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Human occupations in the mountains of central Tierra del Fuego: an archaeological approach

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SUMMARY - *Human occupations in the mountains of central Tierra del Fuego: an archaeological approach* - The aim of this paper is to inform about the results of archaeological investigations carried out in the central strip of Isla Grande de Tierra del Fuego, the main island of the fuegian archipelago. The central sector of the island is a mountainous and woody environment, characterized by development of sub Antarctic forest as well as by its various environments and microenvironments with different resources. The investigations have the dual purpose of contributing to solve a regional impact problem and simultaneously, to contribute to the theoretical and methodological debate in a current theme of the study of hunter-gatherer societies. Its main objective is to evaluate the inter relationship between environment, resources and population dynamics in this area, that we consider as a key to understand the dynamics of mobility throughout the island. The investigation is organized around hypothesis regarding differential resources supply in the various environments of the area, and the possible circulation of hunter-gatherers, as well as the role of both factors in the variability of the archaeological record.

RIASSUNTO - *Occupazioni umane sulle montagne del centro Terra del Fuoco: un approccio archeologico* - Il lavoro presenta i risultati delle ricerche archeologiche effettuate nella Isla Grande in Terra del Fuoco (Argentina). L'ambiente è montagnoso, caratterizzato dalla presenza della foresta subantartica così come da vari ambienti e microambienti di diverso tipo. Le ricerche hanno un duplice scopo: comprendere l'impatto regionale degli insediamenti e contribuire teoricamente e metodologicamente negli studi sui cacciatori-raccoglitori. Il principale obiettivo è di valutare le relazioni dinamiche tra ambiente, risorse e gruppi umani, chiave di lettura per la comprensione delle strategie insediamentali in questo territorio. La ricerca tiene in considerazione il fatto che differenti risorse sono presenti nei vari ambienti e questo può influire sulla modalità dei gruppi umani così come l'insieme di questi elementi può influire sulla variabilità dell'evidenza archeologica.

Key words: hunter-gatherers, Selknam, landscape, Tierra del Fuego

Parole chiave: cacciatori-raccoglitori, Selknam, Territorio, Terra del Fuoco

1. INTRODUCTION

The research we are currently carrying out in the central strip of Isla Grande de Tierra del Fuego is part of a project named “Archaeological project Heart of the Island” (PACI). Its main objective is to evaluate the interrelationship between environment, resources and population dynamics in an area that we consider as a key to understand the mobility dynamics of the hunter-gatherer societies in all the insular territory. Furthermore, from that starting point, we wish to contribute to the theoretical-methodological debate in a current theme in the study of hunter-gatherer societies (Kelly 1995; Binford 1980, 1982, 1983; Bettinger & Baumhoff 1992). The field of study is what we call “central strip” of Tierra del Fuego, a region characterized by the development of the fuegian Cordillera, with an important faulting zone occupied by the great Fagnano lake, oriented West-east, as well as by development of the magellanic forest (Fig. 1). Far from being a uniform environment, this zone shows different landscapes interconnected by perpendicular valleys that possess a diversity of exploitable resources for the hunter-gatherer societies.

From the point of view of circulation of human pedestrian groups, mobility is conditioned by this particular geographic configuration which prevents movement in the North-South direction. The main obstacle is the Fagnano Lake, where passage is only possible eastward of the lake's head, towards the Atlantic slope, or through the Azopardo river, near its mouth, to the West. Nevertheless, the other environments of the central strip are interconnected. On one side, because there are some perpendicular valleys creating corridors that allow communication between the hills, but also because there are others allowing movement towards the base of the mountains, providing access to the Atlantic coast. Towards the north, circulation is also possible, due to the wide valleys descending from the mountain range (Mansur *et al.* 2000) (Fig. 2). Therefore, our research is based on hypothesis concerning differential resource availability within the different environments and the possibilities of mobility of the hunter-gatherer groups, as well as the role that both factors played in the variability of the archaeological record (Borrero 1985, 1991; Mansur *et al.* 2000; Mansur *et al.* 2010). In order to test them, the methodology combines areal systematic surveys in order to

