



Lithic resources in the prehistoric societies of the III - II millenniums B.C. in the Rio Turón valley (Ardales, Malaga, Spain)

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Abstract. The valley of the Rio Turón, a tributary of the Guadalhorce river, is placed at the Northwest of the Malaga province, South Spain. This has been an important area of transit, between the coast and the inland of central Andalucía, along the historic and prehistoric periods. An abundant human occupation has existed in this valley, that presents a wide and continuous archaeological register from the Palaeolithic to the Mid Age. Mineralogical and petrological characterization of polished and chipped lithic materials from the III-II nd millenniums B.C. from archaeological settlements in the Rio Turón valley, are carried out.

Mineralogical and petrological features of these materials are compared with the possible geological source areas in this area: flint materials from the limestones and dolomites of the Jurassic - Cretaceous age (Subbetic and Betic materials of the Betic Cordillera); dolerites from the outcrops in Keuper facies (Triassic Subbetic materials); ultrabasic rocks from the Ronda peridotites Massif, and other lithologies as amphibolites, limestones, sandstones, etc. that appear in the tools, with geological materials of this area.

Finally, a preliminary systematic study of the technological features of these materials show a direct relation between lithology and kinds of tools, in these agricultural societies of the III-II millenniums B.C.

Key words: Mineralogy - Petrology, Polished artefacts, Flint, Neolithic-Calcolithic, Raw materials, South Spain.

Introduction

We have developed an investigation project called „Archaeological systematic prospection in the municipal district area of Ardales“ (Ramos, *et al.*, 1987; Espejo, *et al.*, 1987), with a prospection continuity in the valley of the river Turón (Espejo y Cantalejo, 1988, 1989). We have also excavated two necropolis of the II millennium B.C., Morenito I (Ramos, *et al.*, 1986, 1989) and Cerro de las Aguilillas (Espejo *et al.*, 1994; Ramos, *et al.*, 1995, 1997, 1999).

These studies have allowed us to document a register of 24 sites (centres of population, caves, lithic production workshops, burials) that belong to societies of the III and II millennium B.C. We must also remark a great number of occupied sites (villages, settings in caves) associated to tribal communitarian Neolithic societies (Espejo 1987; Ramos *et al.*, 1987, 1995) that inform us of a long historic process of sedentary life and of the beginning of the production economy of the area zone.

We are studying with petrological and mineralogical characterization techniques the different types of resources: siliceous, basic rocks, metamorphic, etc. These types of lithic resources are checked with the ones ob-

tained in the archaeological register, by prospection or excavation, and they allow us to obtain an important approximation to their catchment and sources.

We developed a technological and typological study of the products as an approximation to the technology and the working processes. Here we carried out a contrast between the various lithologies and the archaeological types, that informed us of the possible preferences associated with the use of the available raw materials. We pretend within a medium time, to integrate the functional studies as an approximation to the working processes.

This methodological frame aspires to integrate the geological resources with the archaeological facts. The local and regional knowledge helps to understand the lithic potential resources of this zone.

Finally, we unified all the above with the spatial contexts of the products location, according to the idea of associating products with structures, in order to define activity areas (Ruiz, *et al.*, 1986).

Thereby, the archaeometric techniques overcome the „innocent and only descriptive“ conceptions and they are of a great help to understand the economic, historical social problems, associated to the social formations in study (Ramos, Domínguez and Morata, 1997).

We work from a theoretical position related with the Social Archaeology. We pretend to link the development of the mineralogical and petrological techniques to solve historical problems. Our aim is, by using other studies (technological, archaeobotanic, faunistic, spatials, etc.) to examine thoroughly the knowledge of the way of production and the working process in these societies (Bate, 1998; Terradas, 1998; Pie and Vila, 1992; Ramos, 1999).

Geographical setting and territorial occupation

We study the occupation during the III and II millenniums B.C. in the geographical territory of the intersection of the Turón, Guadalhorce and Guadalteba rivers. It is a peripheric area to that of the nuclear zone located in the Depresion de Ronda (Aguayo *et al.*, 1992), Vega de Antequera (Ferrer and Marques, 1986; Fernández, 1988), and into a general frame of the Guadalquivir Valley, within what F. Nocete calls the meridional mining periphery (Nocete, 2001).

This zone is a confluence area of paths that permits to go over the Subbetic mountains barrier, that separate the inland and the Malaga coast. It is also a natural way between the Vega de Antequera, a fertile inland plain; and the upper course of the Guadalhorce river, with the Higher Andalucía area, and to Antequera with the Ronda-Cádiz lands and the Lower Andalucía (Fig. 1).

