

Contents lists available at [SciVerse ScienceDirect](http://www.sciencedirect.com)

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

On the extremes of hunter-fisher-gatherers of America's Pacific Rim

Jordi Estévez^{a,*}, Assumpció Vila^b

^a *Departament Prehistòria, Universitat Autònoma de Barcelona, Facultat de Lletres UAB, 08193 Bellaterra, Barcelona, Spain*

^b *Departament d'Arqueologia i Antropologia, Institució Milà i Fontanals-CSIC, Egipcíacues 15, 08001 Barcelona, Spain*

ARTICLE INFO

Article history:

Available online xxx

ABSTRACT

The paper explores the feasibility of a comparative analysis of the elements related to the social reproduction of hunter-gatherer-fisher societies. Those living on both extremes of the Pacific coast of America have been used to discuss the Evolutionist approach. There are common traits in the evolution of the societies in both extremes. Their evolution began to diverge only after a particular point. The impacts of some sudden changes and mismatches show up as hiatuses in the respective developments. In Tierra del Fuego people manage to control and adjust their own reproduction, whilst the NWC entered into a spiral development that led to the complex societies described in the ethnographic record.

These parallel developments and the recurrences in social organization in completely independent places have also been useful for deconstructing some assumptions about prehistoric Art, derived from modern concepts. The analysis of Pictures-Drawings-Engravings-Stencils must be situated in its historical context to show that there are also complex series of hierarchized traits in the systems of social relationships that can be effectively reflected archaeologically.

© 2012 Elsevier Ltd and INQUA. All rights reserved.

1. Introduction

This paper returns to the topic of prehistoric art, which was discussed nearly 30 years ago (Estévez, 1981). During those 30 years, the authors have worked on the archaeology of hunting and gathering societies in Spain, France and different South American countries. Research has focused on the ethnoarchaeology of Tierra del Fuego since 1986, and since 2008 (starting during a sabbatical leave in British Columbia), studying the societies of the North West Coast (NWC) of British Columbia in Canada to try to understand the variation in strategies of exploitation of littoral resources. As a result, there is first hand information about the two geographic extremes of the Pacific Rim and, at the same time, about the two extremes of the supposed variation in hunter-gatherer societies. These studies compare and contrast these societies, and especially to think about the relative social importance of their similarities and differences. This paper will try to highlight common trends in the evolution of societies that can explain their different histories including such elusive issue as rock art. Very different societies in similar settings can be seen as the outcome of divergent developments, triggered by the social—e.g. gender based—organization of labor (still difficult to verify archaeologically, as is the case with most explanatory social theories).

2. Setting out the problem

2.1. Ethnographic record of both extremes and its epistemological context

The comparative analysis began with a critical analysis of the ethnographic evidence about both groups of societies, and constructed a picture from the available archaeological evidence in both situations (Piana, 1984; Estévez and Vila, 1995, 1998; Orquera and Piana, 1999; Vila and Estévez, 2010a, 2010b). The main ethnographic evidence from the extremes of the Pacific Rim, aside from a few initial records from sailors and various other travellers, was recorded after the epidemics that decimated their populations and the collapse of the original social organization.

The motivation of the two principal ethnographers, Martin Gusinde and Franz Boas, both raised in the context of German scholarship, was to fight against evolutionism and to emphasize the issues of the historical particularistic school of anthropological thinking. Father Martin Gusinde sought to show that the people Darwin had described as “the most primitive people on Earth” had very advanced beliefs and even believed in a superior being. According to Gusinde, physical appearance, subsistence strategies, technology and social organization were unconnected from the spiritual. As a result, he tried to deny the existence of evolution in the ideological realm of humanity.

Franz Boas, too, in studying the hunter-gatherer groups of the North West Coast of the Americas, sought to show the inadequacy

* Corresponding author.

E-mail addresses: jordi.estevez@uab.es (J. Estévez), avila@imf.csic.es (A. Vila).

of an evolutionary approach. They were, in his view, groups of hunter-gatherers, with a social and demographic structure, which did not correspond to the level of simplicity expected at the technological and economic level of hunter-gatherers. So, he questioned the idea of a linear evolution from simple to complex in the social as well.

Boas's proposition was important in underlining the complexity of the organisation of societies of the NW Coast who were simply hunter-gatherers. Gusinde's proposal served to demonstrate the opposite: the complexity of spiritual thought, in the most primitive society, that of Tierra del Fuego. At the same time, a simplistic picture emerged that, of the two hunter-gatherer societies, the Fuegians were culturally simplest, with no art and no other sort of sophistication, while the people of the NW Coast were the most complex from a social perspective as well as excellent artists and sculptors of totem poles.

2.2. Focussing on an issue: the meaning of art

Is the presence of what has been called 'Art' really a mark of social complexity? Is there really a correlation between the presence or absence of 'artistic' expressions and the differences among the social structures of the inhabitants of the NW Coast and those of Tierra del Fuego? The answers to such questions are relevant because such issues have been used to reinforce different aprioristic positions.

The first question is related precisely to the subjectivity of the concept of 'Art'. Historically, this concept has distinguished between two types of goods: those that are utilitarian and consumed directly; and those that are refined, with added subjective value, of restricted access and loaded with higher spiritual values.

It is no coincidence that the acceptance of European Cave Art by academics occurred at the same time as the development of anti-evolutionist thought in reaction to the first scientific interpretive-nomothetic approach to the evolution of societies. Cartailhac's change of mind about Palaeolithic Art in 1902 was a result of a general intellectual movement towards idealist positions that sought to use the existence of 'Quaternary Cave Art' as the proof of the presence of a 'superior' intellect from the first moment of human existence (that is, of God's Creation). Nor is it a coincidence that a priest like the Abbé Breuil devoted his main effort to the study of 'Prehistoric art'. Prehistoric 'Art' was tied up with mystical experiences, Shamanism, belief in a supernatural world, and, above all with religions and their rituals (see developed criticism in: Estévez and Vila, 1999; Moro and González-Morales, 2004). The 'spiritual life' was separated from the 'material', from biology, and also from the economic and the social. Overall, according to this theoretical position, the analysis of 'ritual' could be separated from the analysis of all other human activities (Estévez and Vila, 1999, 2006a,b). This particularistic approach, moreover, denied the possibility of generalizations and emphasized the unique character of every cultural manifestation.

2.3. Setting out theory and a methodological background for analysis: art is a social product and nothing but a social product: trying to objectivise the production of art

Archaeologists have to stick to the material evidence (in broad terms and without being restrictive or mechanistic about it). They should study the archaeological record by treating prehistoric societies as a whole: both the social relations of production and those of reproduction (which include and refer particularly to the transmission of knowledge and ideas, and the maintenance of social order), as well as the interaction between production and reproduction and the dominance of one kind of relationship over others.

It is impossible to produce significant new knowledge or to make cross-cultural comparisons based on the archaeological record without first subjecting idealist positions to critical analysis. Objective concepts are needed that can be used cross-culturally, without extrapolating preconceptions that are a result of subjective analysis of one's own society. However, a perspective from within the past society cannot be adopted, and a modern 'emic' perspective cannot be carried into the prehistoric past. Societies described by ethnographers were not fossil societies.

The societies of both the Fuegians and the people of the North West Coast had just as much history as any contemporary society. The changes that each society has undergone in its history, as shown in demography, the diversity of work or social position of each individual, the energy invested in the reproduction of society, the society's efficiency, its capacity to transform the environment—these are variables that can be measured objectively and to some extent are correlated with changes in the production of the components of the ideology.

Extreme or apparently anomalous cases do not prevent a scientific or nomothetic interpretation but they often require researchers to go back to the archaeological record using a different approach for interpreting the evidence and a review of the social and historical context. The most obvious example is the need to review what has been said about 'Prehistoric Art' in Europe because it has affected all studies of prehistoric art. First of all, numerical dates for the cave art are needed. The chronological sequence was worked out on pseudo-evolutionist assumptions about a development from simple to more complex or sophisticated. As a result there has been dispute about any evidence which does not fit into this pre-ordained scheme (the most well-known example is the dispute about the direct dates for the images in Chauvet Cave in SE France) (Clottes, 2001; Pettitt and Bahn, 2003).

