



Memòria justificativa de recerca de les convocatòries BCC, BE, BP, CTP-AIRE, DEBEQ, FI, INEFC, NANOS i PIV

La memòria justificativa consta de les dues parts que venen a continuació:

- 1.- Dades bàsiques i resums
- 2.- Memòria del treball (informe científic)

Tots els camps són obligatoris

1.- Dades bàsiques i resums

Nom de la convocatòria

BE

Llegenda per a les convocatòries:

BCC	Convocatòria de beques per a joves membres de comunitats catalanes a l'exterior
BE	Beques per a estades per a la recerca fora de Catalunya
BP	Convocatòria d'ajuts postdoctorals dins del programa Beatriu de Pinós
CTP-AIRE	Ajuts per accions de cooperació en el marc de la comunitat de treball dels Pirineus. Ajuts de mobilitat de personal investigador.
DEBEQ (Modalitat A3)	Beques de Cooperació Internacional i Desenvolupament
FI	Beques predoctorals per a la formació de personal investigador
INEFC	Beques predoctorals i de col·laboració, dins de l'àmbit de l'educació física i l'esport i les ciències aplicades a l'esport
NANOS	Beques de recerca per a la formació en el camp de les nanotecnologies
PIV	Beques de recerca per a professors i investigadors visitants a Catalunya

Títol del projecte: ha de sintetitzar la temàtica científica del vostre document.
Noves Tecnologies per l'estudi de l'Arqueologia de Patagònia (Amèrica del Sud)

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Paraules clau: cal que esmenteu cinc conceptes que defineixin el contingut de la vostra memòria.
Arqueologia, prehistòria, Evolució social, caçadors-Recolectors, Patagònia, Amèrica, Col·lonització

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Vistiplau del/de la responsable de la
sol·licitud



Resum del projecte: cal adjuntar dos resums del document, l'un en anglès i l'altre en la llengua del document, on s'esmenti la durada de l'acció

Resum en la llengua del projecte (màxim 300 paraules)

Aquest projecte tenia per objectiu l'estudi històric i arqueològic de Patagonia, la regió poblada més austral del món. El nostre objectiu ha estat analitzar aquestes societats per a comprendre com van poder mantenir el seu sistema socioeconòmic, és a dir com van poder mantenir-se aquestes societats malgrat la contradicció entre producció i reproducció característica en societats caçadores recol·lectores. Les noves metodologies en informàtica ens han permès una millor integració de la gran diversitat de dades necessàries.

Heu volgut analitzar l'evolució històrica de les relacions i interrelacions intragrup i intergrup de les societats nòmades patagòniques, així com comparar les seves diferents respostes davant el canvi radical de realitat immediata que va suposar la colonització. Per això hem analitzat exhaustivament els resultats d'excavacions arqueològiques de diverses regions i hem integrat la informació provinent d'altres disciplines com l'antropologia, la etnohistòria i la geografia. Estem desenvolupant els programes informàtics que ens permetin integrar dades geogràfiques actuals i paleoambientals de la dinàmica natural de formació dels sòls, de la vegetació i dels recursos hídrics en Patagonia (rius, llacs, valls, altiplans i estepa) amb informació històrica de l'acció productora, transformadora i distribuïdora de les poblacions humanes. La memòria posa de manifest els resultats de la investigació, i no tant les eines utilitzades.

Resum en anglès (màxim 300 paraules)

The goal of this project was the historical study of Patagonia, the southernmost human settled area of the world. Our aim has been the analysis of those societies to understand how they maintained their socioeconomic system, that is to say, how social reproduction allowed resolving the basic contradiction between production and reproduction, which is characteristic of all hunter-gatherer societies. New computational technologies have allowed a better integration of the big amount and diversity of data needed.

We have analyzed the historical evolution of inter-group and intra-group social relationships among nomad patagonian societies. We have compared different social answers in front of the radical change of their immediate reality produced by european colonization. We have exhaustively analyzed the results of archaeological excavations from different regions. We have also integrated information from anthropology, ethnohistory and geography. We are developing computing programs to integrate geographical actual data with paleoenvironmental data about the dynamic nature of soil formation, vegetation, hydrography, etc., with information about the history of productive action and how products were distributed among different human groups.



Resum en anglès (màxim 300 paraules) – continuació -.

2.- Memòria del treball (informe científic sense limitació de paraules). Pot incloure altres fitxers de qualsevol mena, no més grans de 10 MB cadascun d'ells.

The proper limits of Patagonia are difficult to establish, but it is of general acceptance that the American continent south of a line between 36°-41° South (The Colorado River Valley) can be called Patagonia. Obviously, not all this region of the world can be described as *subantarctic*, therefore we will limit ourselves to South and Central Patagonia (south of 47° south, approximately), with only a few remarks about northern Patagonia, because social processes were very similar and historically related, although some environmental aspects were markedly different.

South and central Patagonia has been usually described as a land poor in resources, where human groups configured a set of isolated communities of ecological, economic, and ethnic individuality, without any relation between them. In reality, the situation is quite the opposite.

Variability at the Economic Scale

Ecological variability is what characterizes Patagonian more than 1.000.000 sq. kilometers (Balmaceda 1976, Cabrera and Willink 1980, Soriano 1983, Paruelo and Sala 1995, Paruelo et al. 1998, Oesterheld et al. 1998). This heterogeneity is determined by two strong climatic gradients:

- The West-East gradient of decreasing precipitation
- The Northeast-Southwest gradient of decreasing temperature

Human exploitable resources are linked to those gradients, although the correlation is not perfect.

Inside each ecological region (southwestern coasts and islands, eastern coasts, mountains forests, steppe), the diversity of sources for food may be not very diversified, although occasionally it is very abundant. These resources are distributed in a non-continuous and non-uniform way across the space (concentrated) and along the time (seasonality), making them sometimes very variable or even occasionally unpredictable.

Economic variability across central and southern Patagonia seems to coincide with the climatic and ecological gradient West-East and Northeast-Southwest. Furthermore, it has been traditionally suggested a clear-cut separation between the social management of coastal and marine resources along the western and southern shores of Patagonia, and the exploitation of the forest and the steppe all along continental Patagonia. The separation would be so strong that it has been interpreted as the existence of different human populations at both areas. If one wishes to test the veracity of this hypothesis, there are



essentially two choices. One is to examine faunal and botanical samples from archaeological sites. The second is to focus on stable isotopes in human bone from archaeological contexts, which offer a long-term dietary record, and can be used to compare with ethnographically or ethno historically reported patterns. Offsets between those data may sometimes be attributable to localized factors—particularly if ethnographic descriptions and archaeological samples are not from the same immediate vicinity.

