THE PROVENIENCE OF PORTUGUESE ARCHAEOLOGICAL AMBER ARTEFACTS - A CASE STUDY FROM MOREIRINHA (BEIRA BAIXA)

by

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Resumo: Estudam-se duas contas de âmbar provenientes das escavações realizadas, nos inícios da década de 90, no povoado do Bronze Final da Moreirinha (Beira Baixa).

O principal contributo deste texto reside nos resultados obtidos pela aplicação do método de espectroscopia (desenvolvido no Amber Research Laboratory - Vassar College), o qual permite determinar se o âmbar em causa é, ou não, de origem báltica. Pela primeira vez artefactos de âmbar pré-históricos prortugueses foram submetidos a análises desta natureza, tendo os respectivos espectros de infravermelhos revelado que ambos os achados são feitos de âmbar Báltico ou sucinite.

Ao mesmo tempo, faz-se uma resenha, não exaustiva, e tecem-se alguns comentários sobre os outros achados de âmbar pré-históricos conhecidos no actual território português.

Palavras-chave: Âmbar báltico. Bronze Final. Beira Baixa.

INTRODUCTION

The opportunity to study archaeological amber artefacts from Portugal is exceptionally welcome, because it is still unknown whether, when, and how this southwesternmost country of the European continent played a role in the prehistoric amber trade. The question can only be answered by chemical analysis, because deposits of amber-like fossil resins do occur naturally in Portugal and might have furnished the raw material for amber artefacts of local manufacture.

This article reports the analysis of two Bronze Age beads from the site of Moreirinha (Beira Baixa), with the objective of determining their origins.

The first account about the archaeological site of Moreirinha, in *Memorias Parochiaes,* published in 1758, refers to the existence of fortified walls. Early in

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the 20th century, Leite de Vasconcelos mentions very briefly the same evidence, with no further developement of the archaeological significance of the site (Vasconcelos, 1917:304).

The development of a research project by R. Vilaça involving settlement patterns during the Bronze Age in Beira Baixa led to the survey of the area, wich was followed by excavations, in 1989, 1990 and 1992. The analysis of both stratigraphy and artifacts of Moreirinha indicates that it is a domestic site dated to the Late Bronze Age (Vilaça, 1994).

LOCATION AND GEOGRAPHICAL CONTEXT

The site of Moreirinha (Monsanto, Idanha-a-Nova, Beira Baixa) is located on the hilltop of Serra da Moreirinha, at 679 m above sea level. The central point coordinates are 40.04 N 7.07 W (Carta Militar de Portugal, f.258, 1/25.000, 1974). Serra da Moreirinha is a very irregular "Inselberg" of about 2,000 m long, stretching in an East-West direction. The archaeological site is situated in conditions of natural defense: the hill slopes are steep, especially along the southern and northen sides, and the difference of elevation in relation to the surrounding plains is about 220 m. From the settlement one can easily see all the surrounding plains (Figure 1 and Foto 1).

The local bedrock is granite, modified by erosion with the visible portions taking the shape of enormous rounded blocks. The soil is shallow, belonging to soil series E (Carta de Capacidade de Uso do Solo, 1/1.000.000, 1982 and f. 21-C, 1/25.000, 1966). The vegetation includes mainly eucalyptus and olive trees in the southern and northen slopes of the hill. However, the higher spurs have some shrubby vegetation of ferns and genista.

The site of Moreirinha is located in the drainage area of the Ponsul river, which runs south of the settlement. In Antiquity the Ponsul, as well as the Tagus, which it joins, was famous for its gold deposits.

NATURAL OCCURRENCE OF AMBER IN PORTUGAL

The summary report of LaBaume (1935) lists a fossil resin from "Figueira, west of Coimbra", i.e. Figueira da Foz (40.09 N 8.52 W) that had been obtained by Professor Klein in 1903 and was first thought to be retinite. When it was analyzed by Olshausen and Rathgen in Berlin, it yielded 9.15% of crystals identified as succinic acid. This was one of several instances that invalidated the method of provenience analysis of archaeological amber developed and widely

applied by Helm (1885), because this method depended on the quantitative analysis for succinic acid by hydrolysis or pyrolysis and claimed that 3-8% of succinic acid were certain proof that an artifacts was made of the Baltic amber or succinite whose natural distribution is limited to northern Europe (Beck,1970; 1986). Other natural occurrences are listed by Veiga Ferreira (1966) at Algueirão (38.48 N 9.20 W) and north of the Praia de Santa Cruz (39.08 N 9.23 W), but these do not seem to have been analyzed.