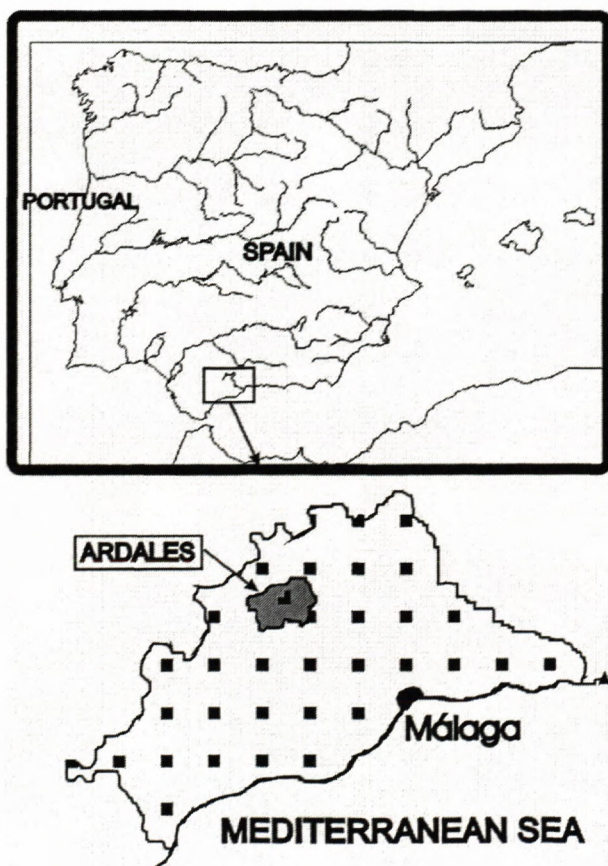


Fig. 1: Geographical setting of the Ardales municipal territory (Malaga province, Andalucía) South Spain.

This territory has a diversified landscape of a great geologic complexity (Durán and López, 1995), that offers to the different societies that occupied the zone wide possibilities for the human settlement. On the one hand, the Sierras Prieta, Alcaparain, Ortegar, offered cynegetic resources, of mountain agriculture, forestall and siliceous resources catchment.

On the other, this zone has wide resources into the actual countryside and fertile valleys, that permitted a development of the production modes based in the agriculture and the cattle raising.

Archaeological register and lithic materials (III-II millenniums B.C.)

The transition from the IV to the III millenniums are well documented in this area, specially at the villages of Olivar de Curro and Cortijo de San Miguel, in zones with a great agricultural potentiality.

The last, with a silos field typical of the control and storage of an agricultural production. They are stable villages that have an agricultural economic base characteristic of the tribal society.

The villages of the III and II millenniums are placed (Fig. 2) in strategic height sites as Peñas de Ardales, Cerrajón and Espolón de Guadalhorce-Kontiki. Its dimensions are small, around 50x50 m. They control the routes and conform a natural belt of safety and internal control of the barns placed in the silos fields.

The most important villages are situated in the fertile valleys, as occur in Viveros, Morenito, Loma del Infierno; they occupy spaces of 50x50 m. The Mirador is an archaeological site of 100 x 100 m. placed on a fluvial terrace of Turón river.

Archaeological materials: chipped industry

The flint extraction by quarrying or mining works are linked to the obtention of siliceous materials for the elaboration of tools that will be used later in the domestic diary works, as well as in artefacts production of forest works, as axes, picks, big retouched flakes.

We have studied a selection of 65 archaeological samples of chipped stone industry from four flint workshops of the III millennium (La Galeota, Castillo de Turón, Lomas del Infierno and Morenito) and one workshop of the II millennium B.C. (La Raja del Boquerón).

Laminar products have also been documented (Fig. 3) that will later be deposited as ideological objects in the burials. This allows us to understand how the production of big laminar flint have become an strategic sector of constant demanding (Nocete, 2001). The flint extraction labours will increase during the III and II millenniums in this zone for the demand of the zone and for the countryside of the Guadalquivir valley, where these resources are practically absent (Nocete, 2001)

Lithic production areas are also located in Cucarra, Azulejo, Loma del Infierno and Morenito.