There are many published studies about stable carbon and nitrogen isotopes from human burials that date within the last 1500 years before European contact (Gomez Otero et al. 2000, Borrero et al. 2001, 2006, Barberana 2002, Guichón 2002, Yesner et al. 2003, Tessone et al. 2005). Isotopic analyses only confirm partially the existence of two differentiated populations in terms of their subsistence patterns. Human bones coming from sites along the southern and western coasts and islands are reflective of major components of marine foods in the diet, varying from 55 to 95% of the total diet. Published results from the Atlantic coast show the existence of mixed diets, with strong vegetable component at some places (Gómez Otero 2007). The relevance of marine components would diminish towards the interior lands constituting a 50-90 km buffer zone around shores, where diets can be mixed (marine and terrestrial). Although the traditional hypothesis says that terrestrial hunters did not make significantly greater use of any other food except guanaco meat, stable carbon isotope data from human burials around the steppe lakes show that the dietary dynamics of the terrestrial hunters were more complex than what archaeologists and ethnographers had previously suspected (Tessone et al. 2005).

Our criticism towards the oversimplified “adaptation” hypothesis is in line with the modern criticism to the “Man, the hunter” assumption. Most scholars have only considered big and medium sized game as the most relevant food sources for any hunter-gatherer society, because they were the quintessential result of men labor. Food acquired by women has traditionally been regarded as low quality and of minor importance. Consequently, archaeological observation techniques to document the presence of other resources in the archaeological record were hardly considered. Archaeologists arrive to the simple conclusion that hunting was over-important because only bones of big animals are being considered. Small sized animals like birds, mice, reptiles, or even other sources for food and consumables like vegetables, eggs, fishes, shells, insects, worms are usually forgot. In many cases, these “other” resources are not easily detectable in the archaeological record because of the way they were consumed in the past or the impossibility of preservation. In other cases, although detected in the archaeological record, the bias in the archaeological interpretation has prevented further studies. Developing new techniques for observing evidences of economic variability in the past imply the previous discussion of the necessity for such studies. In the Patagonian case, the fact that instruments made of vegetal raw materials are mentioned in the ethnographic descriptions (nets, ropes, baskets, etc.) should make us developing the appropriate techniques for archaeological analysis (Nacuzzi and Pérez de Micou 1985, Pérez de Micou et al. 1985, Pérez de Micou and Ratto 2004, Piqué et al. 2007, Berihuete et al. 2006).

Recent studies tend to insist in the necessary flexibility of indigenous economic decisions (Borrero 2005, Orquera 2005). However, among many scholars, there is a resistance to accept that what to eat is a decision that may be conditioned by the ecology, but it is determined by the social. In Patagonia, there were plenty of exploitable resources in the past, but human groups decided not to consume many of them, giving more emphasis to a small subset of what the environment had to offer.

To know whether restricted diets were a result of environmental constraints or the consequence of a socially mediated decision, we need to explore the list of exploitable resources in different areas, and the possibilities of enlarging the subsistence basis. In this volume, papers by Piana, Prieto, Estévez and Vila, Mansur and Piqué deal with the economic variability at the southern and western coasts, and islands environments. Therefore, we concentrate here on economic variability at the Atlantic coast, Patagonian forest areas along the Andes Mountains, and the steppe.

There are not many ethnographic information regarding human uses of the Atlantic coast in the past. European travelers arriving to this area around 16th and 17th centuries described only occasionally how indigenous populations used marine resources (seafood, sea mammals, fishes) and probably marine birds. This absence of information comes from the fact that such travelers only visited Patagonian eastern shores at specific seasons of the years (Moreno and Izeta 1999). From middle 18th century on, the frequency of descriptions of Patagonian coast increases, but most travelers report the indigenous populations did not exploit littoral resources (Moreno 2003). Nevertheless, archaeological data from the region around 47° South show the abundance of archaeological material with marine or littoral origin, like sea mammals bones, marine birds bones, seafood and fishes remains, and instruments for their exploitation (harpoons, among others). Terrestrial resources are poorly represented at those sites (Moreno 2003; Moreno and Castro 1995-96). The spatial distribution of

human settlement along this coast is strongly correlated with the distribution of marine resources. Given the heterogeneous nature of Atlantic coast and the ecological concentration of resources at specific places, we cannot generalize this situation to all eastern Patagonian coasts (Gómez Otero et al. 1998, Gómez Otero 2007). Chronologically, it is important to remark the fact that later sites (around the time of the European contact) show a much-reduced exploitation of marine resources (Moreno and Videla 2007).

The Patagonian forested areas at both sides of the Andean mountains are ecologically much more diverse than the steppes or the Atlantic coast. Archaeological identification is certainly difficult in woods, and the archaeological record is probably biased (Borrero and Muñoz 1999). However, archaeological excavations show enough evidence for the exploitation of some characteristic resources of forests, like hunting *Hippocamelus bisulcus* (huemul), and *pudu pudu* (pudú), small deers, which are exclusive of this ecological region (Mena 1999, Belardi and Gómez Otero 1998, Belleli et al. 2000, Fernández 2003, Arrigoni and Fernández 2004, De Nigris 2005, Díaz et al. 2007). The frequency of huemul remains relative to guanaco bones increases in sites within the forest and decreases in mixed areas between forest and steppe. There is also strong support for the use of the specific vegetation from forested areas (Arrigoni 2000, Scheinsohn and Mateucci 2004, Berihuete et al. 2006), and the other resources characteristics of the sub Antarctic woods (Silveira 1996, Mena 1999, Adán et al. 2004, Belleli et al. 2007). It has been suggested that the presence of these materials in the archaeological record of the steppe sites may suggest hunting and gathering journeys to their preferred environments (Gómez Otero 1986-1987). The strong seasonality of the use of forest resources would give additional support to this hypothesis.