METHOD OF PROVENIENCE ANALYSIS

For more than thirty years, the identification of Baltic amber or succinite has been made by infrared spectroscopy (Beck *et al.*, 1964; 1965). Since then, well over 5000 archaeological amber artifacts have been analyzed (Beck, 1986). This instrumental method has the advantage of requiring only a very small sample of no more than two milligrams. It is entirely empirical: the identification is made simply by matching the infrared absorption patterns against a reference collection of about 2000 spectra of fossil region from all over the world (Beck, 1986). The method has been shown to be highly reliable: no other fossil resin furnishes an infrared spectrum that can be mistaken for Baltic amber, and 97.5% of all known samples of Baltic amber have been correctly identified by their spectra, the remaining 2.5% being amber artifacts that are so extensively weathered that no useful spectra can be obtained. The first results of applying the spectroscopic method of provenience analysis to Portugese archaeological amber artifacts are reported below.

ARCHAEOLOGICAL CONTEXT AND ANALYSIS OF THE AMBER FROM MOREIRINHA

The archaeological excavations were done on the higher terrace of the hill, which has an area of 2850 square meters. The units excavated, covering an area of 92 sq m, yielded several domestic structures (hearths, floors and stone walls) associated with ceramic, lithic and metallic artifacts, as well as faunal remains. The main occupational level (Level 2, with a thickness of 30-40 cm), yielding most of the remains, lies directly on the bedrock, but in circumscribed areas it lies on Level 3, defined as the initial occupation level of the settlement. The post--occupational (and/or plough zone) upper level, which is 12-18 cm thick, also yields abundant archaeological material; however, these artifacts lack any context. Through the analysis of material culture the settlement was dated from the Late

Bronze Age. Four C14 dates obtained for the site confirmed this assumption (ICEN-834: 2940 ± 45 BP; ICEN-835: 2910 ± 45 BP; GrN-19659: 2785 ± 15 BP; OxA-4085: 2780 ± 70 BP). The calibration of these dates, with a confidence interval of 2 sigma (95%), dates the occupation from the second half of 13th century BC through the second half of 9th century BC.

Two objects were referred to the Amber Research Laboratory (ARL) for infrared analysis:

ARL N° [P] 1 is labeled "Mor 14.4.92, I, B4" and consists of a fragment that appears to be about one-fourth of a plane-convex bead (Figure 2-a). The original surfaces have a thick orangebrown weathering crust; the surfaces exposed at the breaks are dark reddish-brown. This fragments weighs 0.759 grams. Associated with this piece are 15 very small irregular fragments weighing 0.166 grams, for a total weight of 0.925 grams.

ARL N°[P] 2 is labeled "Mor. 90, I. E-2" and is a small ring bead with a diameter of 8.7-8.8 mm and a maximum thickness of 3.5 mm (Figure 2-b). The large perforation has a diameter of 4.5 mm, and the bead weighs 0.132 grams. It is covered by a deep-yellow weathering crust.

Infrared spectra were taken with a Perkin-Elmer Model 1750 Fourier Transform Infrared Spectrometer coupled to a Perkin-Elmer Laboratory Computer. Samples were prepered by grinding a small amount of amber with a hundredfold excess of potassium bromide and pressing the powder into a transparent pellet in an evacuated die.

The infrared spectrum (IR 7708; Figure 3) of the fragmentary bead was made from one of the small detached pieces. While it indicates considerable oxidation, it is quite clearly the spectrum of Baltic amber or succinite. The principal indicator is the single absorption in the carbon-oxygen single-bond region which is expected at 1160 ± 5 cm-1 and which is found at 1155 cm-1 in this spectrum.