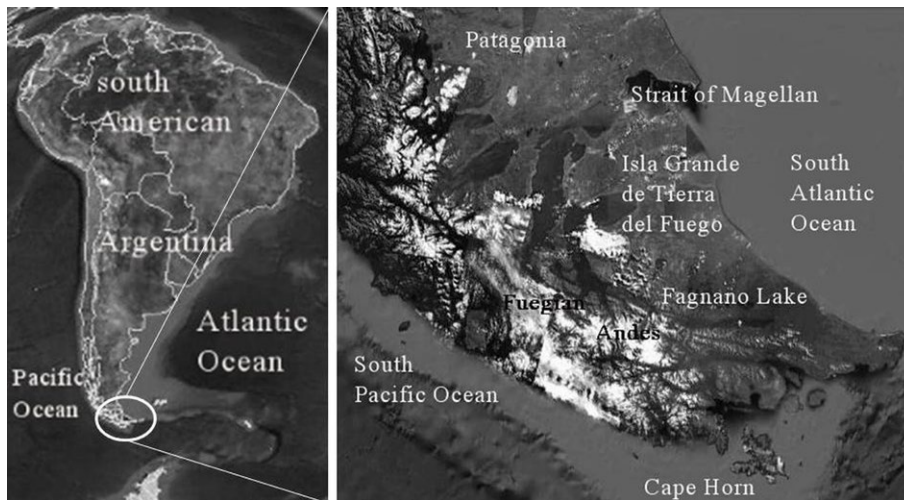


Fig. 1 - Geographical location of Tierra del Fuego, Subantarctic forest area and fuegian Andes.

Fig. 1 - Localizzazione della Terra del Fuoco (Argentina), della foresta subantartica e delle Ande fuegine.

evaluate the archaeological record as well as the offer of biotic and abiotic resources, excavation of selected sites and confrontation with ethnohistoric and ethnographic information for the area.

Up to now, research within the scope of the PACI developed in three phases. The first one was carried out in collaboration with the Instituto Fueguino de Turismo, aiming to plan the *Reserva provincial Corazón de la Isla*. In this phase, were surveyed several areas to the north of Lake Fagnano, the basins of Chepelmut and Yehuin lakes, and Marina I site was excavated (Mansur *et al.* 2000; Mansur 2002; Mansur & Piqué 2009). As a corollary of this first phase, it was possible to start characterizing the archaeological record, with special emphasis in the study of abiotic resources, as well as taphonomic processes and soils in forest environment.

The second phase included work in collaboration with the Autonomous University of Barcelona, which were co-directed by Dr. Raquel Piqué. In this phase, we prospected the area extending northeast from the head of Lake Fagnano and we excavated sites in the Ewan locality, allowing to characterize a ceremonial site of the selknam society and to begin implementing a number of new lines of analysis for characterization of biotic resources (for inst. Bogdanovic *et al.* 2009, Mansur & Piqué 2012 and bibliography cited).

In the third phase, which is being developed, we have undertaken study of the forest area extending to the South and East of Fagnano lake, where a number of extended sites were discovered (Mansur *et al.* 2010; Parmigiani *et al.* 2012). At the same time, we carried out systematic surveys in order to understand utilization of landscape and different environments, as well as resource management by the hunter gatherer societies (De Angelis *et al.* 2012).

The goal of this paper is to present the general scope of these investigations, hypothesis and methodology, to summarize the results obtained up to now and to discuss them according to the occupation of this area.

2. LANDSCAPE AND HUMAN OCCUPATION

Due to its geographic characteristics, the central area of Tierra del Fuego differs sensibly from the surround-

ing areas and even from the southern part of Patagonia. Its main geomorphologic feature is the development of the Andes mountain range, formed by subparallel chains with a general W-E orientation, with inner mountain valleys and depressions with various depths (Olivero & Malumian 2008).

Cordillera and precordillera are separated latitudinally by the Magellan/Fagnano fault system, which extends from West to East along hundreds of kilometers, defining the transcurrent limit between two tectonic plaques, Scotia and South American (Olivero & Malumian 2008). In its central strip, a deep depression hosts the Fagnano lake. It is approximately 120 km long, with a maximum width close to 10 km. The lake drains towards the Pacific Ocean through the Azopardo River, that connects it with the Almirantazgo gulf and the Magellan Strait.

On the Northern part of Fagnano lake, the Sierra de las Pinturas, formed by marine sedimentary rocks (sandstone) of Paleogen age (Early Cenozoic), delimits the southern border of the South American plaque (Olivero *et al.* 2007). Towards the south, the Cordillera's southern flank is limited by another depression, occupied by the Beagle Channel. Here the mountains form an irregular coastline that alternates bays and cliffs. Towards the east, mountains spread towards the oriental side of the island, the Mitre peninsula and the neighbouring Isla de los Estados. Towards the north, the Cordillera's northern slope descends gradually towards the plains of Isla Grande, through a zone of hills and flat terraces that were modeled by different glacial events (Ponce *et al.* 2011).