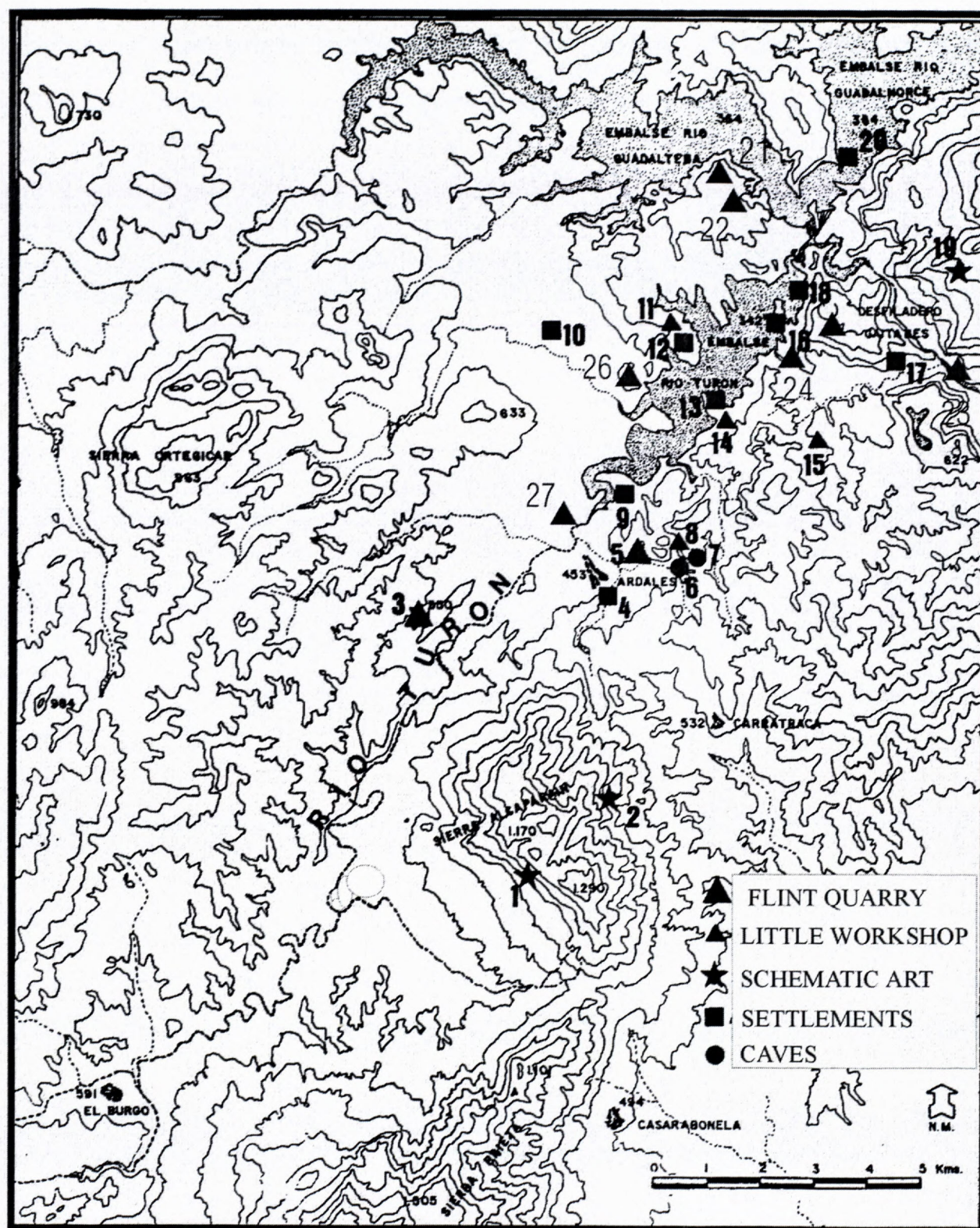


Fig. 2: Archaeological sites of the III and II millennia B.C. in the Río Turón Valley.

III-II Millennium sites: 1: Runtuntún; 2: Los Murciélagos; 3: Castillo de Turón; 4: Peña de Ardales; 5: La Galeota; 6: La Calinoria; 7: Ardales Cave; 8: Cucarra; 9: Vivero; 10: Olivar de Curro; 11-12: Lomas de Infierno; 13-14: Morenito; 15: Azulejo; 16: Parque Ardales; 17: Villaverde; 18: El Mirador; 19: Los Gaitanes; 20: Espolón de Guadalhorce.

II Millennium sites: 21-22: Las Aguilillas; 23: Gaitanejo; 24: Las Atalayas; 25: Almorchón; 26: Raja del Boquerón; 27: Retamar.

