus* origins of these horn cores. Such keels have often occurred in early forms of Indian wild cattle and on those of certain *B. p. namadicus* of the Indian Geological Survey (Calcutta) and of the Deccan College (Poona). The double keels represent an archaic feature of the Indian aurochs, and this is why they often appear in its early forms. This interesting feature of Indian aurochs skulls firmly connects the latter with the wild forms found at Shahr-i Sokhta.

In fact, Caloi and Compagnoni (1981: 181 ff.) already had observed the presence of a probably wild bovine species along with domestic cattle but they left the problem open for further studies.

The region of zebu domestication has been a long debated question among archaeozoologists and prehistorians alike. Adametz (1925: 591 ff) was one of the earliest authors who supposed the northern and northwestern regions of India as a possible early centre of zebu domestication. According to Zeuner (1963a: 239, 1963c: 19), the earliest domestication of the zebu took part in the Indian subcontinent sometime between 6000 and 4000 bc. Allchin (1963a: 149 ff) was in essence of a similar opinion putting the beginning of cattle keeping to the time of earliest settlement e.g. in the Deccan. There he found domestic cattle remains at two of his own excavations, at Piklihal near Mudgal and Utnur, and also at that of Maski excavated by B. K. Thapar of the Archaeological Department of the Government of India (Allchin, 1963a and b).

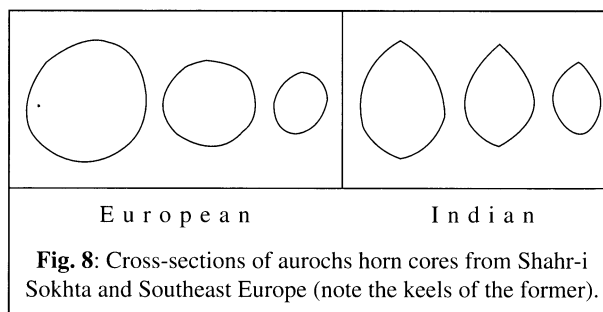
Recent excavations have yielded decisive evidence concerning the earliest domestication of Indian cattle. The earliest evidence of humped cattle comes from Mehrgarh, a village site of Middle Pakistan dated to ca. 6000 bc (Jarrige and Meadow, 1980: 122 ff; Meadow, 1984a: 37, 1984b: 322).

At any rate, zebus have not been the only domestic cattle in India. Artistic representations and osteological remains reveal that besides zebu, numerous taurine cattle have been living in India, in spite of the fact that they are not very competitive against zebus firstly because they can not stand hot climate very well and as oxen they are not as fast draft animals as zebu oxen. Oxen as draft animals are still playing an important part as draft animals in the small peasant households.

It is quite obvious that humped cattle could be domesticated everywhere where *namadicus* aurochs lived. In this respect, the regions lying to the north and to the west of India are particularly important. Unfortunately, one knows comparatively little about the area of distribution of the Indian wild cattle; nevertheless, the increasing number of post-pleistocene finds of *namadicus* aurochs found outside India will multiply our knowledge both about the area of its distribution but, at the same time, about its possible centres of domestication too. One thing is certainly obvious: the earliest zebu occurred in the supposed area of distribution of the Indian wild cattle (Bökönyi, 1990: 39).

The richness in zebu of the domestic cattle population of the Great Salt and Lut Deserts and their eastern steppe territories is not a simple question of cattle import from the Indian Peninsula. The two big deserts formed a natural barrier of the area of distribution of *Bos namadicus* to the west, and the steppe foreland of them provided an excellent habitat for such a large wild beast of grassy steplands. Thus it is not surprising at all that in the region in question a large centre of domestication of Indian aurochs developed (Sistan, where Shahr-i Sokhta lies, was part of this domestication centre).

In this way Epstein (1971: 511) correctly supposes that the area mentioned above was the place of origins for zebus with cervical humps. The vicinity of this region to the Quetta-Pishin valley that extends between Afghanistan,



southern Baluchistan and Sind gave the possibility of the development of cattle with large cervico-thoracic humps. Representations of such zebus can be often seen on Quetta pottery from the latest prehistoric (G) period that was contemporaneous with the Harappan civilization (ca. 2500-1500 bc). Bovine remains from the preceding H period seemingly prove this too. In the Chalcolithic site of Rhana Ghundai (northern Baluchistan) zebus were depicted on pottery which can be correlated with Sialk III or Hissar I, thus with the al-Ubaid period of Mesopotamia towards the end of the 4th millennium bc.