Among academics, such prehistoric evidence is classified as 'Art', following a modern and fuzzy concept of what is Art. 'Art' was derived from the Latin word 'Ars' that is equivalent of the Greek 'techné', Art as activity. The subjectiveness of the meaning of this concept is derived from its history and the bourgeois conception of art as opposed to craft that began in the XV Century. It has been also defined as a system of expressing emotions and ideas through intellectual and use items or as 'Activity made with the intention of stimulating thoughts and emotions'; 'a special human faculty together with religion and science emphasizing formal elements'. As it is very difficult to enter into another person's mind, even by doing direct analysis of behavior or interviews, it is probably an illusion to search for prehistoric intentions and (altered) states of mind, without projecting personal fantasies and extrapolating from modern behaviour. It would be more useful to describe such phenomena from the starting point of what is known, that is to say the processes involved in the production of the marks that are classified as art: thus, it might be more appropriate to use the acronym PEDS to refer to paintings, engravings, drawings and stencils (as suggested by Davidson, 1997).

Only identification of repeated patterns will allow which categorization can be assign to those phenomena in their different chronological and social contexts, how they can be grouped together and on what basis. This research is more interested in relating PEDS to the development of social relationships, in particular the organization of production and reproduction, than in archaeological aspects of psychology or neuro-psychology, or in getting into the minds of prehistoric people: that is to say, in the translation of the archaeological record of PEDS into theory about the development of social relations. Interest is focused on the social characteristics of the activities that resulted in the production of PEDS.

There is little doubt that most such materials were produced in a social context, as is true for most human activity that is not strictly

neuro-physiological or mechanical, and that many are clearly associated with communal activities (e.g. Arias, 2009). They are yet another example of a social product, the result of the need for society to continue from generation to generation and to manage their resources. The PEDS are social responses. They represent the use of particular tools (figures of animals, humans or geometrics) produced to reinforce realities or to communicate or pass on knowledge, and/or to reinforce and normalize particular social categorizations or social roles and rules that might not be accepted spontaneously.

The most productive study of PEDS should begin by putting them into context and integrating them with the other evidence, within the whole set of strategies and processes of production and of social reproduction (Estévez, 1981). The goal is to analyse the processes that produced those PEDS together with those that produced all sorts of activities and artefacts involved in maintenance and reproduction of social relations including thoughts and ideas. That means that some things must be included that others do not normally understand as art, such as architecture, performances and displays—including the movement of bodies and objects—the production of sounds and also painting and modification of the human body.

This means that, as for any study of social activities, researchers have to look at who were the producers and how was the object produced, distributed and consumed (in what context of consumption) rather than concentrating on the form or on the style of the product itself (as in the classical approach of Leroi-Gourhan, 1965), which would be much closer to the classic definition of Art and as is the main aim of Art History. Although this seems possible, it may not be easy to achieve because of the long tradition of studying the products for maintenance, reproduction and ideology separately from other products like tools, weapons and some utensils.

In many cases, they have been explained in isolation, searching for significance in their own terms, without analyzing the social process that (perhaps) provided them with that significance. The greatest analytical effort is generally put into studying prehistoric tools and implements. Those things studied in the traditional category of Art have, above all, been described in formal or stylistic terms, and sometimes only in those terms (e.g. Apellániz, 1990, 2002). The study of PEDS in an integrated way, that is to say by analyzing the role they played in the whole effort invested by the society in the maintenance and reproduction of the social system, has often been sidelined. By advocating caution in interpretation the way has been left open to subjective (intuitive and phenomenological) interpretations instead of analysis of PEDS as main elements of the social structure.

However, the culture-historical approach found itself up against impossible explanations, for example, hand stencils are found at the very ends of the ranges colonized by hunter-gatherers: in Tasmania and other parts of Australia, in the extreme southwest of the European peninsula and in the most remote painted rockshelter on the Strait of Magellan, but not always in the points in between on the routes to those 'uttermost parts of the earth'. Some motifs are shared by societies which are known with certainty to have developed independently: for example, the double-headed serpent can be found from classical Greece to Asia through the North West Coast ethnographic societies of America as far as Maya society in Mexico. Whether or not this motif had a common origin is unimportant, now, except as evidence of the long survival of some ideological elements which may survive in different contexts and types of social organization changing their role and significance. Christian mythology which retains many significant symbols of the Neolithic in the Near East in an industrial and capitalist context, is just one example of the persistence of ideological elements, icons

and symbols. Ethnographic studies from both ends of the Pacific coast show that some mythological elements passed from one group to another, sometimes changing iconography, sometimes not, and that some imagery crossed boundaries without carrying the ideology with it.

It was possible for different subsistence strategies to coexist (for example, there were at least two on the Isla Grande de Tierra del Fuego); it was possible to maintain different languages (at least three in Tierra del Fuego) despite the fact that people moved from one language group to another. People from distinct and distant groups had similar ceremonies and some people participated eventually in the ceremonies of social reproduction of other groups.

Despite this apparent lack of correlation between the different levels of social organization, these PEDS elements can be included among the social mechanisms of different societies. Study can work out their rôle in those mechanisms, the effort involved in their production, their pattern of distribution and their use, and put them into the context of technological and general development in each society. For instance, drawing a red deer in the same way in a cave today may or may not have the same meaning (for example, just evoking an animal seen by the artist) as it once had in the cave of Altamira, but what is completely different and what explains the most about of the artist's ideology and role is the social context, the different effort involved in the production, the educational background of the artists and the way society will 'consume' (will look at) the item.

Analyzed in this way, PEDS become artefacts that contain information about the global development of these societies. Both the people of Tierra del Fuego and those of the North West Coast invested heavily in the work of producing goods and of undertaking activities to maintain social order. In both, people engage or engaged in dance, singing, the use of masks, body painting and the construction and decoration of houses. Comparison between the societies of the effort invested and its differential distribution among the people in each society reveals much about the characteristics of these societies. For instance, it is not just the kind of motifs that are painted on wooden planks but the kind of houses they are painted on, and when and who is using those decorated houses, that really makes the difference between the societies and the meanings (the social roles) of the paintings. What makes the great difference between societies is not only the goods themselves, nor their function, nor the amount of work invested, but the way labour and social reproduction is organized. That organization is, at the same time, an outcome of the way production of the material means of subsistence and of social reproduction has been articulated throughout their history.

The proposed method is derived from a particular theoretical approach, which would allow explanations of the development of hunter-gatherer societies. The production of PEDS, which, like any other product, has its beginning and its end, ought to be analyzed in its historic context. The explanation of them can only emerge after they have been put into a diachronic historical context (Davidson, 1997, 2006).

3. Setting the empirical context in change through time: social development in Tierra del Fuego and in the North West Coast

As an illustration of the way this approach could be applied in future research, this section summarizes the historical trajectories in the two regions, the North West Coast and the coastal strip between Chiloé and Cape Horn (in Chile), as they can be derived from the existing archaeological evidence (Fig. 1). Despite the local variation within each region, there are common denominators among the pre-contact populations that allow the definition of