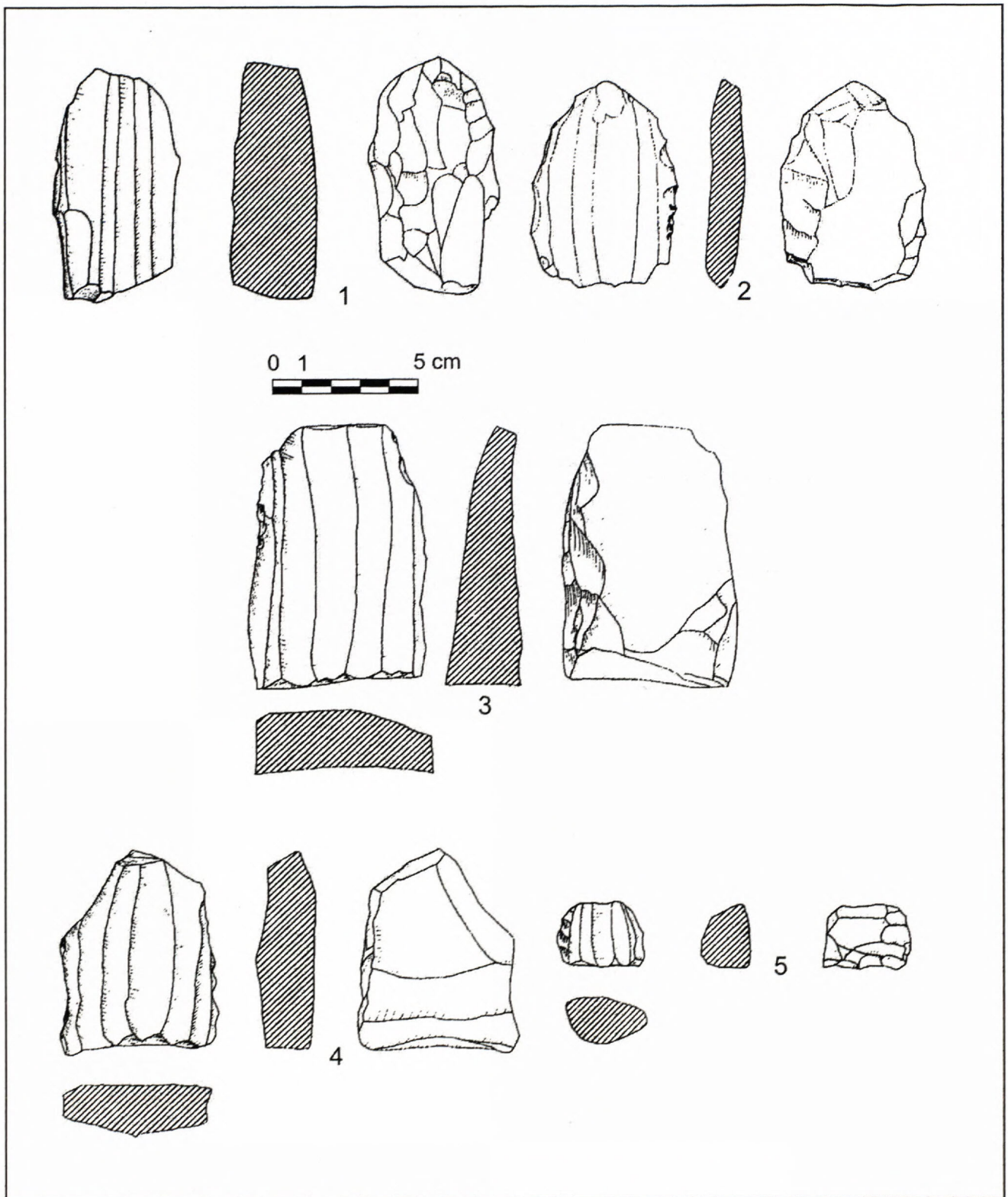


Fig. 3: Flint cores for blades obtention. (III millennium B.C.). Castillo del Turón flint workshop.

The flint working process generates cores and flakes that will support tools, that will be used in different functions and works (Figure 4).

The agricultural works are described with sickle elements, blades with lustre and products in elaboration process; linked to them are notches, denticulate and ser-

rated flakes. There are also products related to domestic activities as scrapers and blades with continuous retouches. On the other hand the maintenance of the hunting work mode are confirmed with foliaceous points with plain retouches. These, together with the metallic objects, confirm the increase of the control on the productions.