In a semiarid environment, water is a key resource not only for humans but also for any other species (Modenutti et al. 1998, Paoloni et al. 2003), in such a way that rivers, lakes and all other water points can be seen as potentials attraction areas for human settlement. However, intensive survey in central Patagonian coasts has not found any clear relationship between human settlement and actually known permanent or seasonal water points (Castro et al. 2004, Gómez Otero 2007). Moreover, ethnographic and historical sources seem to coincide that indigenous populations did not fish in river or lakes, nor hunted the locally adapted animals (otters, amphibians, etc.). There are, however, some archaeological sites from the steppe and the forest areas show evidence of fishes and other fresh water resources (Gradín et al. 1979, Arrigoni 1991, Miotti 1993, Bellelli 1994, Fernández 1996-1997, Cassidoro et al. 2004, Gómez Otero 1994, Martínez et al. 2005). On the other hand, a few harpoons and lithic artifacts recovered from the central-southern patagonian coast and Musters and Colhue Huapi lakes can be related to fishing (Moreno et al. 2005).

All around the Patagonian steppe, and during all historical periods, *Lama guanicoe* (guanaco) seems to be the over-dominating resource. Archaeozoological record is absolutely dominated by this animal species, in many cases it is even the only one present (Mengoni Goñalons 1999, De Nigris 2005). The biological flexibility of this animal explains its presence in most Patagonian ecological regions. Its high visibility, however, has traditionally hidden other resources whose importance is sometimes difficult to evaluate from archaeological data alone. Birds seem to be a conspicuously absent resource; however, *Pteronemia pennata* (choique) was relatively common prey of the steppe hunters, as evidenced in ethnographic sources, although scarce in the archaeological record (Giardina 2006). The presence of eggs in the archaeological record is well established, but there are not any additional studies regarding other avian resources, nor small mammals or alternative resources.

There are some edible vegetables across the Patagonian steppe. Among them, *Arjona tuberosa* (macachin), *Berberis sp* (calafate), *Condalia microphylla* (piquillin), *Bolax gummifera* (yareta), and *Prosopis alpataco*, *Prosopis denudans* (algarrobo) (Vignati 1941, Beeskow et al 1987, Gómez Otero et al. 1998), but probably there were many others still not identified. Although there are some ancient descriptions of indigenous populations having consumed them (Coan 1833), archaeological evidence is biased by preservation issues, but especially because of the low interest in studying such remains. When archaeologists look for archaeobotanical remains, they usually find evidences (Aschero et al. 1983, Arrigoni 2000, Pérez de Micou 1999, 2002, Pérez de Micou and Ratto 2004, Berihuete et al. 2006). Indirect evidence can also be used to support the hypothesis of generalized consumption of vegetables: pottery and mill instruments have been identified in many archaeological sites, with decreasing frequency along the Northeast-southwest gradient. Although stone mills have not yet been analyzed, the identification of residues in some pottery containers from coastal sites suggests their use to process vegetables mixed to animal fat and protein (Gómez Otero 2007).

Wild horse was introduced from Spanish domesticated animals, and indigenous populations tamed those animals and stored them in privately owned little herds. There is a debate whether this control of animals can properly be called pastoralism (Palermo 1986). In northern Patagonia, a proper

pastoralist way of living can be argued, but in southern regions, the local control of horse reproduction did not arrive to produce the number of animals that were socially needed, so the only possibility was to obtain them from the north through exchange or robbery.

A final remark about agriculture. It only was adopted partially in some limited areas at the western side of the Andean Mountains, with a southern limit on 42° South (Mena 1997). When western Andean agriculturalists expanded their territories to the other side of the mountains towards the Patagonian steppe, they mostly abandoned their agriculture experience and adopted a hunter-gatherer-pastoralist economy, with only a few exceptions in Northern Patagonia.

Indigenous economic variability cannot be really understood without taking into consideration mobility across the territory. There are many historical and ethnographic descriptions of systematic population movements between different ecosystems for profiting seasonality variability of local resources (Viedma 1780). In later times, once horse had been integrated as the main mean of production, mobility increased and territorial circulation changed drastically. Nevertheless, it is important to remark that such mobility had not only an economic sense. Human groups move from place to place for social and political needs, in such a way that extremely long and complex interaction networks are configured. Goods and information would have traveled more than people would.

To sum up, the diversity of potential sources of food and consumables is much greater than expected. It is very important to recognize not only the sources of food, but also the sources of consumables necessary as raw material for instruments. Fuel for light and warm is as necessary as meat, stone, and vegetable fibers for many kinds of tools.

Modern studies are beginning to show that indigenous populations consumed a lot more than mere guanacos, and therefore that economic variability is what really characterized human life. Existing evidence seems to suggest the extreme flexibility of human economic decisions, and the fact that they were mediated by social factors more than by ecological adaptation requirements.

Nevertheless, archaeological knowledge of prehistoric economic variability in Patagonia is actually incomplete, given the biased nature of excavated sites. Only caves and shelters have been excavated for the most part. We are beginning to document the complexity of archaeological sites along the Atlantic coast. However, we still need more archaeological documentation from the steppe contexts. It is not easy to discover and excavate in this area, and modern erosion may have affected the preservation of remains sometimes. In any case, excavable sites have already been detected in basin areas, and other wind protected places.

Variability at the Linguistic Scale

¿How many different human groups shared the complex and diverse ecology of Patagonia? We can use linguistic variability to estimate cultural diversity among human groups.

Modern studies of austral languages distinguish between more than 30 different languages and dialects, with different degrees of relationship between them (Viegas Barros 2005. Other important references are Clairis 1985, Klein 1985, Fernández Garay 1998, Campbell 1997, Fabre 1998, Key 2000, and Vezub 2006). This linguistic map is based on historical sources from 16th- 19th centuries. Linguistic complexity was probably much greater before European contact, because one important characteristic of colonization was the disappearance of languages and a trend towards linguistic homogeneity.