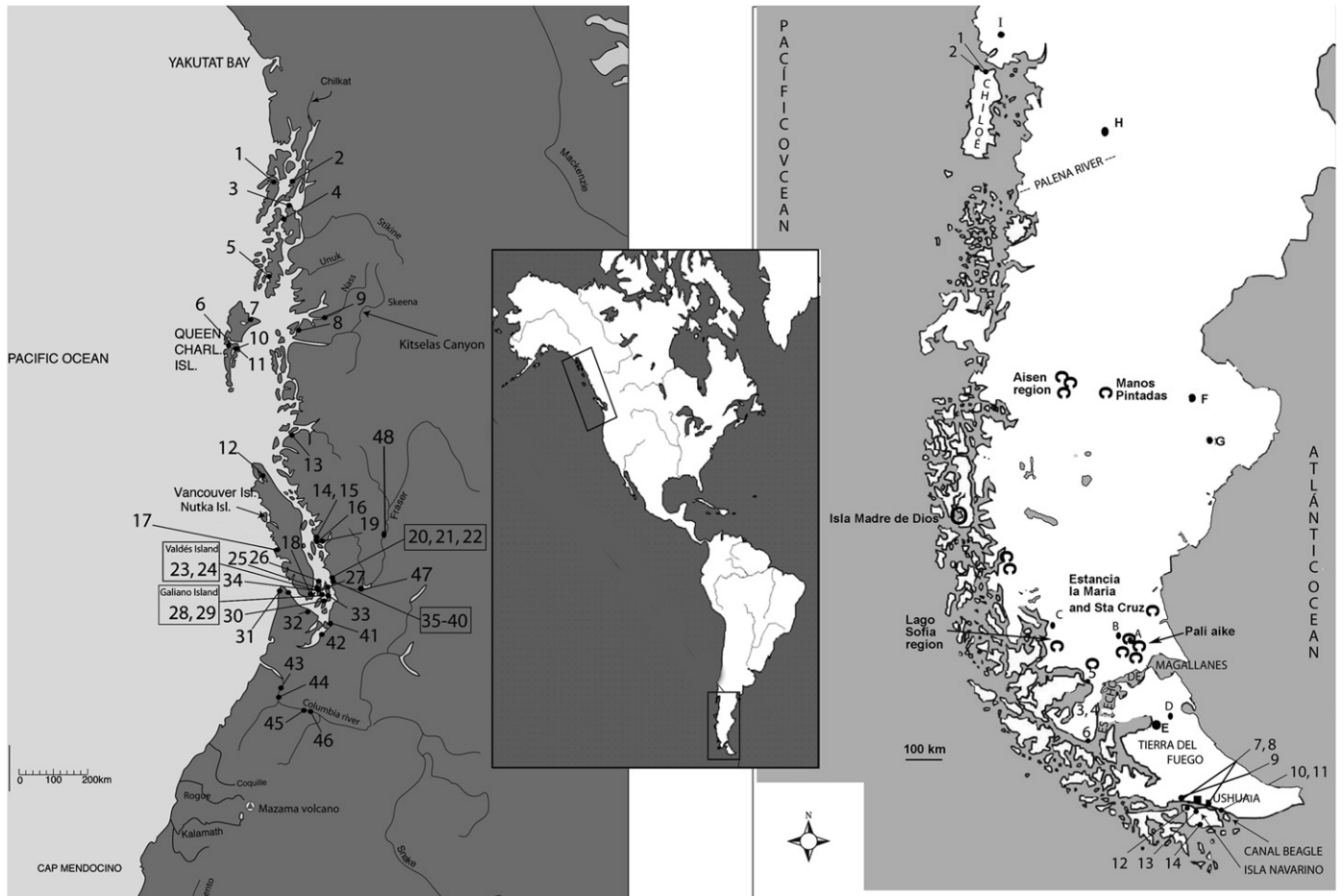


Fig. 1. Map of the American Pacific rim. Details at the same scale of A) the most significant sites of the NWC cited in the text: 6-K1 Cave, 8-Prince Rupert: Gbto23 Site; 12-Bear Cove, 13-Namu, 30-Ayer Pond, 32-Manis, 35–40-Fraser river sites by Vancouver: Glenrose, Saint Mungo, and B) the Southern cone with the most significant archaeological sites: the most ancient sites: A-Pali Aike, B-Fell and Cerro Sota sites, C-Zone of Milodon, Lago Sofia, Dos Hermanas caves, Alero Quemado; D-Tres Arroyos site, E-Marazzi, F-Piedra Museo, G-Los Toldos, H-Piedra Parada, I-Monte Verde. Canoe people sites: 1 Piedra Azul, 2 Puente Quilo, 4 Punta Baja, 3 Englefield, 5 Ponsonby, 6 Punta Sta Ana, 7 Lancha Packewaia, 8 Túnel, 9 Isla Salmón, 10 Imiwaia, 11 Lanashuaia, 12 Caleta Segura, 13 Aridos Guerrico, 14 Grandi. The Ω sign indicates the main sites with rock art.

a 'NWC pattern' in the north (Matson and Coupland, 1995; Ames and Maschner, 1999), and 'Magellan-Fuegian canoers' in the south.

In the far south, the archaeologically best-known zones are the east coast of the Beagle Channel (Orquera and Piana, 1999; Ocampo and Rivas, 2000) and the western part of coasts of the Strait of Magellan and to the north, the island of Chiloé, although the southern regions are less well known (Massone and Prieto, 2004; Ocampo and Rivas, 2005). In the NWC, the region with the greatest tradition of research is the Gulf of Georgia and the north of British Columbia (Matson and Coupland, 1995; Moss, 2011).

Even allowing for the limitations of the existing archaeological record, the societies at the two extremes of America had a parallel evolution up to a particular moment when their development began to diverge (Fig. 2). In these two vast regions the first occupations that are well-documented date to the final moments of the last deglaciation.

There is, still, no complete consensus about the occupation of the Pacific coast of the Americas before the Last Glacial Maximum (see Carlson and Dalla Bona, 1996). The dates of some American archaeological sites are not consistent with a passage through an ice-free corridor in Alberta at the beginning of the post-glacial. However, there is also no consensus about a late glacial presence of people along the NWC, which would support the hypothesis of a late glacial coastal colonisation as was proposed by Fladmark (1979). Great geomorphological transformations (erosion and

periglacial till, catastrophic breakouts of glacial lakes (Blaise et al., 1990; Blais-Stevens et al., 2003) transgression of the coast line, etc) as well as the problems of undertaking surveys (Fedje et al., 2011; Mackie et al., 2011) in such regions could easily explain the absence of better evidence of occupation or much earlier migration which would be consistent with the most ancient southern evidence.

The state of the question of the first peopling of the two regions, and of the Americas in general, is reminiscent of the state of the discussion of the first peopling of western Europe during the 1980s: Peopling earlier than 700,000 years ago was not the majority view and was discussed by questioning the artefactual nature of flaked cobbles on river terraces and doubting the chronology of stratified sites. The discovery of hominin remains clearly outside the range of *erectus/heidelbergensis* at Dmanisi, Atapuerca and probably Orce has cleared up that question, only to raise other questions, such as why a stone industry based on flaked cobbles appeared/arrived a million years later than it did in east Africa, or about the continuity and evolution of the first people, or else their replacement by a second wave of Out of Africa.

Leaving the oldest sites to one side, for the moment, in both regions there are clear signs of peopling before the beginning of the Holocene. In the north of the Chilean fjords there is a human occupation (Monte Verde) well dated between $13,565 \pm 250$ and $11,290 \pm 220$ BP (Dillehay, 1989; Dillehay, 1997; Dillehay and

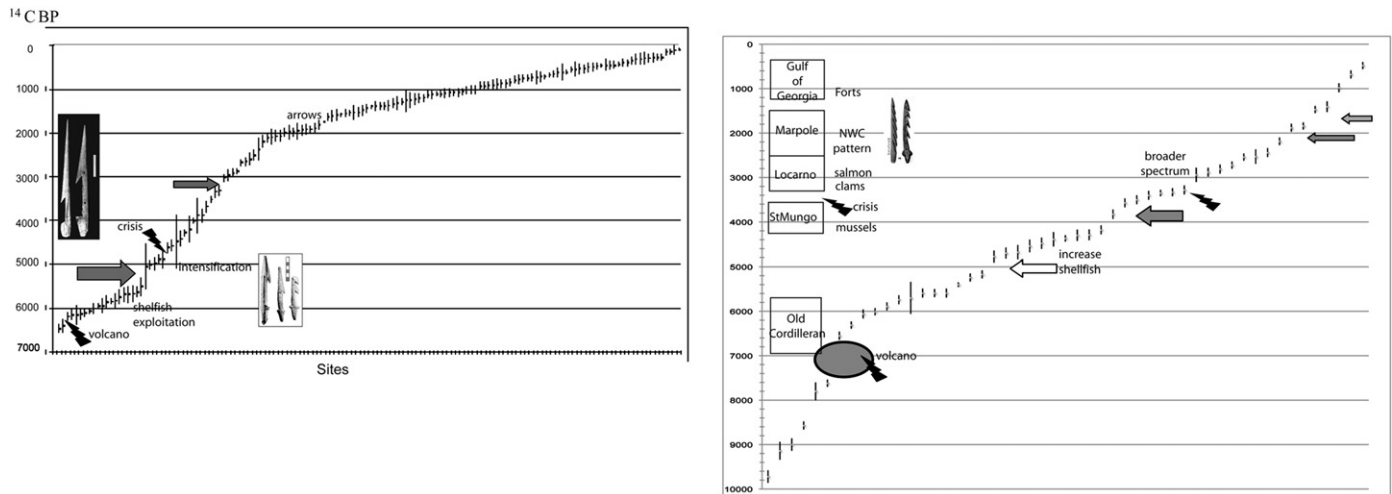


Fig. 2. Sequence of dates in the NWC (Estévez and Vila, 2010: 187) and Tierra del Fuego (dates from; Orquera and Piana, 1999). The main hiatuses are marked with an arrow. The major social and economic trends are also indicated. Pictures of the different harpoon types in Tierra del Fuego are posted in their chronological position. In the Marpole period of the NWC there was a type of harpoon very similar to the oldest type of Tierra del Fuego.