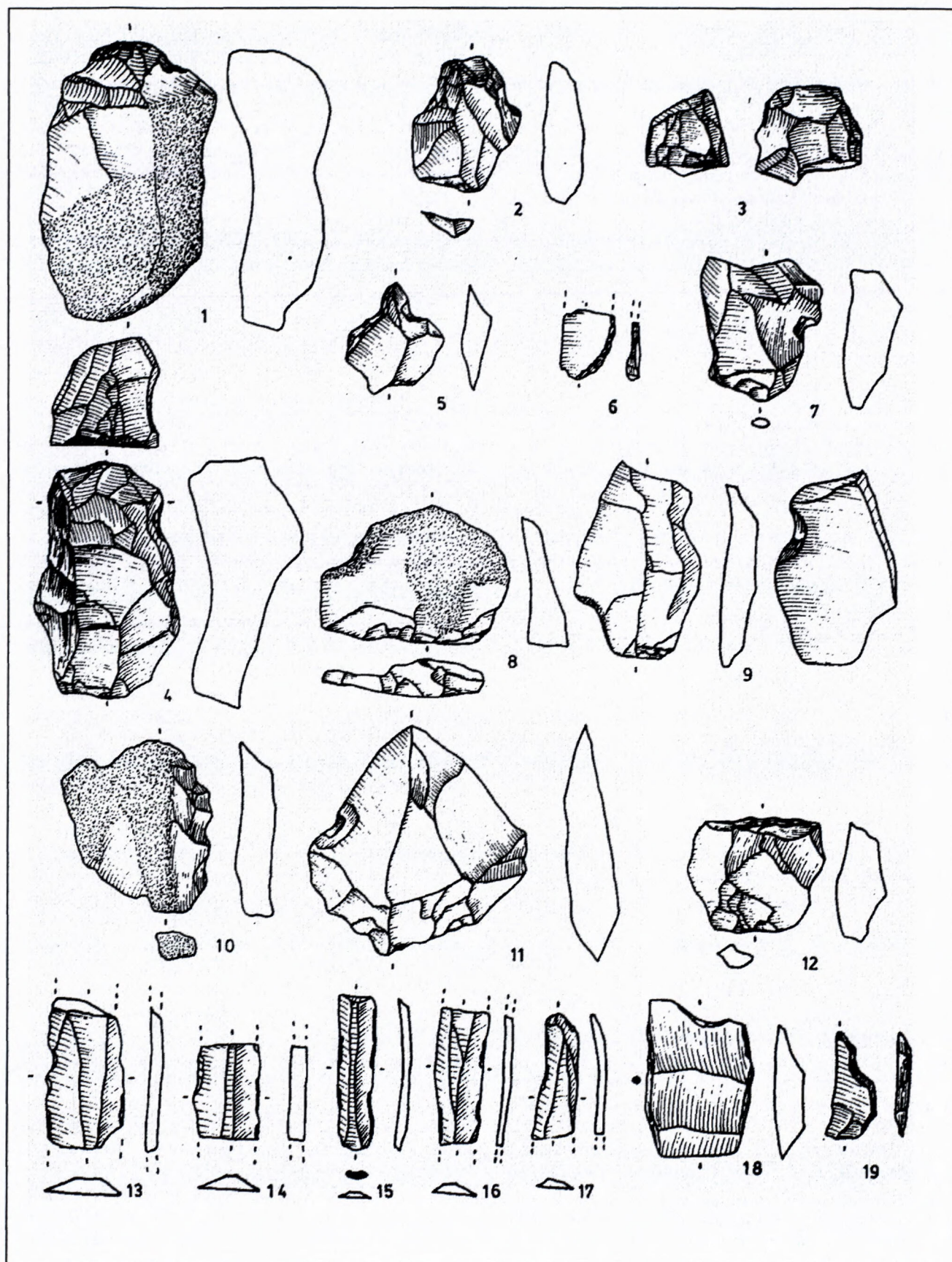


Figure 4: Different kinds of flint chipped tools (III millennium B.C.). Puerto de las Atalayas flint workshop.

Archaeological materials: Polished industry, ceramic and metals

In the settlements of the III millennium B.C., numerous polished stone products are documented. They are elaborated in dolerite and other hard rocks, as fundamental tools for the agricultural activities, as axes and adzes, mullers and mills for the vegetal product processing.

The documented ceramics of the different sites help us to explain their functionality.

There are shape evidences (jars, pots) characteristic of a storage for a direct consumption in the reduced sites. The morphological kind of ceramic for consumption, as dishes and serving dishes with thickened edges, are located in the villages of Olivar de Curro and El Mirador. The consumption bowls appeared in different sites. There are also alloctonous ceramics that are obtained in the trade relations, as the Campaniform ceramics.

During the III millennium B.C. a consolidation process of the tribal society is conformed. An agricultural intensification and an reorganization of the settlements are developed. This occurs in the surroundings of the Guadalhorce, Guadalteba and Turón rivers. We document real barns with accumulation of agricultural surplus that are organized as a real belt of places for its control (Peñón de Ardales, Parque Ardales and Espolón del Guadalhorce-Kontiki).

This situation is increased during the II millennium B.C. The settlements now occupy high, strategic places in pass ways with a good visibility and strategic position in relation with immediate productive territory.

Some villages of the III millennium are abandoned, and the number of settlements and villages are reduced. A population concentration is appreciated in the site of El Castellón, with important settlements in the Guadalhorce and the Guadalteba fluvial beach.

Places as Cerrajón and Peñón de Ardales are placed in steep hills and they seemed specialized settlements, due to its strategic situation and to the disposition of metallic products, that prove the extension of armament and the increase of the extortion of direct producers. They also control the soil used for planting cereals and the shepherding routes of the nearby mountains.

All this points out to a characteristic phenomenon of an initial classistic society. The economic structure of this society is agricultural, with a technology production, with elements of sickles, polished axes and adzes (Figures 5, 6 and 7).

In the inhabited sites, the silos are placed for pots for its storage. The cattle raising is documented by faunistic register of places as Cerro de las Aguilillas, with: *Bos taurus*, *Capra hircus*, *Sus domesticus*; and with hunting of *Cervus edaphus*, *Lepus granatensis*, *Oryctolagus coniculus* and *Vulpes vulpes*.

A certain specialized production exploitation is kept of the mines and quarries of siliceous materials, for local consumption and to supply the villages of the Guadalquivir valley countryside.

The metallic products are documented in the strategic sites and in the necropolis of Morenito, Las Granjas,

Rajas del Boqueron, Lomas del Infierno, Las Aguilillas. Palmela points, punches, swords, daggers, appear. They are related with a military control. There is an interesting social hierarchization documented in the burials and artificial caves. Collective burials of the individuals, with important ceramic and lithic products and votive objects trousseaus, are found. These prestige objects denote differences of social status, this is only possible in these kind of societies with surplus products.

The burials in individual cists reflect that the local elites can acquire luxury products in periphery territories, so there was a centralization process and a posterior distribution.

Geological setting

This zone is situated in the occidental sector of the Betic Cordillera, an alpine mountain chain specially affected in the Tertiary, with the North zone of Africa, by an intense tectonic phenomenon. This valley is placed in a limit zone between the Internal and External zones of the Betic Cordillera, with the presence of some zones: the Betic zone, the Circumbetic zone, the Subbetic zone, the Tectosedimentary formations and Post-nappe materials.

In this area of the Cordillera we can differentiate many Complex: the Alpujárride complex; the Maláguide complex (Betic zone); the Campo de Gibraltar Flysch (Circumbetic zone); the Subbetic Units and the Miocene pre and postorogenic formations (Tectosedimentary formations) (Cano Medina, 1990).

In Figure 8 a synthesis of the distribution of geological materials may be observed in this zone of the valley of the Rio Turón. At the East of the village of Ardales appears a series of Jurassic mountains as the Sierra del Valle, that formed the most important relief of the zone (1191 m.), orientated in the E-W direction and is formed by oolitic limestones, marls and marly limestones, that are crossed by the Guadalhorce river in the Los Gaitanes gorge.