According to Zeuner (1963a: 239) zebus reached northern Mesopotamia coming from the East around 4500 bc. This is evidenced by a zebu figurine from the earlier Halaf period of Arpachiyah, northern Mesopotamia. The occurrence of this figurine is somewhat strange because it ca. 1500 years predates the earliest zebu representation from the second period of Susa in Iran. This is in spite of the fact that in eastern Iran, there was going on a considerable zebu domestication, on the one hand, and Susa itself lay on the route of extension of domestic zebu to South-west Asia, on the other.

Nevertheless, southern Mesopotamia could be reached from Baluchistan by a sea route too. Baluchi merchants traded this way, among others, also zebu with cervical humps (Epstein, 1971: 512).

East of the Quetta-Pishin valley, zebu with well-developed cervical humps appeared on seals from Mohenjo daro and Harappa, dated to 2500-1500 bc (Epstein, 1971: 511), though one cannot decide whether they had been domesticated in eastern Iran or in Peninsular India. Similar zebus of southern Baluchistan probably are of east Iranian origins.

Another area where the possibility of a local zebu domestication could be supposed is Arabia (Zeuner, 1963a: 239). Nevertheless, there is no positive evidence for the occurrence of *namadicus* type aurochs from there. Aurochs were undoubtedly living there, as evidenced by osteological finds from all over the Arabian Peninsula but they seem to be closer to the Egyptian subspecies (*Bos p. hahni*).

Zebus with cervico-thoracic humps appeared in Egypt in the time of the XIIth Dynasty (ca. 1900-1780 bc) and their representations are well-known from the graves of Beni Hasan, Tell el-Amarna and Thebes. This wave of zebus arrived to Egypt in all probability from the South, coming from South Arabia through the Horn of Africa (Epstein, 1971: 505). This has been a well-known trade route since at least from the Chalcolithic (Tosi, 1986: 463 ff).

Another possible place of origins for Egyptian cervico-thoracic zebus could be the Levant. Zebus arrived into the

Levant rather late. They could be described from Deir'Alla (Jordan) from the Middle Bronze Age or later (Clason, 1978: 91 ff) and reached Levant proper in the same time. According to our most recent knowledge, the zebu of Kamid el-Loz of the Bekaa Valley (Lebanon), whose dating is about the same as that of the Deir'Alla ones, are among the earliest humped cattle in the Levant and as such could play a certain role in the second wave of cervico-thoracic zebu to Egypt (Epstein, 1971: 507). This can be confirmed by the fact that Kamid el-Loz was under a heavy Egyptian influence during the Bronze Age (Edzard, 1970: 50ff), and in this way trade connections between Egypt and the Bekaa Valley can be rightly supposed.

As for the other zebu group, the thoracic-humped or should-humped zebu could also originate from the Irano-Indian borderland but somewhat later. (In fact, the division of the zebus on the basis of the situation of their hump carried out by Curson and Bisschop seems to be somewhat artificial, particularly looking back from the recent breeds when in many cases it is extremely difficult to put some living animals or zebu representations into the proper group). Anyway, shoulder-humped zebus lived along with cervical-humped ones in the Quetta-Pishin valley in later prehistoric times, ca. 2500-1500 bc (Epstein, 1971: 514, fig. 622) and they were introduced by Neolithic settlers from Baluchistan through Gujarat and Maharashtra to the Deccan (Allchin, 1963a: 152, 1963b: 160). From this time onwards, cattle have played a major role in their economic life. Nevertheless, in a later work, Allchin (1969: 318 f) considered the zebus resulting from an Indian domestication.

In Mesopotamia, the earliest shoulder-humped zebu appeared during the 2nd millennium bc. Such zebu reached Egypt by the time of the XVIIIth Dynasty (Epstein, 1971: fig. 614). Then they disappeared and occurred again only in the 4th century bc. It is quite interesting that humped cattle never penetrated Anatolia in larger masses, and this is why one cannot practically find zebus there. The reason is that a strong central power has ruled there since the Bronze Age, that has for some reason forbidden the importation of such cattle.

Humped cattle reached Europe quite late, first during the time of the Roman Empire. Besides the usual trade routes they were introduced also by near eastern or north African military units as it happened with the camel. Nevertheless, humped cattle did not reach the same frequency as camel did in military stations in the European territory of the Roman Empire because they had no military importance. The only zebu representation in the Roman colonial territory of Europe is known from a tombstone in Plovdiv, Bulgaria (Bökönyi, 1974: 130, fig. 27).

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