This absorption maximum is preceded by a broad shoulder of negative slope; in well-preserved Baltic amber, this shoulder is essentialy horizontal, i.e. it has a slope of zero. Computer enhancement of part of the spectrum also shows the secondary characteristic of Baltic amber, a small but distint absorption at 890 cm -1 that is caused by the presence of an exocyclic double-bond in the structure (Beck *et al.*,1965).

The analytical sample taken from the ring bead was of necessity a very small surface sample to avoid any damage to the find. It consists entirely of weathering crust and predictable yielded a weak and poorly articulated infrared spectrum (IR 7709; Figure 4) even after accumulating and adding ten successive scans. Nevertheless, the absorption pattern in the carbon-oxygen single-bond region shows a single maximum at 1164 cm-1 preceded by a negative slope and computer-

-enhancement reveals the exocyclic double bond absorption at 893 cm-1.

The spectra therefore show that both of the amber finds are made of Baltic amber or succinite, the nearest natural deposits of which are found in the North Sea and the surrounding countries, i.e. the coast of England, the eastern part of the coast of Holland, the west coast of Denmark, and the north German plain. This establishes for the first time that northern amber reached Portugal in the Late Bronze Age.

Veiga Ferreira (1966) list five locations, all in the southern half of the country, where archaeological amber has been found. A related find, from the tumuli of Almeria, has been analysed and, according to Siret (1913) "the analysis established 2% of succinic acid, which proves its Baltic origin, according to the specialists". That statement can not no longer be accepted. For one, 2% is well below the range of the succinic acid contend defined by Helm as proving Baltic origin, but more importantly, the succinic acid method itself is invalidated by the discovery of non-Baltic fossil resins in southern Europe which contain large amounts of that acid, as seen above in the amber of Figueira da Foz. Since 1966, the first list of archaeological amber finds in Portugal has grown from five to thirteen, and the newer finds are all in the northen part of the country (Figure 5).

Amber beads are not common in Late Bronze Age archaeological contexts, however there are several other cases besides those from Moreirinha. From the same time period, the sites of Castelo de Matos (S. João de Ovil, Baião), Coroa do Frade (Nª Sª da Tourega, Évora) and Senhora da Guia (Baiões, S. Pedro do Sul) yield some beads. The former has a single well preserved bead; both its form and perforation are in the shape of a double conical frustum (Figueiral & Queiroga, 1988:145, fig. 1). The sedond is a small ring bead (Arnaud, 1979:69, fig. 8-8). The latter consists of three beads and fragments which are still unpublished (Silva, 1979:524).

Amber artifacts from earlier time periods are more common. Several megalithic monuments and *tholoi* yield amber objects: Alcarapinha (Vila Fernando, Elvas), Bela Vista (Colares, Sintra), Barranco da Nora Velha (Nossa Senhora de Cola, Ourique), Anta Grande da Comenda da Igreja (Montemor-o-Novo), Anta do Pinheiro dos Abraços (Bobadela, Oliveira do Hospital), Anta do Vale d'Antas (Cardigos, Mação), Mamoa V da Chã de Arcas (Baião) and Monuments 3 and 4 of Alcalar (Portimão). The specific contexts of each of the artifacts are poorly known, due both to the lack of stratigraphy and the looting of the monuments. Nevertheless, it is probable that some of the artifacts are contemporary with some of the burials (for example, in the Monument of Bela Vista, where the amber bead is associated with an assemblage of Bell Beaker materials (Melleo *et al.*, 1961:243), and in Alcalar (Veiga, 1889:167 and 217). Therefor, the amber artifacts in the actual territory of Portugal may go back to at least the 3rd millenium b.C.

Of all the objects mentioned, only the beads from Moreirinha were chemically analyzed, allowing their integration into the broader problematic of geographical origin of amber deposits and circulation of this material.

The analysis presented shows that the amber used to make the beads from Moreirinha is Baltic amber. However, we cannot determine where they were made: it is possible they were brought here completely shaped, but their typology does not agree with those more common to European contexts dating from the Late Bronze Age (Beck & Shennan, 1991:51-62 and Table 4.14). Conclusions based merely on stylistic atributes are always dangerous, thus the hypothesis of a Baltic origin still has validity. On the other hand, we cannot underestimate the possibility of a local manufacture for the beads. There is evidence for the circulation of unworked blocks of amber in this time period: the amber block from "locus" 11 in Fort Harrouard, Eure-et-Loire (Mohen & Bailloud, 1987:9, 114) and another amber block from Senhora da Guia (Silva, 1994).