These mountain are limited in the South by materials of the Alpujárride and Maláguide complex, with approximate chronology of Precambrian? (migmatitic banded gneisses) and Palaeozoic (mica-schists and quartzites), and in the West, in clear discordance with them, by calcarenites and horizontal conglomerates of the Upper Miocene (Tortonian).

At the South of Ardales village appears the Serrezuela de Carratraca and the great relief Alpujárride of the zone, the Sierra de Alcaparain (1190 m.), that is mainly formed by white saccharoid marbles of Triassic age; with Triassic and Jurassic materials, formed mainly by dolomites and limestones.

The western zone of the Ardales municipal district, that occupied the left margin of the Rio Turón valley, was dominated by materials of the Upper Cretaceous, the called „red beds“, that are constituted by marly limestones and reddish marls. The right side of the river is dominated by dolomitic materials of the Triassic age and by La Nava Oligocenic breccias.

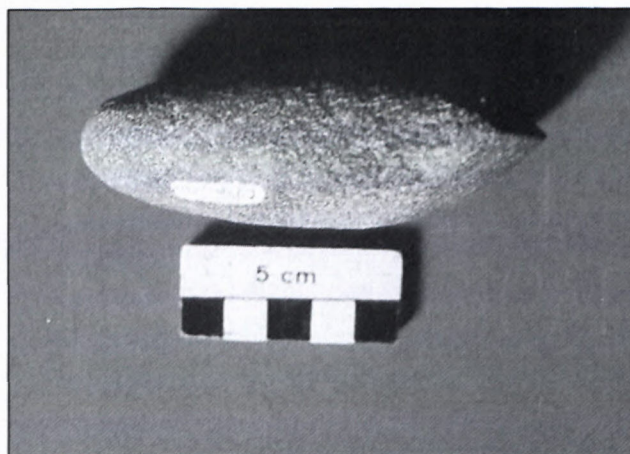


Fig. 5A–B: Amphibolite polished axe. Olivar de Curro site.

Fig. 6: Dolerite polished muller and metamorphic black quartz polished ball. Almorchón West site.



Fig. 7: Amphibolite - Dolerite polished axes. Peña de Ardales site.

All the fertile valley at the North of the river, is mainly occupied by marls and clays of the Miocene age, where we can find outcrops of Cretaceous limestones and marls.

Raw materials and possible source areas

Different lithologies appear in the archaeological register of the sites from the III-II millenniums B.C.; minera-

logical and petrological features of these materials are compared with the possible geological sources in this area.

The main geological materials that appear in the area of Ardales and the valley of the river Turón are as we have described, of different origins, ages and lithologies:

- *Igneous rocks*, represented by the outcrops of the SE district area, in the Sierra de Aguas, with peridotitic materials and lithologies of dunite type, harzburgites and lherzolites. Subvolcanic rocks outcrops of dolerite type (ophite) have been as well found in the north zone of the Guadalhorce and Guadalteba dams, in the clays and marls of the Subbetic Triassic.

- *Metamorphic rocks*, specially the banded gneises, situated in the south slope of the Turón valley, at the East of Ardales, belong to the Alpujarrides units and they usually present a migmatitic character with other mineral association type: quartz, muscovite, biotite, garnet, plagioclase, with the presence in other zones of sillimanite, kyanite, andalusite and staurolite. In some zones the appear crossed by quartz veins, usually deformed.

Amphibolites have been described in this zone (Cano Medina, 1990), in intercalations with Palaeozoic materials, with associations: quartz, epidote, hornblende and quartz, biotite, garnet, epidote, hornblende, oligoclase.

- *Sedimentary rocks*, limestones and limestones with flint of the Jurassic, appear as well as a cretaceous marls