Mañosa, 2004); in Magallanes and Tierra del Fuego the oldest dates are between 12,380 and 9505 BP (Massone and Prieto, 2004). This is similar to the situation documented for the NWC: Manis, Ayer Pond, K1 Cave (Wilson et al., 2009; Mackie et al., 2011). Dating uses a rough BP (radiocarbon years before present) approach for the periods, rather than the calibration fashion for general approaches in coastal archaeology. Calibration is a statistical algorithm applied over the top of another statistical approach. The calibration algorithms used differ and are changing. The calibration has to take into account the very variable reservoir effects of every sample, spot and time, which is not always the case. Not all the published calibrated dates explain the process used. Thus they give a false sensation of accuracy.

In the western edges that were ice-free, there is evidence of human presence, albeit tenuous, before 12,000 BP (Ward et al., 2003; Fedje and Mathewes, 2005; Fedje et al., 2008; Wilson et al., 2009; Kenady et al., 2011; Mackie et al., 2011). In both ends of the Pacific, the pre-Holocene people exploited animals that became extinct. In both regions there are important chronological gaps between the late Glacial and Holocene archaeological evidence, thus a possible reduction of population. In the extreme south, after an intriguing hiatus (Martinic, 1996) possibly associated with some catastrophic events around 9000 BP (this is a calibrated date because it is well controlled by proxies derived from these events: volcanic eruption, glacial lake outbursts, rapid changes in the landscape and rises in sea level), the Holocene environmental traits began to be established and to stabilize after the opening of the Strait of Magellan (Franco et al., 2004; Rabassa et al., 2000). Significant environmental changes documented for most climatic variations, even when reflected in sea temperature, did not make significant differences to the range of shore fauna that people exploited.

The fauna exploited in the known sites of both regions in the Holocene is very similar to the modern fauna. Some of the oldest sites on the coast of both regions share particular characteristics: both in Tierra del Fuego (Tunel I) and in the NWC (Namu, in the central coast, Glenrose, on the Fraser delta, Gbto23 in Prince Rupert, and Bear Cove, on the north of Vancouver Island) there is evidence of an initial occupation which did not involve intensive exploitation of shellfish, and does not seem to have a specialization on any particular type of resource. In the south the documented subsistence was of terrestrial animals such as guanaco and *Rhea*, despite the fact that the sites dated between 8000 and 6500 BP (e.g. Tunel I,

Sofia I, Ponsonby) are close to the modern coast (Laming-Emperaire et al., 1972; Orquera and Piana, 1999; Legoupil, 2003). All of the sites seem to represent incursions by people who hunted terrestrial fauna, without any specialization on littoral environments (Orquera and Piana, 2006).

In the middle of the NWC there is more evidence of fishing and exploitation of marine animals (e.g. Namu before 5000 BP, Bear Cove and Glenrose before 4500 BP). This has sometimes been characterized as a specialised littoral exploitation, but it could be more easily and better interpreted as the occasional exploitation of such resources within an opportunist strategy of catching a resource that was seasonally abundant (e.g. Matson and Coupland, 1995; Matson, 2010).

In the south after a break in occupation that followed an important volcanic episode around 6980 ± 110 BP, there was a change towards intensive exploitation of littoral resources: from the island of Chiloe to Tierra del Fuego, 1500 km to the south (Legoupil, 1985–1986, 1994; Orquera and Piana, 1987; Ocampo and Rivas, 2000; San Román et al., 2002). From that time onwards, the coastal sites were based on the exploitation of littoral resources, specifically hunting pinnipeds and fishing, hunting terrestrial birds and occasionally land mammals (especially guanaco or huemul, *Hippocamelus bisulcus*) and the collection of crustaceans, fruits and fungi. At least in coastal areas of the Beagle Channel of Tierra del Fuego, the staple that was basic and critical to daily diet was the collection of mussels (Estévez and Vila, 1995, 1998).

In a similar fashion, there were volcanic episodes in the NWC such as the eruption of Mazama at about the same dates as the southern episode (6730 ± 40 BP or 7627 ± 150 cal BP), but the collection of molluscs began, or increased spectacularly, around 5500 to 4500 BP (Wessen, 1988; Moss et al., 2007). Collection of shellfish was a general trend in sites from the Gulf of Georgia to the north of British Columbia. In the NWC, the change towards the collection of shellfish coincided with a rapid increase in the numbers of sites (see Grier, 2003). This has been interpreted as the being the result of an intensification in the exploitation of the environment (Ames and Maschner, 1999) or as an option to support an increasing population (Croes and Hackenberger, 1988). It is interesting to note that the most commonly collected mollusc in coasts separated by such a large distance was the mussel, which is found in inter-tidal zones and is very productive in terms of the output for a unit of work.

The beginning of broad spectrum exploitation aimed specifically at littoral resources is related to the appearance of harpoons and so of a technology developed for fishing and hunting in the water, with a pattern of annual exploitation and highly mobile logistics, without permanent structures nor clearly established social inequalities (Matson and Coupland, 1995; Orquera and Piana, 1999; Estévez and Vila, 2006b). In both regions, the NWC and the TdF, bone and stone artefacts appear with engraved decoration, or even small sculpted figures in the case of the Saint Mungo period (5500–3500 BP after Matson and Coupland, 1995) at the mouth of the Fraser River.

According to the Argentinian authors Orquera and Piana (1999) and in the view of some Canadian authors (e.g. Ham et al., 1986; Fladmark et al., 1990; Carlson and Dalla Bona, 1996), from this time onwards in the Beagle Channel and in the NWC basic subsistence strategies consolidated into adjustments to local littoral resources with some local variations. In the north of the NWC the sequence is very slightly different: although the old period is very little known, the few data there are seem to indicate that the first Holocene occupation (after 10,000 BP) was already oriented towards the exploitation of littoral resources (Ackerman et al., 1989), but towards about 4000 years ago an expansion started which, 1000 years later, became an intensive exploitation of aquatic resources with emphasis on fishing, and about 1000 years ago ended up with a proliferation of fortifications (Moss and Erlandson, 1992). Nevertheless, despite the general stability in the non-biological conditions and an identifiable continuity of occupation in some sites and in the qualitative nature of the exploited resources, there was no simple, fixed and stable adaptation to the environment from the mid-Holocene in either region.

There are obvious changes and hiatuses in the archaeological record that demonstrate that there were crises and readjustments, some of which affected a whole region. Some, but not all, times these were related to sudden changes in nature, or were due to volcanic activity or tsunami (see Fryxell and Daugherty, 1963; Borden, 1975; Darienzo and Peterson, 1990; Atwater et al., 1995; Ocampo and Rivas, 2000; Bacon and Lanphere, 2006).

All in all, the record shows that there were attempts to maintain stability within a dynamic equilibrium (Butler and Campbell, 2004), but that it was not always possible to achieve this successfully. Apart from these potential natural triggers in the crises in key resources, the critical problem that imposed the limiting factor on these systems (as proposed in the model of Croes and Hackenberger (1988) for the NWC and in the conclusions for Tierra del Fuego), was not the fundamental resources such as the sea lion, terrestrial hunting or fishing, although these provided the greater part of the calories.

The problem is in resource reliability: in the easy availability but rapid depletion of mussels, which, although they appear in large quantities and are easy to collect, they also have a relatively slow recuperation, especially if they are intensively exploited (Mannino and Thomas, 2002). The subsistence in broad regions of both American coasts relied on this type of key resource, although it was sustained mainly by marine mammals and generally by fishing in both Tierra del Fuego and the NWC.

In the southern sequence, one of the marked breaks occurred shortly before 5000 BP (Rivas and Ocampo, 2006). But the break that was most marked (Gassiot and Estévez, 2006), and is most controversial to interpret, occurred between 4100 and 4500 BP (Orquera and Piana, 1999; Legoupil and Fontugne, 1997). At this time, there appeared a type of coarsely made, bifacially flaked stone points made from non-local stone which characterized the assemblage of tools of production at a time when terrestrial mammals were more abundantly consumed than pinnipeds (Morello et al., 2002).

In the NWC there were also stratigraphic breaks in most of the sites (Mitchell, 1971; Matson, 1976; Cybulski, 2001). But a recurrent marked break occurred about 3500 BP in both the coast and the inland plateau. From this time onwards, behaviour in the two regions (north and south) diverged increasingly quickly. The chronology is out of step with respect to Tierra del Fuego to about the same extent as the difference in time for the establishment of mollusc exploitation (about 6500 BP in the south and 5500 BP in the north).