According to Viegas Barros (2005) different language families can be identified:

- Most linguistic variants spoken in Northwest Patagonia (North of 42°) have a similar origin in west Andean languages (classical *mapudungung*, *huilliche*, *picunche*, *pehuenche*, *lafkenche*, etc.). Some of these variants are not mutually understandable.
- Most linguistic variants spoken across the Patagonian steppe (South of 42°) have a similar origin in a prehistoric common language, later subdivided in *günuna a iajüch* and *chon* (or *tsoneka*) languages. Later subdivision of *chon* languages gave origin to *aónik'o ais*, *teuschen*, and the languages spoken by the *selk'nam*, *haush* or *mannekenk* and many other dialects. Most of these variants were not mutually understandable.
- Most linguistic variants spoken along the southern and western Patagonian coasts and islands have a similar origin in a prehistoric common language, later subdivided in three different families: *chono*, *alikaluf* and *yaghan* (or *yámana*). The two later were also diversified in later times. Most of these variants were not mutually understandable.

Given that there are not enough archaeological studies of the historical period when this linguistic variability was described, we cannot correlate different sources for cultural differentiation, and we are limited to use linguistic data as a surrogate for ethnic variation.

Ethnic and cultural differentiation is far more complex than this classification in three common linguistic groups may suggest. For instance, inhabitants of southern and western coasts spoke a considerable variability of languages and not only dialectal variations of a same language. More than a dozen different linguistic groups can be identified only in this area. Theoretically, all of these human groups had the same economic basis, specialized in the exploitation of marine resources, but they revealed considerable cultural diversity (Orquera 2004, Piana 2005). A similar degree of differentiation existed among the inhabitants of the interior lands of the Big Island of Tierra del Fuego (Lanata 2002), where nearly 10 different linguistic groups can be distinguished (Viegas Barros 2005) (Figure 1).

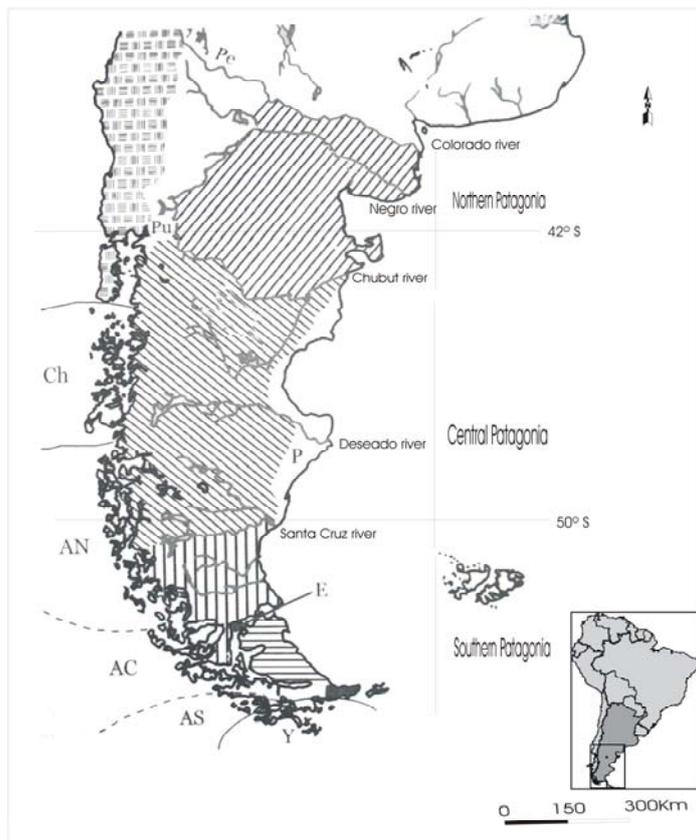


Figure 1. Hypothetical extension of different languages and ethnic groups in the 16th century (after Viegas Barros 2005, page 108, modified by the authors).

Legend:

-  *Mapudungung*
-  *gūnuna a iajüch*
-  *teuschen*
-  *aónik'o ais*
-  *selk'nam*
-  *haush*

- AC:** central Alakaluf
- AN:** Northern Alakaluf
- AS:** Southern Alakaluf
- Ch:** Chono
- E:** Enoo/Guaicuru
- P:** Coastal patagonian dialect
- Pe:** Prehistoric Pehuenche
- Pu:** Puelches from the lake district
- Y:** Yagan (or Yamana)

Obviously, cultural variability did not finish at the level of linguistic groups. European travelers from 18th and 19th centuries mention the existence of subdivisions even within the same linguistic group, which sometimes integrated a single unified community, and sometimes were separated and conflicted (Martinic 1995). Boschín has characterized Patagonic identity by a series of concentric circles; from the inside, the smallest of the circles, to the outside, the biggest circle, and these circles encompass and contain identity levels that run from the specific to the general. At the same time, a Patagonic settler was a *Limaiche*, or inhabitant of the neighbourhood of the Limay River, a speaker of *günuna a iajüch*, a Northern Tehuelche, and a member of a determined kinship group (Boschín 2002).

It is important to remark that many of these groups and subgroups did not have ethonyms for self-identification. Nevertheless, it does not mean that different populations had not their own identity. Simply, the social way to build and express ethnic identity was different in Patagonia to what Europeans have used along their history. We must avoid the traditional mistake made by first travelers and primitive ethnographers that described indigenous groups as if they were Old World nations. Ethnic, linguistic, cultural, economical, and even territorial frontiers were extremely permeable according to all evidences, suggesting a considerable degree of population mixture. After all, what has been traditionally called “ethnic” differentiation is nothing more than a consequence of the diverse degree of social interaction between human communities. In general, the less the intensity and frequency of inter-group relationships, the higher the differences in ways of speaking and other cultural features. However, in the case of inter-group conflict, the intensity and frequency of violent contact may generate high degrees of differentiation, and probably also of domination.

There are many ethnographic evidences of inter-ethnic relationships (Nacuzzi 1999, Vezub 2005, 2006). There is also mention of mixed groups formed between coastal gatherers and interior hunters (*guaicurues* along the Magellan Strait, *cacae* in central western coast, cf. Viegas Barros 2005 for the linguistic evidence, Martinic 1995, Bate, *in press*). Biological and anthropometric studies give additional support to the permeable frontiers hypothesis. Lalueza et al. (1996) argue that geographic distance (in latitudinal sense) is the main factor that influenced the differentiation of the human groups from Tierra del Fuego and Patagonia. For instance, despite their cultural and economic differences, the three hunter-gatherer groups from Tierra del Fuego tend to cluster together. Studies by Guichón et al. (1989-1990), Guichón (2002), Gonzalez et al. (2001), Beguélin and Barrientos (2006) go in the same direction. Anthropometric variation can be explained in terms of the positive relationship between increasing geographic separation and phenotypic or genetic distance among groups.