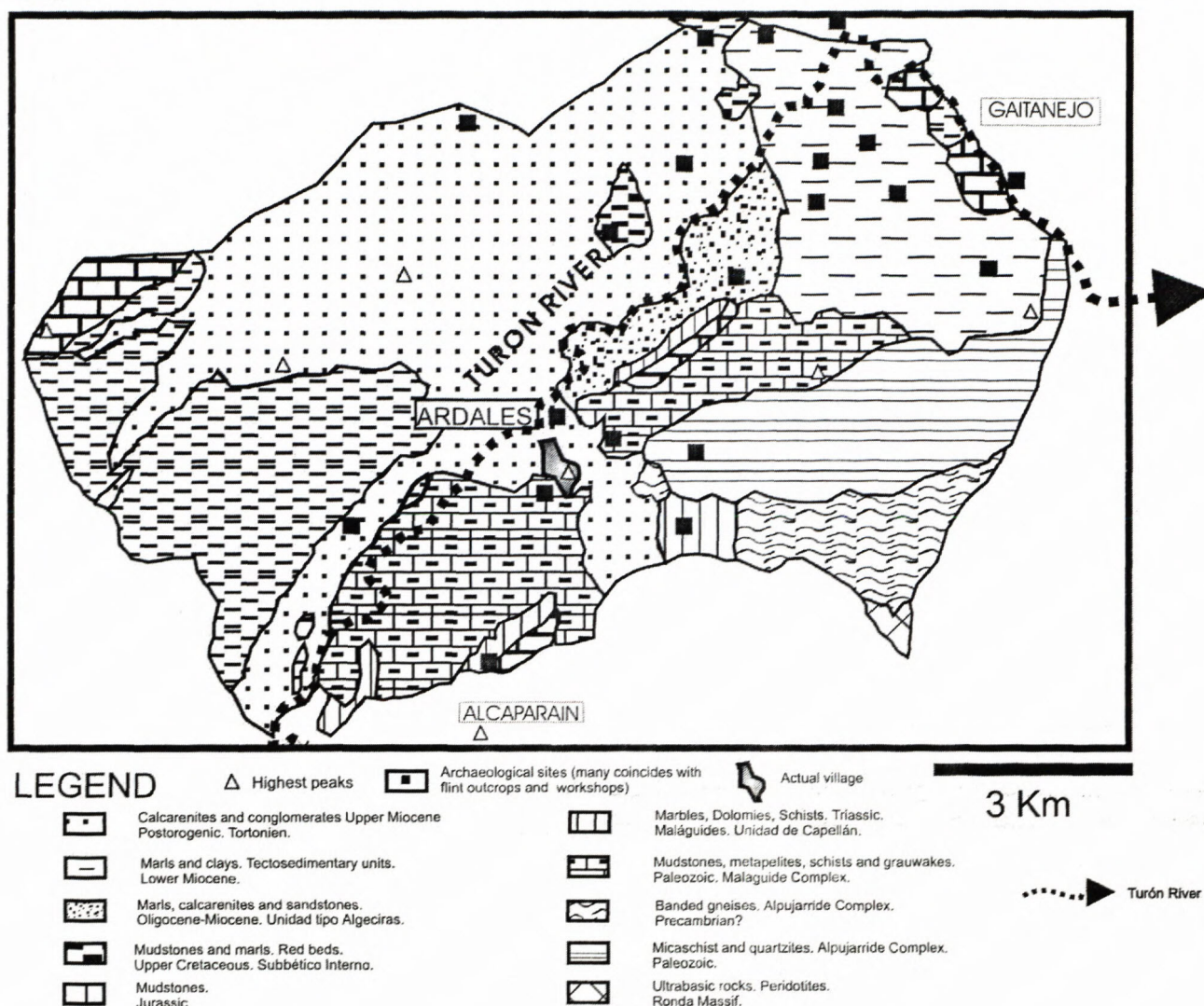


Figure 8: Synthesis map of the geological units present at the Río Turón Valley (Ardales municipal district).

and marly limestones. Carbonated lithologies of the Triassic Age are also common, as occur in the Sierra de Alcaparain.

The Tertiary materials are based in the presence of marls and clay of the Lower Miocene, in all the North fertile valley of Turón and the calcarenites and conglomerates of the East zone of the valley, in the dam of El Chorro, Puerto de las Atalayas, the Mesa de Bobastro, etc., with a chronology of the Upper Miocene (Tortonian).

After the study of a representative selection of polished tools from the III-II millenniums archaeological sites of the Río Turón Valley, we observe a limited variety of lithological kinds. This distribution is shown in the Figure 10. Dolerites with fine, medium and coarse grain are the dominant lithology (69.23 %), amphibolites (11.54 %), metamorphic quartz (7.69 %) and other lithologies as calcarenites, calcareous sandstones and a nodule of magnetite (all with 3.84 %) appear.

Technological Approximation

Finally, a systematic study of the technological features of these materials show a direct relation between lithology and kinds of tools, in this agricultural societies of the III-II millennium B.C.

The hardest and highest mechanic resistance lithologies, as the dolerites and amphibolites are usually used in the elaboration of axes, adzes and chisels (Domínguez-Bella *et al*, 2000), as other more abrasive lithologies, however of less resistance, as the sandstones and calcarenites are used in the elaboration of hand muller and other instruments to the cereal milling. Other minor lithologies as the quartz pebbles (that are associated to many metamorphic rocks in this region), appear associated to cereal treatment works; and others, as an magnetite pebble, related with an artistic activity, the treatment of pigments in a cave.