In Tierra del Fuego after 3300 BP the basic features of the tools and the archaeologically documented strategies remained unchanged until the arrival of Europeans. From the first moment of coastal exploitation right through the following period, the tool set remained mainly the same; the only changes were its simplification, the disappearance of decoration on bone artefacts, and the incorporation (perhaps around 2600 BP but certainly before 1400 BP) of bows and arrows (Mameli et al., 2003). Even taking into account a possible demographic increase that happened in one part of Tierra del Fuego (Rivas and Ocampo, 2006), people used a great variety of particular strategies to adjust to the slight geographic and temporal environmental variations. A successful social control of social reproduction together with flexibility and a high supply of marine resources which flowed in from breeding grounds that were located outside the normal reach of groups, maintained the balance between resources and population until the arrival of Europeans (Vila and Ruiz, 2001; Gassiot and Estévez, 2006).

In contrast in the NWC the dynamic of change was a spiral (Estévez and Vila, 2010; Grier, 2010). Around 3500 BP there was an important change of emphasis in gathering strategies: they changed from collecting mussels (which occur in concentrated patches and could be collected easily) to collecting molluscs from sandy bottoms (which are more dispersed and often must be gathered one by one). This change is documented in many places: the north of British Columbia (Mitchell and Donald, 1988), the Gulf of Georgia (Mitchell, 1971; Matson, 1976, 2008; Coupland, 1991; Stein, 2000) and in the south of British Columbia (Butler and O'Connor, 2004). There were also changes much further south towards the coast of Santa Barbara in California (Erlandson and Moss, 1999). This has been attributed to factors such as the transformation of coasts and their stabilization and the advance of deltas, or to cultural factors of over-exploitation (Croes and Hackenberger, 1988; Wessen, 1988; Cannon, 1991).

Around the Gulf of Georgia this change was accompanied by an emphasis on fishing for large fish, and this provides the first evidence of the preservation of salmon (Butler, 1993). Almost all authors (Borden, 1970; Matson and Coupland, 1995; Matson, 2010) agree that, only 1000 or 1500 years after the change in the most abundant mollusc species, from around 2500 BP (in the Marpole period), the main elements of the distinctive NWC model are already present:

Intensive exploitation and storage of salmon and other fish species such as herring and candlefish, large/long houses, social complexity, which is related to the production of objects of great added subjective value including, for example, stone sculptures. However, not everything was unchanging. There was another intriguing break between 1700 BP and 1500 BP and more or less at the same time there is evidence of a war-oriented settlement pattern, defensive structures and obvious signs of conflict such as weapons of war (Angelbeck, 2009). Stone sculpture disappeared, and there was a substantive change in burial practice—from about 1300 AD the practice of burial in shell middens ceased in the coastal zone (Cybulski et al., 1992).

4. Towards an explanatory theory

The different trajectories of the histories in the NWC and Tierra del Fuego are explained from the perspective of the contradiction

between production and reproduction (Estévez et al., 1998; Vila and Estévez, 2010a) and a difference in the management of reproduction through history in both extremes of the Pacific Rim. This difference in the management of reproduction is what marks the different trajectories. The management of reproduction is always related to the production of subsistence, but not directly derived from or caused by it, as can be concluded from the striking similarity at the starting point in both areas.

The crisis that occurred around 4000 BP in Tierra del Fuego did not get solved in the same way as the crisis about 500 years later in NWC. There were several options for intensifying the exploitation of different resources from among the large number of possible resources that were already known. Developing fishing to a greater extent was a good solution in both areas. The people had the experience and the necessary techniques on one hand and, on the other hand, fish stocks had the advantage of being difficult to over-exploit with existing technology. The traditional systems were not effective enough to deplete the stocks, and therefore people could overcome the problems of decreasing yields without recognising an immediate limit.

However, in Tierra del Fuego, fishing was probably a task performed only by women. Its intensification would require re-directing the collective efforts towards the exploitation of this kind of resources. This would demand not only an increase in work effort of women, but also would require men to participate in this 'women's' activity and increase their work investment in the related tasks: improving the canoes, collective net fishing, the construction of fish traps on the coast. On the other hand the main breeding grounds of sea lions were far from easy access with the available seafaring technology and therefore the substitution of a relatively stable supply was assured. This means that continuity was assured by adjusting to the minimal daily life requirements that could be supplied sustainably by mussels.

It is assumed for this theory that the gender relationships and the division of labour and social inequality in the subjective values of labour is more conservative than other social (and political) relationships and that the division of tasks observed ethnographically was acquired long time before European contact. Of course this theory must be verified like others by archaeological research. This sets a possible agenda and new objectives for engendered research (Estévez et al., 1998; Barcelo et al., 2006; Vila and Estévez, 2010a).

In the NWC implementing a massive fish extraction system was, in principle, the least-cost solution because it did not need a great investment in new technology (fish traps were already present probably long before 3000 BP) nor did it require a spectacular increase in male work. Once the preservation techniques for fish (drying, smoking, oil extraction) were implemented, the only problem was that it would require a notable increase in the amount of female labour in processing, and preparing and maintaining the infrastructure (hearths, drying facilities, etc.). This would create a demographic trap, which could spiral out of control: more women were needed to increase production, and that would generate more reproduction and thus more demand. In these circumstances there would be a spiralling geometric increase in demand. It is probable that this system was freed of the central contradiction between production and reproduction: The more (female) labour invested in processing the fish captures, the more product was obtained because a large amount of biomass could potentially be extracted without threatening the continuity of the reproduction of the main resource. Thus the society would be transformed into an expanding system (as an agricultural system does) and would end up taking over the neighbouring societies. Setting free the power of reproduction is the dominant factor that underlies all other causes that determined or triggered all the developments in the NWC. Despite the abundance of resources exploitable with the available

technology, these societies were subject to socio-economic stress. The great potential of production (and storage) was conditioned to the availability of enough (women) labour force. This put pressure on reproduction and as a side effect on social organization that invested huge efforts into managing, controlling and capturing the labour force—ultimately including slaves (Vila and Estévez, 2010b).

Clearly the strategy followed for management of reproduction did not produce the same effect in the NWC as it did in Tierra del Fuego despite having some starting conditions, which could have been rather similar in terms of time costs and the types of resources initially exploited. Those differences are reflected in the production of PEDS.

5. And what about rock art? Returning to address the question

There was a long tradition of prehistoric PEDS on the rocks and rock shelters both of the North West and in the most southern West. The two regions share the general problem of the lack of dating but there are different styles among the paintings and among the engravings that have been used to provide a chronological sequence.

Many authors think that the first cave paintings appeared in the Patagonian plateau, east of the Andes, around 9000 BP (Aschero, 2007). They think that the majority of the figurative cave paintings started at this date and continue until 4000 BP. These are realistic, dynamic and narrative representations of hunting scenes accompanied by hand stencils. This earliest Patagonian art is associated with guanaco hunters and their strategies of managing both social reproduction and their limited resources (Fig. 3).

The second phase (from around 4500 BP) has an abundance of hand stencils of women and children and representations of guanaco that are less naturalistic and are shown in static groups. Hunting scenes are completely absent.

The final phase is marked by an emphasis on abstraction and schematization, by linear anthropomorphs and by a majority of geometric shapes such as zigzags, stepped triangles, concentric circles, suns and spirals. This final phase is distributed in the valleys that cross the Andes towards the west (Aschero, 2007; Gradin, 1999; Podesta et al., 2005). This last type of motifs and style is what is found in the sites of the northern part of the Strait of Magellan (Bate, 1970, 1971; Massone, 1982, 1985). Various assessments and dating of the context suggest a chronology in the order of 2000 BP (Gallardo, 2009) in this area. In the north, in the valleys



Fig. 3. Example of the paintings in Cueva de las Manos of Patagonia. Guanaco figures are superimposed on hand stencils.

of the Andes, images of horses and riders suggest the tradition survived until European contact.

This art has generally been associated with terrestrial hunter-gatherers, but some art has recently been found in a cave on the island of Madre de Dios (Centre Terre, 2006), which can only be reached by boat. These are schematic paintings very similar to those in the sites of the Magellan region attributed to the final phase. It would seem, then, that the current absence of cave paintings and engravings in the coast south of the Strait of Magellan and in other islands in Tierra del Fuego could be no more than a question of luck in surveys or of bad preservation, rather than a consequence of activities exclusively performed by foot hunters.

The oldest rock art of the NWC is also found in the interior, on the Columbia Plateau and is older than 6000 BP. A naturalistic style, basically representing quadrupeds, seems to have begun in the inland Plateau and from there extended towards the coast. As for the hinterland of the NWC, there is at least one pictogram dated in the order of 2000 BP (Lundy, 1976; Keyser, 1992) in the Okanagan valley.