In other words, cultural distance has been found to be strongly associated with spatial separation. According to this view, the isolation by distance model forecasts that human groups will reflect geographic separation in the pattern of their between-group distances. The eventual result is a greater similarity between geographically proximal populations and increasing differences between groups that are further and further apart.

Variability at the Social Scale

Historical documents from the time of the European contact mention important differences in the nature of social and political organization between inhabitants of south and western coasts and islands, and inhabitants of the eastern coasts and the interior. It seems as if human groups whose economy was more directed to the exploitation of littoral resources had a simpler organization and less complex relations of production than steppe hunters of guanaco did.

In this volume, papers by Piana, Prieto, Estevez and Vila, Mansur and Piqué deal with the social variability at the southern and occidental coasts, and islands environments. Therefore, we concentrate here on social organization at the Atlantic coast, Patagonian forest areas, and the steppe.

Ethnographic and historical descriptions are of unequal value, and not always generate a clear image about how social reproduction was built by indigenous populations. Although the quality of ethnographic and historical data is very poor, we suggest as a working hypothesis that the inhabitants of the Patagonian steppe and the Atlantic coast during the initial time of European contact, and after having adopted the horse, were based on the level of extended families with their relatives and strong exogamy. These groups were diverse according to territory, activity, wealth, and number of people. Organization was predominantly patriarchal, where men had the possibility of as many wives as they could maintain. The sons of all the wives had the same rights (Viedma 1780, Musters 1871). Division of labor was strongly marked between men and women. The exploitation of women work by men was something remarked by most travelers, especially by the only European woman arrived at the area at this time (Dixie 1880).

From the first chronicles, we have evidence of diverse forms of social and political hierarchy, notably a “chief” or “cacique” (Tomé Hernández 1587). Mascardi (1670) mentions the grouping of families around the prestige of some leader. In 1780, Antonio de Viedma already described big groups under the leadership of a high level chief with the faculty of making war and management of all tasks that required the activity of the entire group. These big groups would subdivide in smaller groups under the leadership of their own chiefs, with a recognized independence. Each chief or leader had control of a specific territory, and the members of the group could not enter into the territory of another chief without permission (Viedma 1780). They had to pay usually for passing or having rights of using the resources of another territory (Musters 1871).

Other travelers refer that chiefs become poor because they distribute what they have to their followers for satisfying them and being celebrated as generous (Muñiz 1826, Cox 1863). Given that people could choose the leader they wanted, without this distributive behavior many chiefs would have the risk of being alone.

We can interpret 19th century descriptions (Coan 1833, D'Orbigny 1833, Bourne 1853, Schmid 1858, Cox 1863, Claraz 1866, Musters 1871, Beerbom 1877, Lista 1879, 1894, among others) in terms of a configuration of social order in two top hierarchical levels, indistinctly held by men and women. The highest one was more irregular in time and extent, but it arrived to dominate groups of more than 1000 people. Immediately below, a second hierarchical position was more stable but affected only disperse and mobile groups. In some cases, especially in Northern Patagonia, this second hierarchical level was subdivided in lower level hierarchical ranks. The lowest social level was that of captives reduced to slavery, whose possibilities for social mobility were extremely low. The majority of group members had no access to dominance and leadership, but they were economically and politically self-sufficient, with the possibility of freely choosing the group they liked to belong.

In southern and central Patagonia, the authority of chiefs was not probably very high, limited to lead the territorial mobility of the group. Explicitly, they are not liberated from work (Musters 1871). However, their preeminence was well recognized by their followers and neighbors during the live of the chief and it was even remembered after his/her death. Only in case of war, they would acquire true leadership. As a consequence of war, captives were integrated into indigenous family groups as servants or even a kind of slaves. At the end of this period, in some parts of northern Patagonia, where European contact and inter-group conflict was stronger, chiefdoms would be strongly consolidated, with relevant hierarchical differences and familiar elites with succession rights (Mandrini 2000).

There are references to women at the top of political hierarchies, and not only as specialists of some sort, sorcerers, or wives of chiefs. European travelers mention “Indian Queens” both in North Patagonia and in Central-South Patagonia, as respected individuals with power and influence over their “subdits” and over exploitable resources in their territory (Mascardi 1670, Viedma 1780, Fitz Roy 1839, Darwin 1839, Coan 1833). The fact that some of them were also related with men at the top of the political hierarchy suggests the importance of kinship when organizing the polity. Musters (1871) mentioned the relevance of marriages to obtain political influence and social prestige. In colonial times, but probably even before, some of the chiefdoms had an important hereditary character (Nacuzzi 1999, Vezub 2005), although we cannot easily conclude that political power and leadership was always transmitted from father or mother to son or daughter. Some families maintained the prestige and social influence of their main members for more than two or even three generations.

To sum up, social structure was characterized by its open and dynamic character, able to build diverse forms of social attraction and rejection. At the end of their historical trajectories, political systems in indigenous Patagonia were based in competitive polities, they were irregularly shaped and flexibly in their numeric composition. Social organization was expressed through territoriality rights, and social membership. Authority was restricted through kinship, and legitimized using rites and symbols. The average size of human groups at the time of the horse adoption and even before -500 people (Boschín and Nacuzzi 1979) - suggests that we are not describing simple societies at the level of unorganized bands.

The unresolved question is how ancient was this variability at the social scale, and how it is related with ecologic, economic and cultural diversity.

The Antiquity of Social Variability in Patagonia

The antiquity of human settlement in the Patagonian steppe during the Pleistocene-Holocene transition is a well-established fact (Nami 1996, Borrero 1996, Borrero and McEwan 1997, Borrero et al. 1998, Salemme and Miotti 2003). The beginning of human settlement in Patagonia was a slow process of

exploration and colonization, carried out by small groups, very mobile and disperse, with approximated site-catchments areas around 100 km (Dilleahy 2000). What characterized those first groups would be then population low density and the absence of specialized uses of the ecosystem given the lack of social concurrence (Mengoni Goñalons 1986, Borrero 2001, Massone 2004).