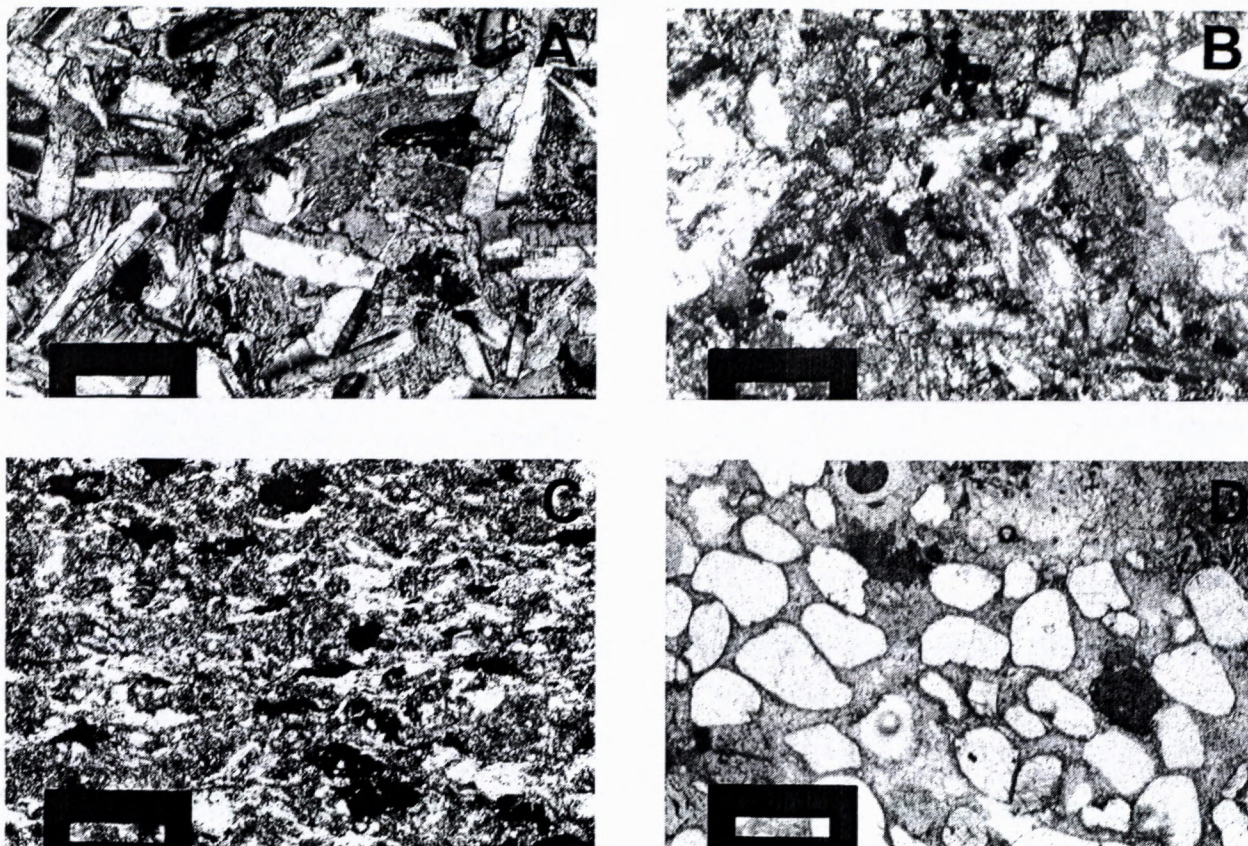


Fig. 9.A: Microscopical view (XPL). of a thin section of a polished axe made in fine grain dolerite. Lomas del Infierno site (III millennium B.C.). (scale bar = 2 mm.)

Fig. 9.B: Microscopical view (XPL). of a thin section of a polished axe made in coarse grain dolerite. El Mirador site (III millennium B.C.). (scale bar = 2 mm.)

Fig. 9.C: Microscopical view (XPL). of a thin section of a polished axe made in amphibolite. Peña de Ardales site (II millennium B.C.). (scale bar = 2 mm.)

Fig. 9.D: Microscopical view (XPL). of a thin section of a polished made in bioclastic sandstone. El Mirador site (III millennium B.C.). (scale bar = 2 mm.)

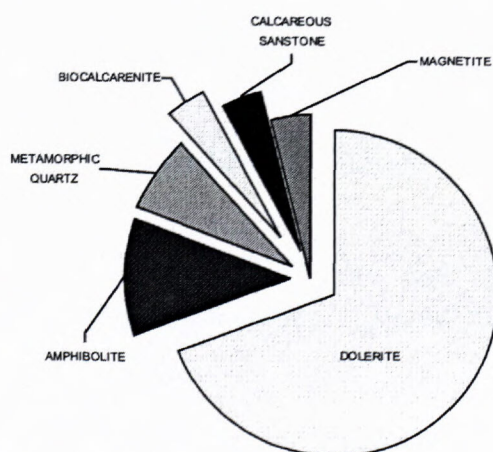


Fig. 10.: Polished tools lithology from the III – II archaeological sites of the Ardales area.

Conclusions

We can conclude that in the Río Turón Valley, during III-II millennia B.C. a exploitation of the lithic re-

sources is produced, mainly centred in the local raw materials or the nearby surrounding (25 km. of radius). Among the raw materials, we may mentioned the dolerites, amphibolites, sandstones and quartz in the polished lithic industry and the flint, as mainly exclusive lithology in the chipped lithic industry.

It is remarkable the specialization in the choice of the raw materials, for the polish lithic industry as well as for the chipped.

Even though there are large outcrops of rocks that could be used as raw materials, as occurs with the ultrabasic rocks of the peridotites Massif of the Sierra de Aguas or the banded gneisses, these materials are practically never used as raw material. Harder and more tenacity rocks as the dolerites and the amphibolites are preferred, although its source areas are further away from the Río Turón valley, but in a radius of 25 km.

In the chipped industry, flint is the main raw material, being a local resource of the valley and being present in different outcrops of the zone, some of them were used as flint quarries and tools manufacture workshops (Castillo del Turón, La Galeota, etc.).

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