At more recent dates there were more and different styles of rock art in the NWC: on the coast there were conventionalized styles among which human and animal figures were very lineal and curvilinear. Some figures clearly resemble the sculptures of the Middle Period (from 6500 BP to 500 BP), and some clearly refer to the paintings and sculpture of wood or argillite of the ethnographic period. There are also representations in abstract geometric styles, one curvilinear and the other using straight lines which is thought to have originated in the inland and moved to the coast (Lundy, 1976). Finally, as in the far south, there are some engravings and depictions of European horses and riders, and boats.

So there are some very general trends in common between the two geographic extremes: from more or less realistic or conventionalized representations there was a move to more abstract images. However, the important point is not to discover the specific meaning, but the historical and social processes that led to people producing or ceasing to produce this behaviour: Why did they abandon the decoration of bone objects? Why did they stop producing stone sculptures in the NWC? Why was there no painting on rocks when Europeans arrived in the extreme south? Unfortunately, to answer such questions much more research needs to be done from survey to numerical age determination to correlation with the historic sequence.

6. Discussion: recurrences in human behaviour

It is important to analyze the circumstances in which a society made use of PEDS to respond to a social necessity that went beyond the needs of the individual. What common interest did members of societies have that they used the tools they knew (burins, pigments, fats, etc.) to make things that were completely new and different (PEDS)? When did they develop this? Their use could have been to provide support or as a mnemonic or to fix changes in their social organization. The different contexts could enable distinguishing between these different uses. And the abandonment of the production of a particular type of PEDS could be an indication of the bedding in of the function that they had had for this new tool.

Some significant repetitive patterns can be identified. The fact that societies in a similar stage of their development use similar behavioural products that are socially necessary, would reemphasize that the need was structural and not contingent or circumstantial. It is probable that throughout the evolution of societies changes can be identified in the emphasis on investment in social reproduction through the production of PEDS.

In European prehistory, for example, where the most detailed sequence is known, perhaps these changes in emphasis can be seen. At the beginning there was an attempt to enhance self

knowledge and self awareness (personal ornaments are the first items associated with social reproduction). After that, there was an emphasis on the identification of women and reproduction, which goes hand in hand with aggression and power (Hahn, 1986). This emphasis translates also into the representation of carnivores and large mammals, just at the time when these large mammals began to become rare and disappear (Estévez, 2004).

In hunter-gatherer societies with appropriate technological development a higher investment in labour jeopardizes the maintenance of production. The maintenance of the system (the sustainability of the society) requires no over-exploitation (over-kill) or over-growth of population and that requires the maintenance of stable relationships between men and women to make it possible.

In sum, it would not be surprising to find an ideological reinforcement (through the use of PEDS) of the control of reproduction (that means of the bodies of women) and a brake on over-exploitation, especially of animals with a slower reproductive cycle. As some authors have repeatedly pointed out (Altuna and Barandiarán, 1969; Davidson, 1986, 1997, 2006) there is no direct relationship between the animals depicted and those on the daily menu towards the end of the Pleistocene in Europe: the ensemble of the depicted animal species usually represents a sample of animal species of larger body size than the ensemble of actually hunted animals (Estévez, 1981).

In the Mesolithic, at the beginning of the Holocene, when the system had begun to collapse, the animals that were on the main menu also began to be those most represented in the imagery, and an emphasis began to be put on scenes of everyday life involving different work done by women and by men (the division of labour by sex) (Escoriza, 2002). Finally, abstract figures seem to go with the establishment of economic and political territories, and with agriculture.

This paper has described a series of common traits in the development at the two extremes of the Pacific coast of America until a certain moment in time. Similarly, a parallel sequence of the more general traits between European and American rock art can be glimpsed: from marking and depicting bodies and body parts (especially hands), selected animals larger than those actually hunted, to scenes and geometrics.

The whole sequences are probably not directly dependent on the strategies of getting food (hunting and gathering, or agriculture), but on the overall social evolution. A final consideration should take into account the instruments (the means) that contribute to the articulation of the production and reproduction of the society. That



Fig. 4. Impossible picture. Two native women at the beginning of the XX Century. On the left from the NWC at the right from Tierra del Fuego. Discrimination and subordinate role of women was a common feature in both extremes of hunter-gatherer societies.

is to say, all those means (institutions, ceremonies or rituals and all related ideological features) that function to maintain traditional social relations, among which would be those that marked control of reproduction and discrimination against women (Fig. 4). This paper is only a first attempt at synthesis of those regularities that might be present in the record, but it also shows that the record is neither appropriate nor sufficient (especially as the numerical chronology is not established and because there are biases caused by taphonomy and the vagaries of research).

Acknowledgements

We would like to thank the organizers of the First Harvard Australian Studies Symposium and especially Iain Davidson for inviting us to take part and for translating our Spanish to English.