Some authors tend to think that, although archaeological data are scarce, human colonization of Patagonia avoided the exploitation of marine resources until some change in social circumstances allowed its management, and the colonization of this area (Orquera and Piana 2006, see also Orquera and Piana, this volume). However, there are not enough data to test the specific exploitation of coastal and marine resources before the first half of the 7th Millennium BP, both in continental Patagonia and austral islands. Consequently, we cannot know whether newcomers avoided such resources in early times. The hypothesis cannot be tested because of the transformation of Pleistocene coastal line along the Atlantic, and the impossibility of identifying sites that can be under the actual sea level.

The increasing number of sites identified as settlements and the increasing rate of material deposition at those sites suggest a demographic increase and population expansion of those groups during the Holocene (Borrero 2001). It is at this moment, around 7th Millennium BP when it has been recorded an increasing use of marine and littoral resources. However, the social management of those resources was diverse at different places:

- Along Atlantic coasts, a mixed production system was configured based on the concurrent exploitation of marine, littoral, and terrestrial resources in different proportions at different areas (L'Heureux and Franco 2002, Moreno 2003, Gómez Otero 2007).
- Along western coasts and austral islands, archaeological evidences suggest an intensive exploitation and even specialization of productive systems in marine and littoral resources (Legoupil and Fortugne 1997, Ocampo and Rivas 2004, Quiroz and Sánchez 2004, Orquera and Piana 2007).

In both cases, the lack of enough terrestrial resources cannot be considered as the cause of marine resources specialization, as suggested by the proponents of the sub Antarctic adaptation model (Sutton 1982). The fact that at the same time the same resources were so differently managed at different places suggest the complexity of the process, and the impossibility of understanding it at the local scale. Coastal colonization was a global phenomena (the European Mesolithic, for instance), although local answers differ for the local context of the historical process.

In any case, 6000 years ago economic variability would have been consolidated all over Patagonia, defining a differentiation between some communities specialized in the exploitation of marine resources, some specialized in terrestrial resources, and those without specialization but exploiting both terrestrial and littoral ones. Paleobiological and paleolinguistic data allow for a partial test of this hypothesis. Paleobiologically, it has been suggested an early genetic diversification of human populations right after their arrival at the southernmost extreme of South America (García Bour et al. 2003, Pérez et al. 2007). Paleolinguistic hypotheses are based on the common average of words and grammar structures. There is no linguistic correlation between languages spoken across the forest/steppe/Atlantic coasts, and those spoken in the south/west/island coasts. Moreover, it has been suggested that the three linguistic families of specialized foragers of coastal and marine resources (*chono*, *alakiluf*, *yaghan*) came from a common language spoken 6000 years ago, that had begun to diversify 5000 years ago (Viegas Barros 2005). This suggestion does not exclude the possibility of different parallel and simultaneous origins for the invention of navigation and specialized hunting-fishing technologies. However, it would be much more possible the existence of a single population that had maintained the same economic specialization but had diversified locally, when interaction between groups reduced (more details in Orquera and Piana, this volume, and Prieto et al., this volume).

If economic variability were already configured some time around 6000/5000 BP, it would be possible that cultural and social variabilities were also configured at the same time. Of course, it does not mean that there was a linear correlation between economic variability and social diversity.

Modern paleolinguistic research suggests that languages spoken by hunters exploiting the forests along the Andes Mountains, the steppe and the Atlantic littoral resources derive from two different linguistic sources. The first one would have been spoken by human groups at the western side of the Andes (*mapudungun* linguistic family), and another for human groups at the eastern side (*günuna a iajüch* and *chon*) (Viegas Barros 2005). In this last region, a relatively homogenous human group, speaking a common language would exploit different resources with complex mobility and interaction patterns around 6000 BP, or probable before. Around 3000 BP, a first social process would had differentiated northern groups (North of Chubut river, 42-43° South), speaking *günuna a iajüch*, from other groups speaking a hypothetical common language called *chon* (or *tsoneka*). Around 2500

BP, speakers of this later language, already differentiated from their northerner relatives, had already specific words for naming the specialized groups of littoral and marine foragers at the west and south. Those ethonyms would acquire depreciative meaning, like “servant” (Viegas Barros 2005). Evidences of biological exchange between steppe hunters and canoe fishers south of the Chubut River and west of the Andes (Gonzalez 2003) may be tentatively dated in this period (see also Bate, *in press*).

Archaeologists have suggested that the geographic differentiation of some material categories may be possibly related with the paleolinguistic hypotheses of a common origin and a later differentiation. The overabundance of rock-art paintings compared to engravings and the lack of a lithic industry based on blade technology in northern Patagonia (Aschero 1987, 2000, Orquera 1987, Fiore 2006) would distinguish the possible region of *günuna a iajüch* speakers. Later, the same region would be distinguished in terms of the specific morphology of arrow points (Boschín 2001, Prates 2006, and references there).

Mena (1997) has suggested that between 6000 BP and 3000 BP, the area between the rivers Chubut and Santa Cruz (42° - 50° South) would have worked as a “macro-cultural region”, whose spatial extent would coincide with the general distribution of rock-art paintings and engravings (Fiore 2006). Moreover, the characteristic features of rock-art sites in Southern Patagonia seem to coincide with the specificities of lithic technology, in such a way that they can be used to distinguish this region (Orquera 1987, Fiore 2006). In any case, Patagonian rivers cannot be considered as natural borders preventing population mobility, as it has been proved by Borrero and Carballo Marina (1998), and Pérez de Micou et al. (1992). Diversity can only be observed at the macro-level, when we consider big cultural areas without well-defined limits.

Linguistic research places around 1500 BP the separation between the languages spoken by continental human groups (*aónik'o ais*, *teuschen* and variants) and islanders (*selk'nam*, *haush* and variants). The crossing of Magellan Strait by a hunter-gatherer population that apparently did not know canoe navigation is still a matter of dispute. Linguistically, languages spoken at both sides of the Strait are very similar (Viegas Barros 2005), but there are some relevant archaeological differences in material culture (Borrero 1989-90, Lanata 2002). *Selk'nam* and *haush* word lists are full with terms used to refer resources not appearing in the big island of Tierra del Fuego: the *pteronnemia pennata* (choique), for instance. The island steppe hunters (speakers of some variation of *selk'nam*) would have referred to themselves as “the clan of the separated branch” (Najlis 1973, quoted in Viegas Barros 2005), and had built a symbolic explanation of their separation from continental groups. Although linguistic chronology -1500 BP- seems too late, it agrees with most radiocarbon-dated sites from the north part of the island (Borrero and Barberana 2004). Obviously, this hypothesis will not prevent the existence or possible arrival of other groups to the island well before this chronology. Recent archaeology surveys have discovered sites with dates in the period 7000-4000 BP along the Atlantic coast of the Big island of Tierra del Fuego (Saleme and Bujalevsky 2000, Lanata 2002).