The landscapes in this area differ from each other within the different basins, due to altitude, climate conditions and soil development. Northwards, the basins from rivers descending the Beauvoir and De Las Pinturas mountains alternate with areas of forested mountains and with important lake basins. The main ones are Yehuin, Chepelmut, Esperanza and Yakush lakes, which occupy an old glacial depression that begins at the Fagnano Lake (Fig. 2).

Eastwards, the terrain descends in height towards the Atlantic coast, in mesa-like formations cut through by the river basins in that slope. Towards the south, the intermountain depressions accommodate lakes and lagoons, and also an important longitudinal valley that separates the

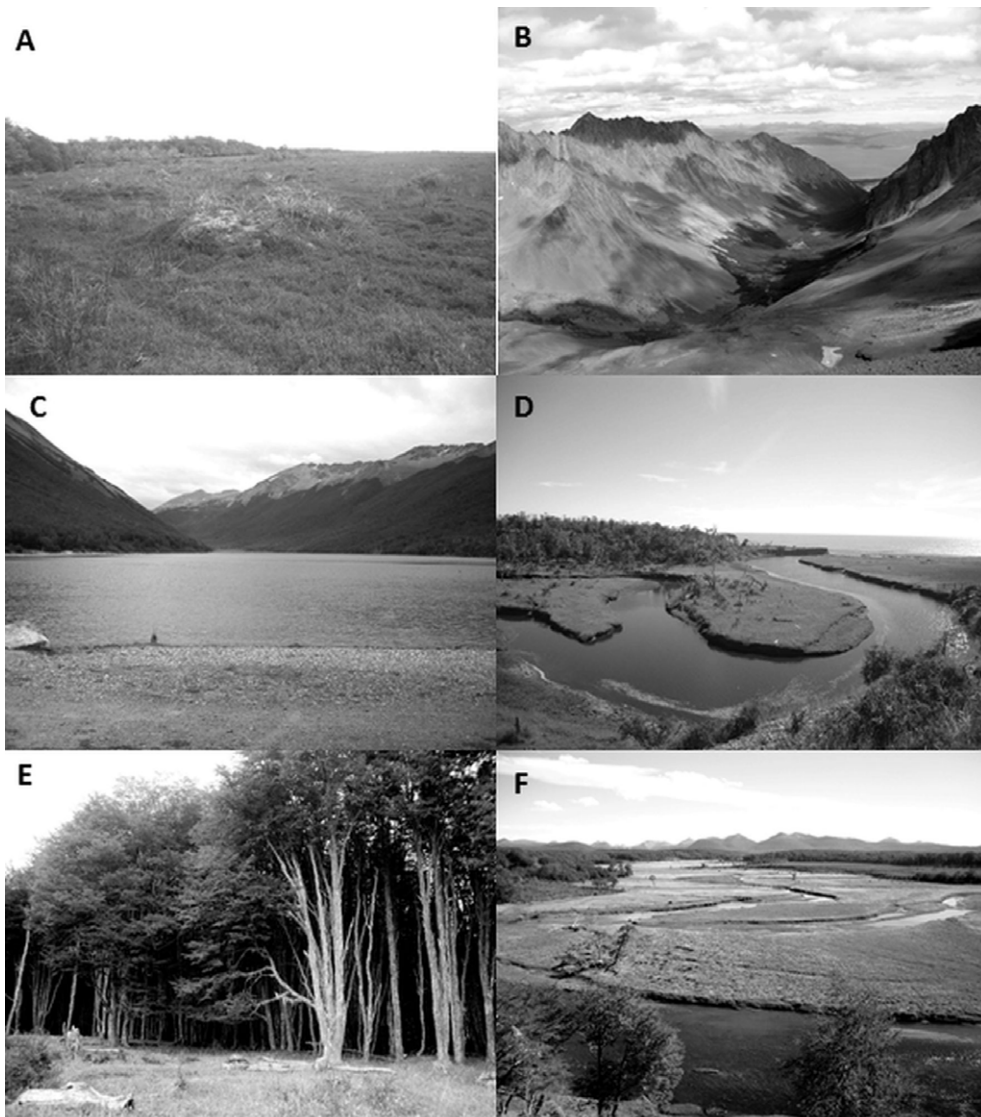


Fig. 2 - Central Fuegian environments. A- Peat Bog; B- Mountain; C- Margarita Lagoon; D- Mouth of Azara river, towards the Atlantic coast; E- Nothofagus forest ; F- Lainez river Valley.
 Fig. 2 - Ambienti della terra del Fuoco central. a- torbiere; b- montagne; c- laguna Margarita; d; foce del fiume Azara, costa atlantica; e- foresta a Notofagi; f- valle del fiume Lainez.

middle and coastal mountain ranges (Fig. 2) (Olivero *et al.* 2007).