In conclusion, the amber beads from Moreirinha, with a clear symbolic and prestige value, present in a domestic context, and associated with other objects allow the integration of the interior regions in those broader and complex circuits of inter - and intra - regional exchange.

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Est. I

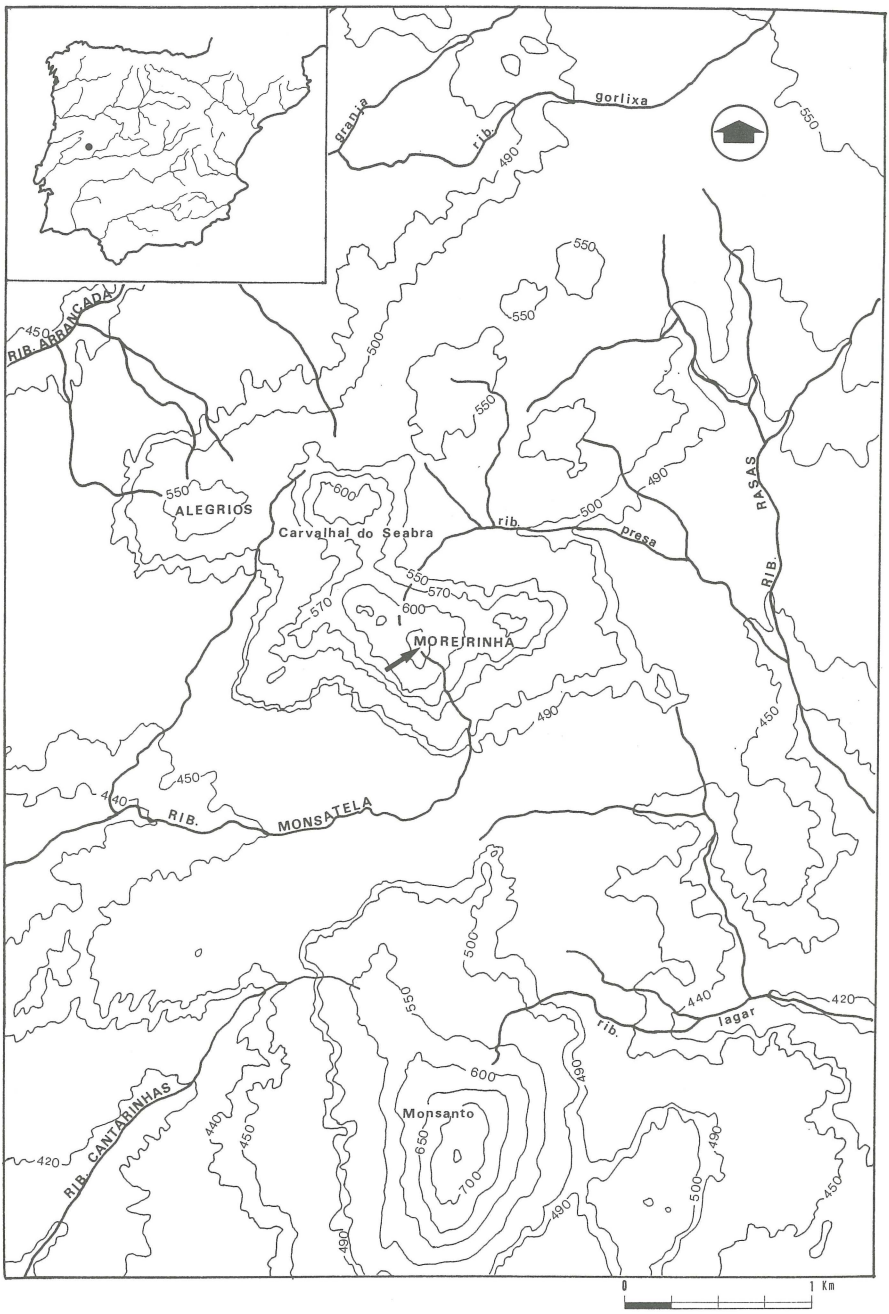

Figure 1 — The location of Moreirinha (Carta Militar de Portugal, 1/25.000, f. 258 aqui reduzida).