Around 1000-800 BP, northern, continental and island groups, increasingly more territorialized, would follow with social differentiation, in such a way that new groups become distinctive in their local language: *teuschen*, *aónik'o ais*, *haush*, *selk'nam*, etc. Obviously, it does not mean that these were the only linguistic variants. They are the only ones that could be reconstructed in modern times from preserved word lists. Surely, linguistic and cultural variation was greater both in northern Patagonia (Boschín 2001), where no dialect from *günuna a iajüch* is actually known, and in southern and central Patagonia (Viegas Barros 2005). It is interesting to remark that the speakers of *aónik'o ais* language distinguished themselves as “people from the south”, although they knew other human groups living more to the south (the islanders) (Martinic 1995). These ethonyms show the degree and direction of interaction flows between groups.

Social differentiation did not stop at this point, and the existence of further linguistic variation at the level of dialect would have continued along different historical trajectories. Given that territorial differentiation could be produced by a similar fissional process, it may be suggested that increasing territoriality and group differences well beyond any linguistic or ethnic origin was already on the way at this period. At this level of differentiation, kinship and political alliance constitutes the only mechanisms for fixing the limits of the social groups. Although kinship tends to configure well-defined groups with clear borders, political alliance is much more flexible and instable, tending to configure irregularly shaped social communities of interest.

Archaeologically, it has been suggested a general reduction of mobility patterns towards enhanced territoriality for this period, related with the Medieval Climatic Anomaly, ca. 1000 BP. R. Goñi has argued this hypothesis on the basis of paleoecological data from Salitroso and Cardiel lakes (48° South). Increasing aridity rates at this area would have caused the reduction of available fresh water sources, and animals and human settlements were spatially constrained and forced to concentrate,

socially specializing the uses of physical space. The nucleation of human settlement would contrast with the opening of social exchange networks to compensate for the reduced mobility of residence patterns. Archaeologically, the high rates of burial areas reuse would suggest that human groups were in some way fixed to that specific territory. The concentration of rock-art in Stroebel Plateau would suggest the convergence of different groups at specific places (Goñi et al. 2000-2002, Goñi et al. 2007, Belardi and Goñi 2006). It seems difficult to generalize this hypothesis to most Patagonia, given that paleobiological and geological data at other areas in southern Patagonia show contrasting higher degrees of humidity, as if the climatic phenomenon would have different effects at different places (Fabier Dubois 2004).

The distribution of pottery constitutes another possible evidence for the process of group fission, territorialization, and divergence (Nacuzzi 1987). It does not appear south of Santa Cruz river (50° South). North of this region, pottery is not very frequent, but it appears in small quantities in most archaeological sites from 1000 AD on. It is difficult to reconstruct the shape from the few sherds preserved, but it seems that globular pots were predominant, probably related with vegetable processing (Bouza et al. 2007, Gómez Otero 2007). They were probably made locally, from local raw materials. Decorative patterns show some relationships with contemporaneous rock-art motives (Bellelli 1980, 1991).

All along this process of historical differentiation, the meaning of some words evolved and changed from their old common origin more than 3000 years ago. In this way, terms used to mean “bow-and-arrow” are very different in the different languages. Viegas Barros (2005) suggests the possible absence of this instrument when the initial group was still culturally homogenous, but its separate invention and adoption once differentiation was already on the way. This hypothesis coincides with the more reliable archaeological dates for artifacts classified as “arrow-points” (microlithics), which have been dated around 2500 BP, or even later, in Southern Patagonia, and only around 1500 BP in Central Patagonia (Aschero 1987). Another classic hunting instrument, the “bolases” (a strong cord with weights attached to the ends for entangling the animal’s legs) would have maintained their original term and meaning, what suggests the antiquity of this hunting instrument. Archaeologically, they have been dated already in the time of first peopling (Gradin 1980, Aschero 2000). From these facts, we can deduce that most aspects of social differentiation were already on the way since 2500 BP.

Word lists transmitted by the first European travelers during 16th century (Pigafetta and Fletcher) come from indigenous groups along the Atlantic coast at 48° South (Cabo Blanco and Deseado River), and they are somewhat different from later linguistic varieties of *aónik’o ais* and *teuschen*. It has been suggested (Viegas Barros 2005) that it can be explained in terms of a third language from the *chon* linguistic family, restricted to this area of the Atlantic coast. Probably related with this interpretation is the change in meaning of some words, which in the original *chon* common language designated some fishing activities, but it would later designate terms within the semantic field of “hunting”. The original meaning would have maintained in *selk’nam* and *haush* (Viegas Barros 2005).

Archaeological record from pre-contact sites along the Atlantic coast would test the hypothesis of a specific human group at the Atlantic coast with its own individualization before the Europeans arrival (Moreno 2003, Gómez Otero 2007). Another partial test is the biological analysis of human bones from the same coastal areas, which suggest restricted mobility ranges around littoral locations (Barberena 2002, Gómez Otero 2007). Finally, we can mention the existence of a very old word for “canoe” (*yenya*), already existing in the original common language around 3000 BP. The existence of navigation means has not yet been tested archaeologically. We still need to survey islands facing continental Atlantic shores to test for indigenous navigation means.

After a conspicuous lack of historical sources for the second half of the 17th century, 18th century chronicles transmitted by European travelers seem to be unanimous referring that human groups at littoral locations did not exploit marine resources. Two contemporaneous archaeological sites on the shoreline also confirm this fact (Moreno and Videla 2007). Therefore, it can be suggested that cultural specificity of ancient coastal groups had disappeared at some time during 17th century, just after the first travelers, because of the colonial encounter (epidemics, etc.). The region could have been later resettled by horse-mounted hunters, without the technology or the experience of consuming marine resources, or local groups would have integrated new social exchange networks with groups from the interior steppe, losing its economic, linguistic, and social difference.