However, most of the landscapes have been modified nowadays since the introduction of beaver (*Castor canadensis*) in the area; they create dams that flood ample sections of the forest and new peat bogs.

3. POPULATION AND RESOURCES

In the XVIII – XIX th centuries, the area was populated by the Selknam society. Archaeological sites from this period are known in other regions, such as the continental coast in the northern section of the island (Borrero 1991). The numerous written sources point out that local groups lived in territories called *haruwen*, in which they moved very frequently. Movement towards other territories is also mentioned, since there were pass permits, meeting moments, etc. In fact, different sources related to the Selknam population of this last epoch mention group movements towards the south (until the Beagle channel coast) and to the east

(Atlantic coast) (Bridges 1978 [1951], Chapman 1986).

Regarding resource availability, the central mountainous area is characterized by its great diversity and abundance of resources, compared to the northern steppes (Mansur 2002; Piqué 1996; Berihuette 2010). Although the entire mountain region in the center of the island is covered by the subantarctic forest, the vegetation types change in the different sectors, according to the climate conditions and the soil characteristics (Tuhkanen 1992; Collado 2007; Frangi *et al.* 2007)

Based on the forest's characteristics, we can distinguish three main zones. One is the perennial mixed forest, extending from the southern coast of Isla Grande to the Fagnano lake. In this area, there is great diversity and abundance of exploitable resources for hunter-gatherer societies, specifically many different kinds of plants. The principal trees are two species of Nothofagus (southern beech): the *guindo* or *coihue* (*Nothofagus betuloides*) and the *lenga* (*N. pumilio*). There is an important shrub layer formed mainly by calafate (*Berberis buxifolia*), chaura (*Pernettya mucronata*), michay (*Berberis ilicifolia*) and parrilla (*Ribes*

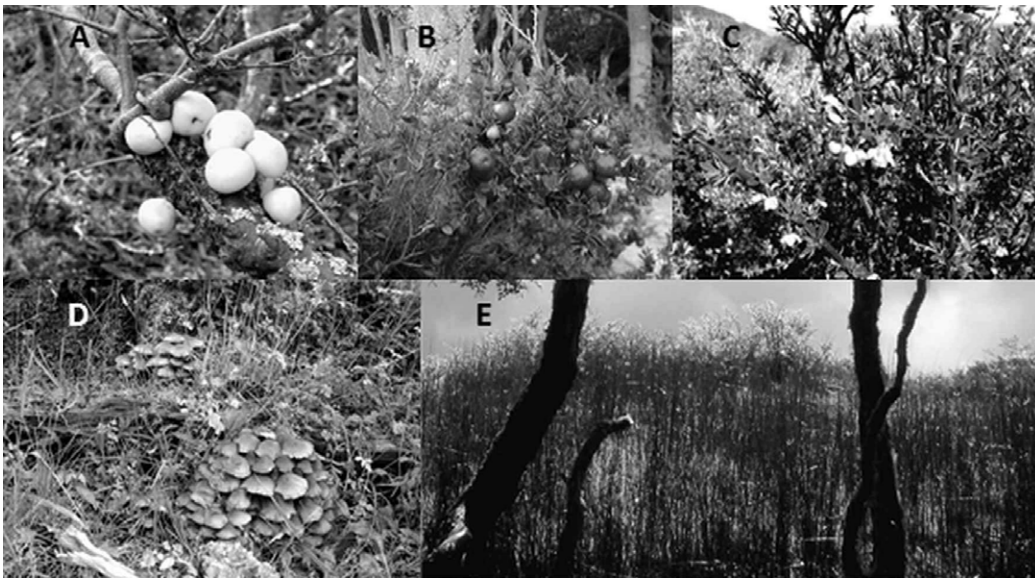


Fig. 3 - Biotic Resources. A & D Mushrooms; B & C berries; E- Reeds.

Fig. 3 - Risorse biotiche. a-d- Funghi; b-c- frutti di bosco; e- vegetali.

magellanicum). All of these have small edible berries that ripen in the summer. During this season, the small Magallanes strawberries also ripen (*Rubus geoides*).