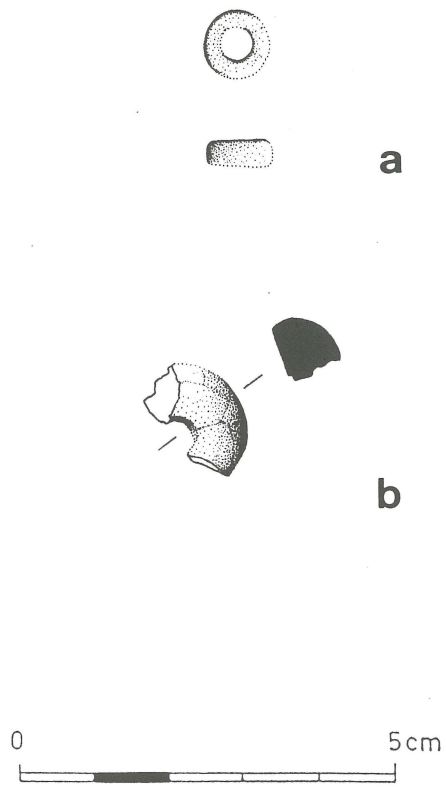

Figure 2 — The amber beads.

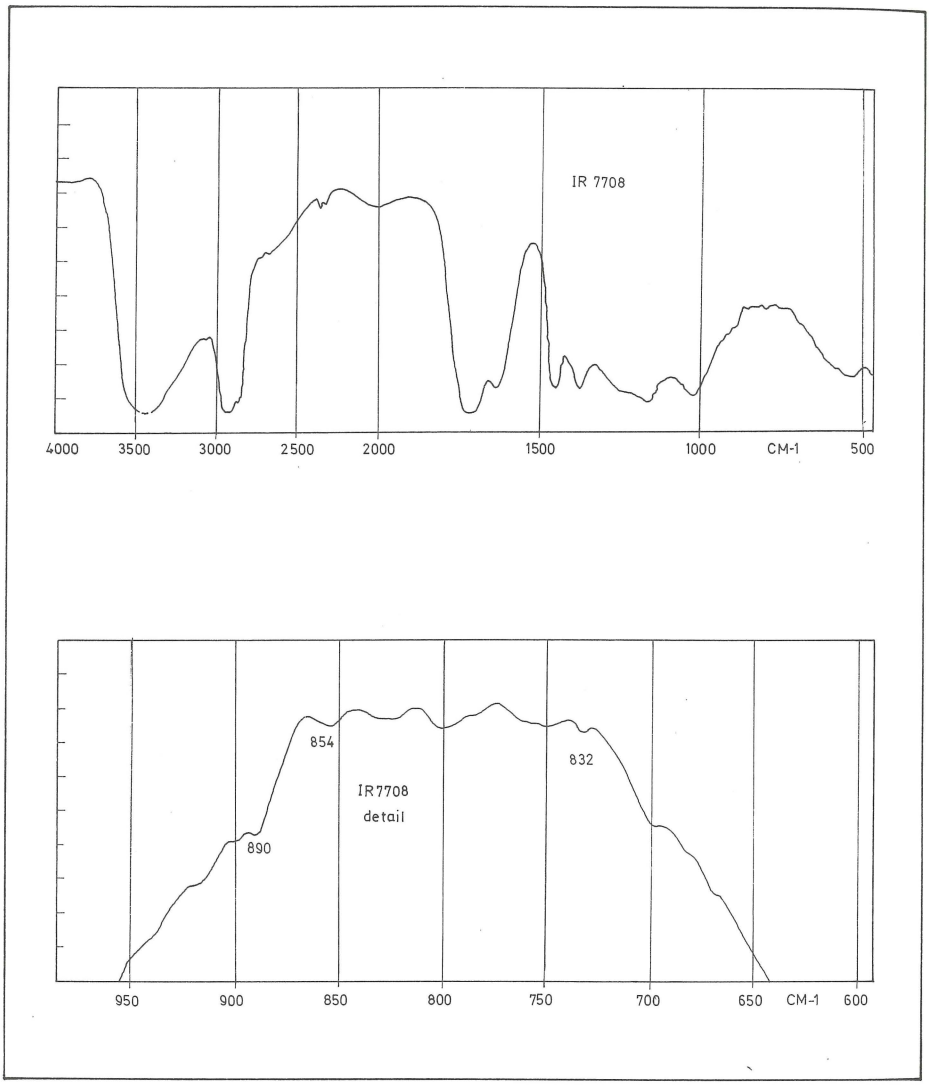

Figure 3 — Infrared spectrum of find ARL [P] 1.