Around the time of the European contact (16th century) or even a little before, *aónik’o ais* use begin to expand northwards (and probably also east- and westwards) (Viegas Barros 2005). This language became a common language among different groups and later substituted other languages until a common culture, the “tehuelche complex” (Escalada 1949), integrated former distinguished

groups. The geographical distribution of some later rock-art styles (a kind of geometric decoration called “grecas style”) and the distribution of pottery would test this hypothesis (Belardi 2004). Some modern studies of physical anthropology suggest even the existence of population exchange at some very specific areas (Barrientos and Pérez 2004).

In this way, 18th century “tehuelche” complex would have reunified culturally and socially what have been in a process of diversification at many levels for more than 2000 years. From this time on, *mapundungung* languages from the western side of the Andes began to substitute local eastern languages, and modifying some aspects of the tehuelche complex. It is important to explain this cultural unification as a dialectical process through history, and not an intrinsic feature of this people.

This later progressive homogenization of languages and cultures across eastern continental Patagonia was probably caused by the increase in frequency and intensity of long-distance exchange mechanisms (Palermo 2000). The even greater complexity, intensity, and frequency of between-group social interaction flows determined the transformation of traditional means of social reproduction and political order. Mechanisms for collective decision-making began an ever-increasing hierarchization process, simultaneously to the increased size and more diverse composition of human groups. Social relations of production began to acquire some characteristics related with domination.

Why human groups would have modified their traditionally mobile and dispersed? Why did they change their traditional residence mobility patterns and adopted long-range wanderings based on political relationships more than in the exploitation of natural resources from different areas?

All these social transformations seem to coincide with the adoption of the horse. However, there are historical and archaeological evidences that suggest that this process of increasing social complexity is older than European contact. First chronicles from 16th and 17th centuries describing “Indians without horses” are not very conclusive, but there are mentions of chiefs and some degree of political hierarchy. Some of the wars and conflicts between different indigenous groups would also have preceded European implication and the trade routes opened by the use of horses (Mascardi 1670, Fitz Roy 1839). Archaeologically, available data suggests that the redundancy of funerary rituals (burials) at specific places, which arrived to concentrations of more than 50 graves in single cemeteries, began around 1000 BP in Salitroso Lake, and around 750 BP on the lower Chubut river valley. The wealth differentiation of burials, the concentration of prestige items in infantile graves, the circulation of raw materials and prestige items through very long distance exchange networks and the big size of some settlements are also characteristics dated before European contact or slightly later, but always before the adoption of horses. The most relevant evidence for the complexity of exchange networks is a decorated bronze age found in a central Patagonian multiple burial, which proceeded from the agricultural complex societies from northwest Argentina (100-1450 AD), at 2000 kilometers of distance (Gómez Otero 2007).

Actual knowledge only allows suggesting that the adoption of horse directly affected social dynamics from older times, making technically possible some transformations in social relations of production, but the conditions for this transformation were already on the way long ago Europeans presumed to have “discovered” a New World.

Conclusions

The ecological diversity of Patagonia is parallel to a comparable social diversity, which was built by indigenous populations through nearly 13000 years. Social diversity means here different human groups, different economies and production systems, different social structures, and different social answers to different ecological challenges.

Nevertheless, some global patterns emerge from all that variability. Agriculture was not practiced south of 42° South. Even husbandry was partially adopted only after the introduction of foreign animal species. For the most part of their history Patagonian human groups built hunter-gatherer production systems with enough flexibility to be able to exploit different resources at different places with different intensities.

Hunter-gatherer production does not mean simple societies, however. Human groups were not *determined* by what nature offered to them, but just *constrained* by the spatial availability of some elements, the absence of other, and the temporal unpredictability of natural productivity. Physical mobility was an economic strategy, socially implemented, that allowed the exploitation of wider economic territories, and simultaneously contributed with the creation of social exchange networks.

Fission of social groups constituted an important characteristic of the social process. We can understand in this way the historical formation of cultural and linguistic frontiers within a relative

economical homogeneity. Different groups would have separated from initial common populations. More than physical isolation and local adaptation, we suggest the progressive reduction of interaction flows, which would have affected social reproduction. Population dynamics in an extremely extended territory, the flexible degree of residence mobility and occasional changes in natural productivity explain the prevalence of within-group social interaction, although long-range social exchange networks were also running. Divergent historical trajectories between canoe fisher-gatherers and terrestrial hunter-gatherers began very early in the temporal sequence, and it was maintained through the centuries, although inter-ethnic exchange was also an important element. Northern Patagonia diverged from central and southern Patagonia later in the temporal sequence, although in this case social variability was far less marked, and was based on the different nature of their social exchange networks with neighbors with different productive systems.

Inter-group conflict and inter-group exchange are opposite aspects of the same reality. Ethnic, linguistic, cultural, economical, and even territorial frontiers were extremely permeable according to all evidences, suggesting a considerable degree of population mixture. Patagonians modified their interaction mechanisms (conflict, war, marriage, exchange, alliance, slavery) according to their concrete historical conditions and the changing nature of their social relations of production.

Increasing hierarchy and social complexity was the consequence in the historical transformation of mobility patterns. When settlement nucleated and people wandering was substituted by social exchange networks, political systems become increasingly competitive. Social organization evolved towards the expression of legitimating through the imposition of social membership rules and territory rights. This structure was capable of negotiate social reproduction needs both in time of inter-group conflict or in occasion of peaceful exchange.

At the end of the historical sequence, when European contact imposed new transformations, chiefdoms consolidated, with important hierarchical differences and familiar elites with succession rights. Chiefs –men and women- acquired important attributions in political leadership, expressed through the ostentation of prestige goods. Specially in Northern Patagonia, where European contact was stronger, chiefs participated as relevant agents in the interregional trade system connecting different ethnic groups, polities and modes of production between indigenous groups and colonizers. Social differentiation went beyond ethnic or linguistic difference, emphasizing territory adscription and political ties, both through kinship or through unstable alliance.

We cannot be known with certainty whether this degree of social complexity existed before European contact. It is necessary to follow with the investigation of social characteristics of human groups before Europeans arrival. Historical trajectory of Patagonian groups was abruptly interrupted by the military expansion of Chilean and Argentina national states frontiers. The wrongly named “Conquest of the Desert” conquered a desert that had been populated.

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