References

- Ackerman, R.E., Reid, E.K., James, G., 1989. Hecata Island: an Early Maritime Adaptation. Washington State University Press, Pullman.
- Altuna, J., Barandiarán, J.M., 1969. La cueva de Ekain y sus figuras rupestres. *Munibe* 21, 331–386.
- Ames, K.M., Maschner, H.D.G., 1999. *Peoples of the Northwest Coast: Their Archaeology and Prehistory*. Thames & Hudson, London.
- Angelbeck, B., 2009. They Recognize No Superior Chief. Power, Practice, Anarchism, Warfare in the Coast Salish Past. PhD thesis, University of British Columbia, Vancouver.
- Apellániz, J.M., 1990. Modèle d'analyse d'une école dans l'iconographie paléolithique: l'école des graveurs des chevaux hypertrophiés de La Madeleine. In: *L'Art des Objets au Paléolithique. Colloque International de Foix-Le Mas d'Azil*. 1987, Tome 2, Paris, pp. 105–138.
- Apellániz, J.M., 2002. L'abstraction dans le graphisme figurative du Paléolithique. *INORA (International Newsletter on Rock Art)* 32, 16–20.
- Arias, P., 2009. Rites in the dark? An evaluation of the current evidence for ritual areas at Magdalenian cave sites. *World Archaeology* 41 (2), 262–294.
- Aschero, C., 2007. *Arqueología y Arte en la Patagonia Central: El Proyecto de Documentación y Preservación del Arte Rupestre Argentino*. <http://www.rupestre.com.ar/articulos/rup05.htm> (accessed 20.10.10.).
- Atwater, B.E., Nelson, A.R., Clague, J.J., Carver, G.A.K., Yamaguchi, D., Bobrowsky, P.T., Bourgeois, J., Darienzo, M.E., Grant, W.C., Hemphill-Haley, E., Kelsey, H.M., Jacoby, G.C., Nishenko, S.P., Palmer, S.P., Peterson, C.D., Reinhm, M.A., 1995. Summary of coastal Geologic evidence for past great Earthquakes at the Cascadia Subduction zone. *Earthquake Spectra* 2, 1–18.
- Bacon, C.R., Lanphere, M.A., 2006. Eruptive history and geochronology of Mount Mazama and the Crater Lake region, Oregon. *Geological Society of America Bulletin* 118, 1331–1359.
- Barcelo, J., Briz, I., Clemente, I., Estevez, J., Mameli, I., Maximiano, A., Moreno, F., Pijoan, J., Pique, R., Terradas, X., Toselli, A., Verdun, E., Vila, A., Zurro, D., 2006. Análisis etnoarqueológico del valor social del producto en sociedades cazadoras-recolectoras. In: Dept. Arqueología IMF-CSIC (Ed.), *Etnoarqueología de la Prehistoria: más allá de la analogía. Serie Treballs d'Etnoarqueología*, n°6. CSIC, Madrid, pp. 189–207.
- Bate, L., 1970. Primeras investigaciones sobre el arte rupestre de la Patagonia chilena. *Anales del Instituto de la Patagonia* 1, 15–25.
- Bate, L., 1971. Primeras investigaciones sobre el arte rupestre de la Patagonia chilena (Segundo Informe). *Anales del Instituto de la Patagonia* 2, 33–41.
- Blaise, B., Clague, J.J., Mathewes, R.W., 1990. Time of maximum Late Wisconsin glaciations, West Coast of Canada. *Quaternary Research* 34, 282–295.
- Blais-Stevens, A., Clague, J.J., Mathewes, R.W., Hebda, R.J., Bornhold, B.D., 2003. Record of large Late Pleistocene outburst floods preserved in Saanich Inlet sediments, Vancouver Island, Canada. *Quaternary Science Reviews* 22, 2327–2334.
- Borden, C.E., 1970. Culture history of the Fraser delta region: an outline. In: Roy, C. (Ed.), *Archaeology in B.C., New Discoveries, Special Issue*, 6–7. B.C. Studies, Vancouver, pp. 95–112.
- Borden, C.E., 1975. Origins and Development of Early Northwest Coast Culture to about 3000 B.C. National Museum of Canada, Ottawa.
- Butler, V.L., 1993. Natural versus cultural Salmonid remains. Origins of the Dalles roadcut bones, Columbia River, Oregon, U.S.A. *Journal of Archaeological Science* 20, 1–24.
- Butler, V.L., Campbell, S., 2004. Resource intensification and resource depression in the Pacific Northwest of North America: a zooarchaeological review. *Journal of World Prehistory* 18, 327–405.
- Butler, V.L., O'Connor, J.E., 2004. 9000 years of salmon fishing on the Columbia river, North America. *Quaternary Research* 62, 1–8.
- Cannon, A., 1991. *The Economic Prehistory of Namu*. Simon Fraser University Archaeology Press, Burnaby.
- Carlson, R., Dalla Bona, L. (Eds.), 1996. *Early Human Occupation in British Columbia*. University of British Columbia Press, Vancouver.
- Clottes, J., 2001. *La grotte Chauvet. L'art des origines*. Editions Seuil, Paris.
- Coupland, G., 1991. The point grey site: a Marpole spring village component. *Canadian Journal of Archaeology* 15, 73–96.
- Centre Terre, 2006. *Ultima Patagonia. Expédition géographique franco-chilienne en Patagonie*. Janvier–février 2006. <http://www.centre-terre.fr/ultima2006/index.html> (accessed 20.10.10.).
- Croes, D., Hackenberger, S., 1988. Hoko river archaeological complex: modelling prehistoric Northwest Coast economic evolution. In: Isaac, B.L. (Ed.), *Prehistoric Economies of the Pacific Northwest Coast. Research in Economic Anthropology (Suppl. 3)*, JAI Press, Greenwich, CT., pp. 19–85.
- Cybulski, J.S., 2001. Perspectives on northern Northwest coast prehistory. In: *Archaeological Survey of Canada, Canadian Museum of Civilization (Eds.), Mercury series Paper*, 160. Canadian Museum of Civilization, Hull, Quebec.
- Cybulski, J.S., Balkwill, D., Young, G.S., Sutherland, P.D., 1992. *A Greenville Burial Ground: Human Remains and Mortuary Elements in British Columbia Coast Prehistory*. Canadian Museum of Civilization, Hull.
- Darienzo, M.E., Peterson, C.D., 1990. Episodic tectonic subsidence of late Holocene salt marshes, Northern Oregon central Cascadia margin. *Tectonics* 9 (1), 1–22.
- Davidson, I., 1986. Freedom of information: aspects of art and society in Western Europe during the last Ice Age. In: Morphy, H. (Ed.), *Animals into Art*. Unwin Hyman, London, pp. 440–456.
- Davidson, I., 1997. The power of pictures. *Memories of the California Academy of Sciences* 23, 125–158.
- Davidson, I., 2006. Getting Power from Old Bones: Two Mediterranean Museums and Their Importance. In: *Series: Museum of Antiquities Maurice Kelly, Lecture 10, Marketing Services and Publications, The University of New England, Armidale*. pp. 2–28.
- Dillehay, T., 1989. Monte Verde, a Late Pleistocene Settlement in Chile. In: *Paleoenvironment and Site Context*, vol. 1. Smithsonian Institution Press, Washington & London.
- Dillehay, T., 1997. Monte Verde, a Late Pleistocene Settlement in Chile. In: *The Archaeological Context and Interpretation*, vol. 2. Smithsonian Institution Press, Washington & London.
- Dillehay, T., Mañosa, C., 2004. Monte Verde: Un asentamiento del Pleistoceno Tardío en el Sur de Chile. LOM Ediciones, Santiago de Chile.
- Erlanson, J.M., Moss, M.L., 1999. The systematic use of radiocarbon dating in archaeological surveys in coastal and other erosional environments. *American Antiquity* 64 (3), 431–443.
- Escoriza, T., 2002. La representación del cuerpo femenino. *Mujeres y Arte Rupestre Levantino del Arco Mediterráneo de la Península Ibérica*. In: *BAR International Series*, 1082. Oxford.
- Estévez, J., 1981. *Paleoconomía y arte rupestre*. Altamira Simposium. Ministerio de Cultura, Madrid, pp. 197–204.
- Estévez, J., 2004. Vanishing carnivores: what can the disappearance of large carnivores tell us about the Neanderthal world? *International Journal of Osteoarchaeology* 14, 190–200.
- Estévez, J., Vila, A., 1995. Encuentros en los concheros fueguinos. In: *Treballs d'Etnoarqueología*, vol. 1. UAB- CSIC, Bellaterra-Madrid.
- Estévez, J., Vila, A., 1998. Tierra del Fuego, lugar de encuentros. *Revista de Arqueología Americana* 15, 187–219.
- Estévez, J., Vila, A., 1999. Piedra a Piedra. *Ha de la construcción del Paleolítico en la Península Ibérica*. In: *BAR, International Series* 805. Oxford.
- Estévez, J., Vila, A., 2006a. Una historia de la investigación sobre el Paleolítico en la Península Ibérica. *Editorial Síntesis*, Madrid.
- Estévez, J., Vila, A., 2006b. Variability in the lithic and faunal record through ten occupations of a XIX century yamana hut. *Journal of Anthropological Archaeology* 25 (4), 408–423.
- Estévez, J., Vila, A., 2010. Introduction: el porque de este libro y de nuestra ida a la Costa Noroeste. In: Vila, A., Estévez, J. (Eds.), *La excepción y la norma: las sociedades indígenas de la Costa Noroeste de Norteamérica desde la arqueología*. *Treballs d'Etnoarqueología*, 8. CSIC, Madrid, pp. 6–62.
- Estévez, J., Vila, A., Terradas, X., Piqué, R., Taulé, M., Gibaja, J., Ruiz, G., 1998. Cazar o no cazar, ¿es ésta la cuestión? *Boletín de Antropología Americana* 33, 5–24.
- Fedje, D., Mathewes, R., 2005. I Haida Gwaii, Human History and Environments from the Time of Loon to the Time of the Iron People. University of British Columbia Press, Vancouver.
- Fedje, D., Steffen, M.D.M., Wigen, R., 2008. Karst cave investigations on the BC coast: windows on pre-Holocene landscapes and early human history. In: *The 61st Annual Northwest Anthropological Conference*. NWAC, Victoria, B.C., p. 42.
- Fladmark, K.R., 1979. Routes: alternate migration corridors for early man in North America. *American Antiquity* 44 (1), 55–69.
- Fedje, D., Mackie, Q., Lacourse, T., McLaren, D., 15 October 2011. Younger Dryas environments and archaeology on the northwest coast of north America. *Quaternary International* 242 (2), 452–462.
- Fladmark, K.R., Ames, K.M., Sutherland, P.D., 1990. Prehistory of the northern coast of British Columbia. In: *Suttles, W. (Ed.), Handbook of North American Indians. Northwest Coast*, vol. 7. Smithsonian Institution, Washington DC, pp. 229–239.
- Franco, N.V., Borrero, L.A., Mancini, M.V., 2004. Environmental changes and hunter-gatherers in southern Patagonia: Lago Argentino and Cabo Virgenes (Argentina). *Before Farming* 3, 1–17.
- Fryxell, R., Daugherty, R.D., 1963. Late Glacial and Post Glacial Geological and Archaeological Chronology of the Columbia Plateau. Laboratory of Anthropology, Washington State University, Pullman.
- Gallardo, F.I., 2009. Sobre la composición y la disposición en el arte rupestre de Chile: consideraciones metodológicas e interpretativas. *Magallania* 37 (1), 85–98.