Another area is the one with the deciduous forests (*N. pumilio*) on the southern slopes of the cordillera and east of Fagnano lake, until the Atlantic coast, where wide peat bogs alternate with forest hills and ample valleys. In this area there is still a wide offer of trees but variability in the shrub stratus is smaller.

Finally, the last area is the deciduous forest of *N. antarctica*, developed in the forest–steppe ecotone hills that extend northwards until the Grande river. In some areas, the “ñire” forest is well developed, with trees over 15 m tall. Among the shrubs, the most common ones are *Berberis buxifolia* (“calafate”), that grow in the lower mountains, in the openings and edges of forests and also in the steppe’s humid areas, bordering rivers and springs. In the areas exposed to the wind, a shrub stratus forms with *Chiliotrichium difusum* (“mata negra”). Another important shrub is *Empetrum rubrum* (“murtilla”), that grows in the lower humid lands and edges of the forests. Here, both the “calafate” and “murtilla” grow edible berries available during the summer (Fig. 3).

The forest offers not only cover and shelter but also abundant wood for fuel, technology manufacture, etc. On the shores of many lakes and lagoons there are reeds that the Selknam utilized for basketmaking. Among the herbaceous, there is a variety of edible plants such as wild celery (*Apium australe*), Lion’s tooth (*Taraxacum sp.*), “amor del hortelano” (*Gallium sp.*), etc. (Mansur & Piqué 2009) (Fig. 3). All the forest environments are also rich in edible mushrooms, available mainly in spring and autumn.

Regarding the animal resources, the grass and vegetation on the edges of the forest attract guanacos (*Lama guanicoe*). Other mammals in the area are the Fuegian fox (*Dusicyon culpaeus*) and a rodent (“tucu-tuco”, *Ctenomys magellanicus*). The lake and lagoon environments attract great variety of birds, from the beginning of spring until the end of autumn, such as “avutarda” or “cauquén” (*Chloephaga picta*), “patagonian carpenter” (*Campephilus*

magellanicus), parrots (*Enicgnathus ferrugineus*), among others. (Fig. 4)

Concerning abiotic resources, undoubtedly the main one is the lithic raw material. Materials with good knapping quality represented in the archaeological sites of this area, such as medium and fine grained rhyolite, cinerite, silicified limolite, come from the Le Maire and Yaghan formations, that emerge in the fuegian cordillera. These materials are also available in different places from redeposited formations with more recent origin (Olivero *et al.* 2007; Mansur *et al.* 2000).

In the whole central and northern area of Isla Grande, the potential sources for the main raw materials are the beaches on the Atlantic coast and the glacial drift deposits, with various redistribution levels regarding the hydrologic systems, since the pebble stones of considerable size are predominant (Borrero 1998). These are particularly important in the southern coast of Fagnano lake, where cliffs alternate with small bays. They provide pebbles of various dimensions, which represent different qualities of raw material for knapping. It is probable that obtaining and transforming this raw material represented an important role in the planning of the movements and settlement selections among the hunter-gatherers that occupied all the central strip of Tierra del Fuego (Mansur *et al.* 2010).

4. HYPOTHESIS AND METHODOLOGY

As mentioned in the introduction, on the basis of previous research, investigations in this phase or PACI are articulated according a series of hypothesis concerning resource exploitation in the different environments in relation with processes of production and social reproduction.

Concerning lithic raw material, we propose that concentration of pebbles acted as an attractor for human occupation. The exploitation of concentrations of pebbles allowed an easy provision of raw material, as well as its circulation to other localities. The methodological approach is being done by means of study of distribution and cha-



Fig. 4 - A- Red fox; B- Cauquen; C- Guanaco.
Fig. 4 - a- volpe rossa; b- anatre; c- guanaco.

characteristics of archaeological sites, characterization of lithic resources and techno-functional analysis of lithic record.

Concerning mobility and seasonality, we propose that the exploitation of resources in the central zone of the southern shore of Fagnano lake, corresponds to a summer exploitation model. Access to this zone is difficult during winter, because of its geographical location along the coast, and limited by the cordillera. On the other hand, there are passes in the mountains that can be crossed after snow melting, giving access to the coast, which in this season is rich in quantity and diversity of plant and animal resources. At the same time, it has visibility of mineral resources, which are difficult to exploit during the winter because of snow covering them. The approach to this hypothesis is being undertaken by means of faunal remains analysis (season of death) and archaeobotanical analysis (determination of fruits and ripening season).