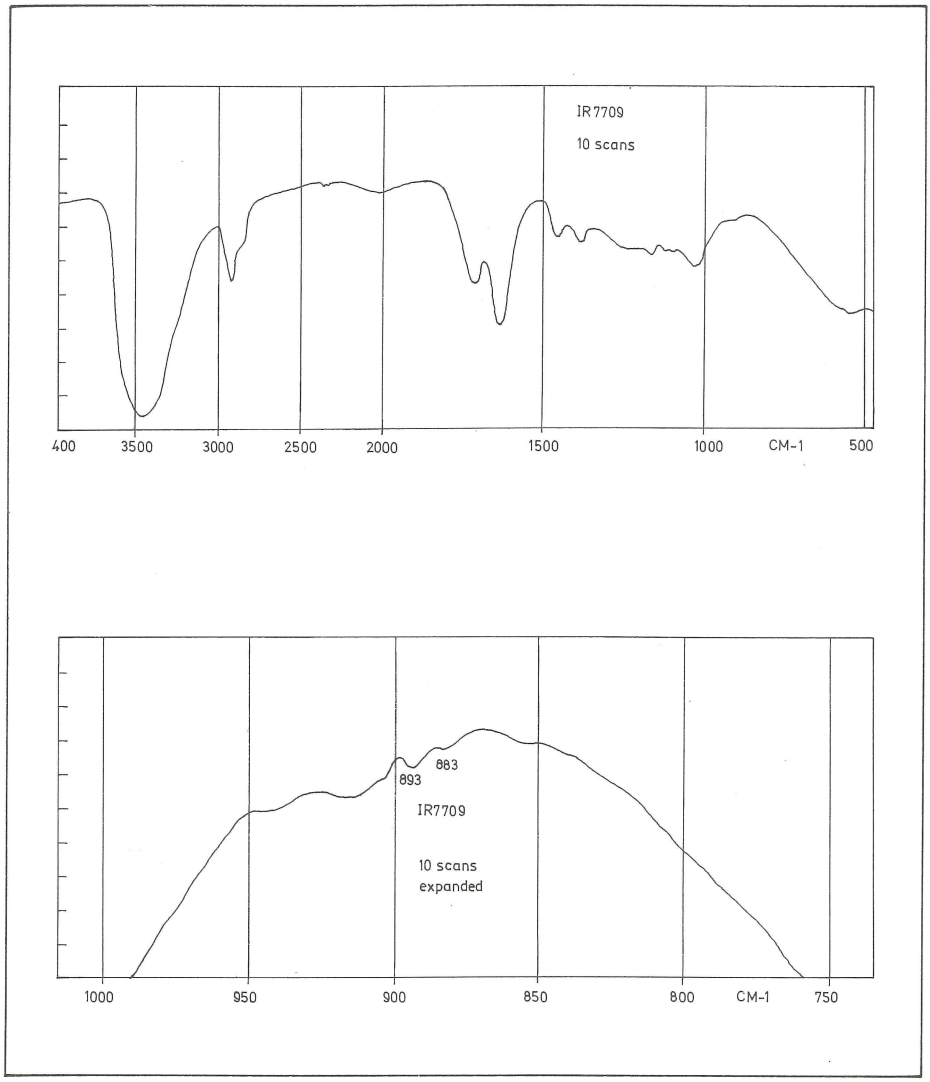

Figure 4 — Infrared spectrum of find ARL [P] 2.