Finally, concerning the size of what we call “extended sites” (*cf infra*), it can be explained in function of two alternative hypothesis. The first one is that they are the result of palimpsest of a series of occupations along a certain period, and that they cannot be distinguished because of technological homogeneity, stratigraphic continuity and taphonomic situation. The other is that they represent an aggregation event, equivalent to the *Hain* studied at the Ewan locality (Mansur *et al.* 2005; Bogdanovic *et al.* 2009; Mansur Piqué 2009). In function of the experience of Ewan, definition of this hypothesis is approached principally from spatial distribution analysis.

Consequently, we adopted a field methodology including systematic surveys in the different environments. When archaeological materials are detected on the soil surface, in concentrations or in stratigraphic continuity, the *loci* are defined as archaeological sites. To begin, they are reticulated in order to establish square meters; then, exhaus-

stive collection of archaeological remains is done within this square meters, so that materials can be correlated with those in stratigraphy. Then, concerning record of archaeological materials, all items longer than 2 cm are recorded tridimensionally, and the same happens with smaller items when they are determinable. Undeterminable items smaller than 2 cm are usually recovered by microsector (0,50 x 0,50).

For the analysis of lithic material, we adopted a series of variables based on techno morphological criteria. These are the same in use in ATMA Project (Techno functional analysis of archaeological materials), applied in other sites (for instance Mansur 2006; Mansur, Lasa & Vázquez 2004; Mansur & Lasa 2005). The aim of techno morphological classification is that it can be correlated with the microscopic functional analysis of lithic pieces. For the analysis of débitage, we use the categories “flake” and “fragment” (this last one when pieces are fractured, probably from broken nuclei, and we cannot analyze butts and bulbs). As for size, to categories normally used (*sensu* Aschero 1975, Orquera and Piana 1986), we add a division in order to consider separately items smaller than 0,5 cm (microflakes and microfragments) and items between 0,5 and 2 cm (small flakes and debris).

Finally, concerning sediments treatment, all the sediment corresponding to combustion areas is treated by machine flotation with 1 mm and 0,4 mm screens. We also flote systematically a sample of one microsector (d) in each excavated sector. The rest of the sediment is dry screened or water screened (2 mm screens)

5. RESULTS

Investigations developed up to now in the mountain region of Tierra del Fuego show evidence of numerous superficial and stratified sites. In general, they are placed in different locations, some in woody slopes, others close to lakes or lagoons, or to the coast; some of them are on the sides of wide valleys, others in the forest.

According to their characteristics of size and surface, we classified them in three groups: isolated findings, small campsites and extended sites. The first correspond to isolated archaeological materials on the soil surface, with no relation with eroded archaeological levels. They are both on woody slopes and near lakes and lagoons. In most cases they suggest utilization of these landscapes for hunting. They were detected in the systematic survey program (see De Angelis *et al.* 2012).

The small sites are concentrations of some archaeological items, frequently around a hearth. These concentrations may correspond to individual habitation units (camps or stops during migrations) for short term occupations. An example of this is Marina I site, located on the borders of río de la Turba valley. Excavations in the site revealed faunal remains (guanaco), lithic tools (projectile points and retouched tools) and other lithic products, associated with two hearths with abundant charcoal fragments. The site was interpreted as a short duration campsite, where people developed activities related with hunting, processing and consumption of animals, hides preparation, repairing or refreshing of lithic tools, etc. Radiocarbon analysis indicates a date around 1.800 ± 250 AP (AC n° 1471). (Mansur *et al.* 2010).