Est. V

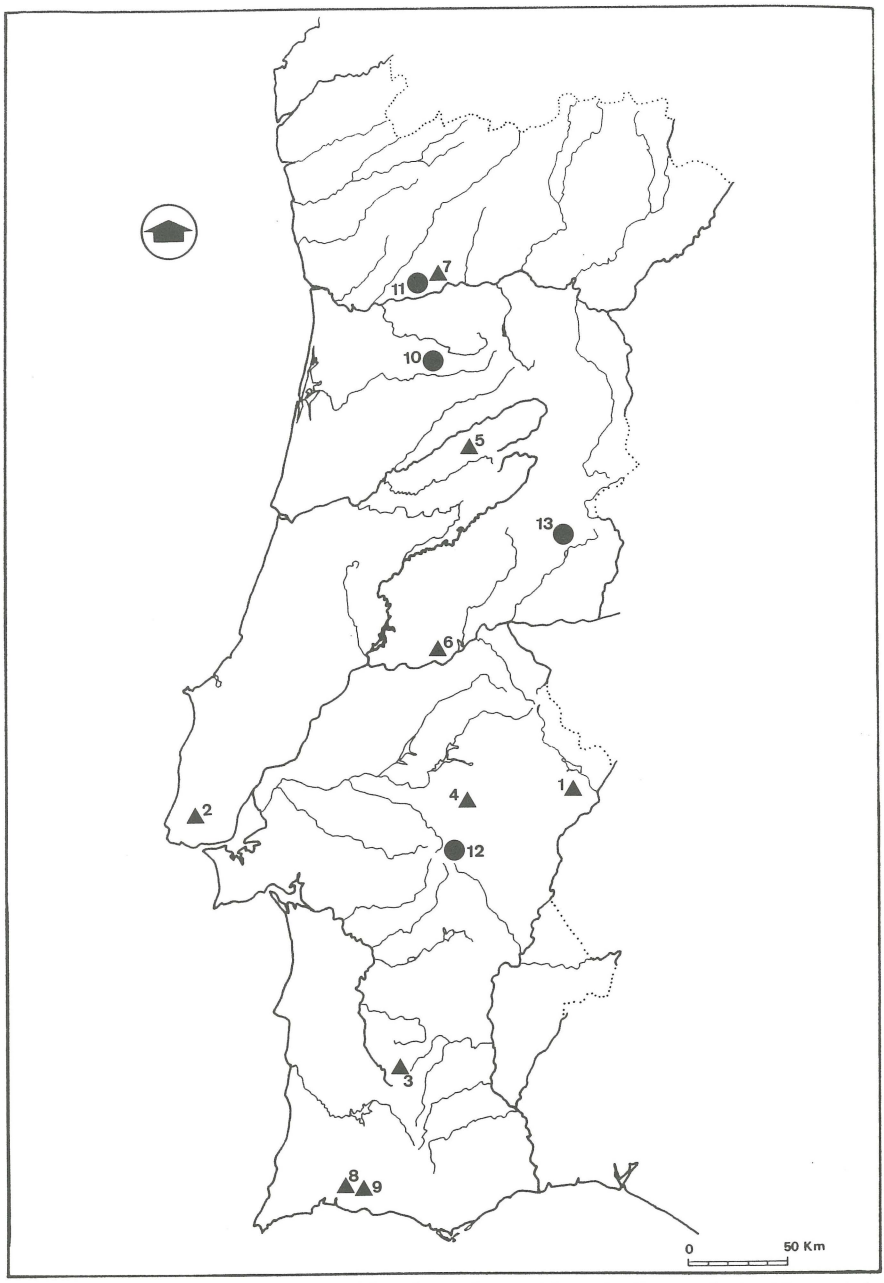

Figure 5 — The distribution of prehistoric amber artifacts in Portugal. 1. Alcarapinha. 2. Bela Vista. 3. Barranco da Nora Velha. 4. Anta Grande da Comenda da Igreja. 5. Anta do Pinheiro dos Abraços. 6. Anta do Vale d'Antas. 7. Mamoa V de Chã de Arcas. 8. Monumento 3 de Alcalar. 9. Monumento 4 de Alcalar. 10. Senhora da Guia. 11. Castelo de Matos. 12. Coroa do Frade. 13. Moreirinha.

▲ Megalithic Monuments/*tholoi*. ● Late Bronze Age Settlements.

Photo 1 — The site of Moreirinha.