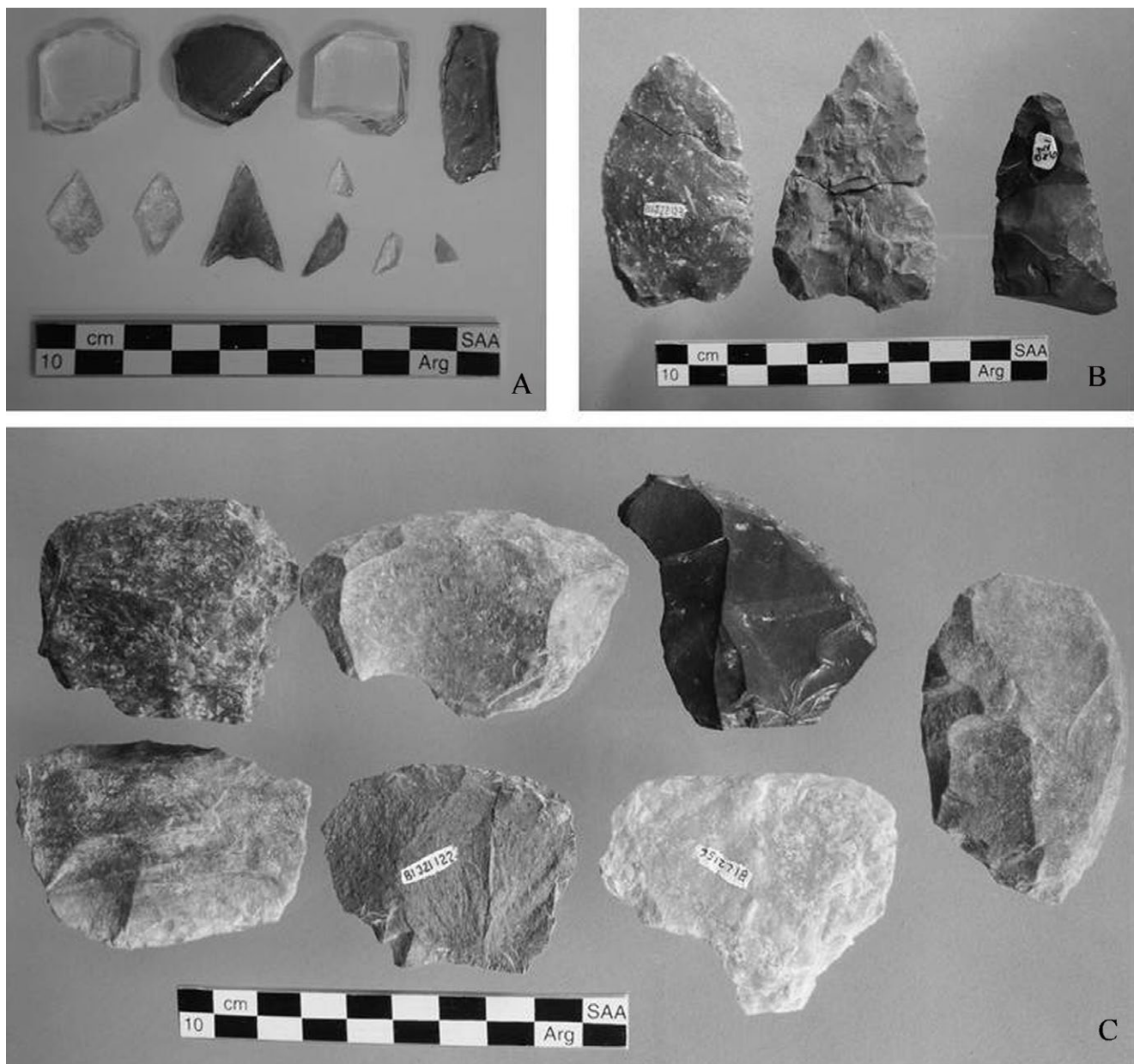


Fig. 5 - A. glass instrument from Ewan; B projectile point preform from Kami 1; C. Sidescrapers from Kami 1

Fig. 5 - A. strumento in vetro dal sito di Ewan; B- punta di proiettile in fase di costruzione dal sito di Kami 1; C- raschiatoi dal sito di Kami 1

5.1. Extended sites

These are sites where the concentrations of archaeological materials are superimposed and cover a large surface. They usually have different hearths. They can represent reoccupation events in a same environment during a certain time, as in the case of seasonal reoccupations, or aggregation events. Among the first, good examples are the occupations of Kami 1 and Kami 7 sites, both located on the southern coast of Fagnano lake. In both of them excavations revealed different hearths surrounded by archaeological materials, including tools and débitage (Mansur *et al.* 2010, Mansur & De Angelis 2012). Tools are abundant; they are mainly represented by long retouched edges (side-scrapers, knives and retouched flakes) and small endsca-

pers. Abundance of lithic material of all sizes, and its characteristics, representing different stages of the operating chain, suggest that raw material was obtained locally from the pebble beaches nearby. Concerning activities developed, functional analysis of lithic pieces (retouched and unretouched) reveals a diversity of activities coherent with multiple activities sites (Fig. 5). Due to soil characteristics, bone remains are very badly preserved. Archaeobotanical analysis revealed carbonized *Empetrum* grains in one of the hearths, indicating that occupation took place during the summer, and *Gallium* in another one, suggesting also an occupation in spring-summer (Berihuete com. pers.). Radiocarbon dating of different hearths in both sites gave the following results: Kami 1: 3210 ± 80 AP (LP 2164), 1130 ± 60 AP (LP 2163) and 1170 ± 60 AP (LP 2201). Kami 7:

1.217 ± 38 AP (AA94284); 178 ± 34 AP (AA94285); and one after XVII th century (Parmigiani *et al.* 2012). These chronologies suggest that the area was reoccupied along at least one thousand years by hunter-gatherer groups who developed economic activities, as searching raw material, manufacture of tools, utilization to process different resources, capture, process and consume animals, etc.

Up to present, only one extended site, Ewan, represents an occupation corresponding to an aggregation event: the Hain ceremony. In Ewan, there was a structure of a ceremonial hut still standing (the *Hain*). 200 m away, surveys let discover an ensemble of domestic units that had collapsed and had been completely buried. The analysis of archaeological materials of each structure and then comparison between them let evaluate activities developed in each hut, duration of occupation and seasonality. Dendrochronological dating revealed that the *Hain* hut was built with logs cut during the spring 1905. Coincidentally, study of mollusks (*Nacella deaurata* and *N. magellanica*) and presence of carbonized seeds where predominate *Empetrum rubrum* and *Gallium aparine* confirm that occupation extended at least along spring-summer. The investigations developed in Ewan let evaluate and discuss the archaeological record of the ceremonial hut, discover and analyze the zone where domestic huts are located, analyze completely one of the domestic units and compare it with the ceremonial structure (Bogdanovic *et al.* 2009, Mansur & Piqué 2012).

6. DISCUSSION AND PERSPECTIVES

The information obtained up to now about the archaeology of the central strip of Tierra del Fuego confirm that the different environments were exploited as a part of the strategies adopted by the hunter-gatherer societies in the occupation of the insular environment. Most of the sectors studied showed archaeological occupations. However, their distribution and their density vary. We believe that this variation is related to resource seasonal availability and mobility of hunter-gatherer groups.

Difficulties to face the analysis of this region are due to its low archaeological visibility, which is a characteristic of mountain forested environments. Then normally have thin soils where numerous disturbing factors act. But they are also related to the type of archaeological record expected, according to the social dynamics. In the case of the Selknam, the small groups were very mobile and had a light material equipment, so they are supposed to have little impact on the landscape and leave few imperishable material, maybe not concentrated (Borrero 1991; Mansur 2002).

Small sites identified probably correspond to transitory campsites; occupational redundancy was not recognized up to now; quantity and quality of archaeological materials, as well as combustion structures, suggest short occupations by small groups. On the other hand, in the case of extended sites, the same criteria suggest reoccupations repeated along time. Only the case of Ewan represents an exception, where the combustion structures correspond to a long term occupation, but only one event (Mansur & Piqué 2012).

As for distribution, small sites have been discovered up to present in sectors where lithic raw material is scarce. In those sites, local raw materials were exploited; they probably come from redeposited glacial formations. Con-

trarily, in sectors where raw material is abundant, extended sites were detected. Analysis of archaeological materials confirms that multiple activities were developed, principally manufacture of tools with varied and abundant raw materials. As we previously mentioned, on the basis of analysis of two extended sites of Kami locality (1 and 7) we believe that both of them could be good examples of a high occupational redundancy. In Kami 1, proximity of radiocarbon ratings is not conclusive; but in Kami 7 reoccupation could be confirmed in function of radiocarbon ratings and different classes of materials related to three combustion areas (Parmigiani *et al.* 2012). Finally, concerning seasonality, in both cases archeobotanical analysis suggests spring-summer occupations.

We believe that the hypothesis proposed concerning exploitation of mountain resources by the hunter gatherers of the central strip of the Island will help us understand the mobility and social dynamics of these populations. Until some time ago, it was thought that this region had not been occupied by aboriginal people; now, these results show the contrary. It's probable that difficulty to recognize human occupation was due to problems of site formation, conservation and archaeological visibility, typical of forested mountain environments.

The results obtained up to present suggest that it is possible to determine seasonality of sites from archeobotanical and zooarchaeological remains; also that it is possible to propose social dynamics from the variety of raw materials present and characteristics of the sites, etc. From now on, ongoing research should let us evaluate better utilization of different environments and mobility in diverse time spans along the human occupation of the cordilleran zone of Tierra del Fuego.

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