- Gassiot, E., Estévez, J., 2006. Last foragers in coastal environments: a comparative study: Cantabrian Mesolithic, the Yámana de Tierra del Fuego and archaic foragers in Central America Coasts. In: Grier, C., Kim, J., Uchiyama, J. (Eds.), *Beyond Affluent Foragers. Rethinking Hunter-Gatherer Complexity*. Proceedings of the 9th conference of the International Council of Archaeozoology, Durham, August 2002. Oxbow Press, Oxford, pp. 90–105.
- Gradin, C., 1999. Sobre las tendencias del arte rupestre de Patagonia argentina. In: *Segundas Jornadas de Investigadores en Arqueología y Etnohistoria del Centro-Oeste del País*. Universidad de Río Cuarto, Río Cuarto, pp. 85–99.
- Grier, C., 2003. Dimensions of Regional interaction in the prehistoric Gulf of Georgia. In: Matson, R.G., Coupland, G., Mackie, Q. (Eds.), *Emerging from the Mist: Studies in Northwest Coast Culture History*. UBC Press, Vancouver, pp. 170–187.
- Grier, C., 2010. Probables pasados y posibles futuros: sobre la reconstrucción de cazadores-recolectores complejos de la NWC. In: Vila, A., Estévez, J. (Eds.), *La excepción y la norma: las sociedades indígenas de la Costa Noroeste de Norteamérica desde la arqueología*. Treballs d'Etnoarqueologia, vol. 8. CSIC, Madrid, pp. 147–166.
- Hahn, J., 1986. Kraft und Aggression. Die Botschaft der Eiszeitkunst im Aurignacien Süddeutschlands. In: *Archaeologica Venatoria*, 7. Universität Tübingen.
- Ham, L.C., Yip, A., Kullar, L., Cannon, D., 1986. The 1982/83 Archaeological Excavations at the St Mungo Site (DgRr 2), North Delta, British Columbia. Heritage Conservation Branch, Victoria, B.C.
- Kenady, S.M., Wilson, M.C., Schalk, R.F., Mierendorf, R.R., 2011. Late Pleistocene butchered *Bison antiquus* from Ayer Pond, Orcas Island, Pacific Northwest: age confirmation and taphonomy. *Quaternary International* 233, 130–141.
- Keyser, J.D., 1992. *Indian Rock Art of the Columbia Plateau*. University of Washington Press, Seattle.
- Laming-Emperaire, A., Lavallée, D., Humbert, R., 1972. Le site de Marazzi en Terre de Feu. *Objects et Mondes XII* (2), 225–244.
- Legoupil, D., Fontugne, M., 1997. El Poblamiento Marítimo en los Archipiélagos de la Patagonia: núcleos antiguos y dispersión reciente. *Anales del Instituto de la Patagonia* 25, 75–87.
- Legoupil, D., 1985–1986. Los indios de los archipiélagos de la Patagonia: un caso de adaptación a un ambiente adverso. *Anales del Instituto de la Patagonia* 16, 45–52.
- Legoupil, D., 1994. El archipiélago del Cabo de Hornos y la Costa Sur de la Isla Navarino: Poblamiento y modelos económicos. *Anales del Instituto de la Patagonia* 22, 101–121.
- Legoupil, D., 2003. Cazadores-recolectores de Ponsonby (Patagonia austral) y su paleoambiente desde VI al III milenio A.C. Magallania, Punta Arenas.
- Leroi-Gourhan, A., 1965. *Préhistoire de l'art occidental*. Mazenod, Paris.
- Lundy, D.M., 1976. The rock art of the Northwest Coast. These for Master. Simon Fraser University, Burnaby.
- Mackie, Q., Fedje, D., McLaren, D., Smith, N., McKechnie, I., 2011. Early environments and archaeology of coastal British Columbia. In: Bicho, N., Haws, J., Davis, L.G. (Eds.), *Trekking the Shore: Changing Coastlines and the Antiquity of Coastal Settlement*. Interdisciplinary Contributions to Archaeology. Springer, New York, pp. 51–103.
- Mameli, L., Estévez, J., Piana, E.L., 2003. Deep impact: stones in bones. In: Terradas, X. (Ed.), *Lithic Tools in Ethnoarchaeological Contexts*. BAR International Series 1370. Archaeopress, Oxford, pp. 9–19.
- Mannino, M.A., Thomas, K.D., 2002. Depletion of a resource? The impact of prehistoric human foraging on intertidal mollusc communities and its significance for human settlement, mobility and dispersal. *World Archaeology* 33 (3), 452–474.
- Martinic, M., 1996. La Cueva del Milodon (Ultima Esperanza, Patagonia chilena). Un siglo de descubrimientos y estudios referidos a la vida primitiva en el sur de America. *Journal de la Société des Américanistes* 82, 311–323.
- Massone, M., 1982. Nuevas investigaciones sobre el arte rupestre de Patagonia Meridional chilena. *Anales del Instituto de la Patagonia* 13, 73–94.
- Massone, M., 1985. Estudio comparativo de nuevos sitios con pinturas rupestres aborígenes de Magallanes. In: Aldunate, C., Berenguer, J., Castro, V. (Eds.), *Estudios de arte rupestre*. Museo Chileno de Arte Precolombino, Santiago de Chile, pp. 205–223.
- Massone, M., Prieto, A., 2004. Evaluación de la modalidad cultural Fell 1 en Magallanes. *Chungara. Revista de Antropología Chilena* 36 (supl. espec. 1), 303–315.
- Matson, R.G., 1976. The Glenrose Cannery Site. National Museum of Man, Ottawa.
- Matson, R.G. (Ed.), 2008. The Crescent Beach Book. <http://www.anth.ubc.ca/people/professors-emeritiemerita/rg-matson/crescent-beach-book.html> (accessed 12.10.10.).
- Matson, R.G., 2010. Los orígenes de la cultura de la Costa Noroeste. In: Vila, A., Estévez, J. (Eds.), *La excepción y la norma: las sociedades indígenas de la Costa Noroeste de Norteamérica desde la Arqueología*. Treballs d'Etnoarqueologia, vol. 8. CSIC, Madrid, pp. 63–85.
- Matson, R.G., Coupland, G., 1995. *Prehistory of the Northwest Coast*. Academic Press, San Diego.
- Mitchell, D.H., Donald, L., 1988. Archaeology and the study of Northwest coast Economies. In: Isaac, B.L. (Ed.), *Prehistoric Economies of the Pacific Northwest Coast*. Research in Economic Anthropology (Suppl. 3), JAI Press, Greenwich, CT, pp.293–351.
- Mitchell, D.H., 1971. *Archaeology of the Gulf of Georgia Area: a Natural Region and Its Cultural Types*. In: *Synesis*, vol. 4 (Suppl. 1), British Columbia Provincial Museum, Victoria.
- Morello, F., Román, M.S., Prieto, A., 2002. Puntas de proyectil lanceoladas en Patagonia Meridional y Tierra del Fuego. *Anales del Instituto de la Patagonia* 30, 147–166.
- Moro, O., González-Morales, M.R., 2004. 1864-1902: El reconocimiento del arte Paleolítico. *Zephyrus LVII*, 119–135.
- Moss, M.L., 2011. Northwest Coast Archaeology as Deep History. Society for American Archaeology Press, Washington.
- Moss, M.L., Erlandson, J.M., 1992. Forts, refuge rocks, and defensive sites: the antiquity of warfare along the north Pacific coast of North America. *Arctic Anthropology* 29 (2), 73–90.
- Moss, M.L., Peteet, D.M., Whitlock, C., 2007. Mid-Holocene culture and climate on the Northwest coast of north America. In: Anderson, D.G., Maasch, K.A.H., Sandweiss, D.H. (Eds.), *Climate Change and Cultural Dynamics: a Global Perspective on Mid-Holocene Transitions*. Academic Press, London, pp. 491–529.
- Ocampo, C., Rivas, P., 2000. Nuevos fechados ¹⁴C de la costa norte de la isla Navarino, costa sur del canal Beagle, provincia Antártica chilena, región de Magallanes. *Anales del Instituto de la Patagonia* 28, 197–214.
- Ocampo, C., Rivas, P., 2005. El Poblamiento Marítimo de los Canales Occidentales de la Patagonia: Desde Chiloé hasta el Cabo de Hornos hasta el Cabo de Hornos. In: Chile País Oceánico. Ocho Libros Editores, Santiago de Chile.
- Orquera, L.A., Piana, E.L., 1987. Human littoral adaptation in the Beagle Channel region: the maximum possible age. In: Rabassa, J., Suguio, K. (Eds.), 1987. *Quaternary of South America*, XIII INQUA International Congress, Ottawa, 31 July–9 August 1987, vol. 5. A.A. Balkema Brookfield, Rotterdam, pp. 133–162.
- Orquera, L.A., Piana, E.L., 1999. Arqueología de la región del canal Beagle (Tierra del Fuego, República Argentina). Publicaciones de la SAA, Buenos Aires.
- Orquera, L.A., Piana, E.L., 2006. El poblamiento inicial del área litoral sudamericana sudoccidental. *Magallania* 34 (2), 21–36.
- Pettitt, P., Bahn, P., 2003. Current problems in dating Palaeolithic cave art: Candamo and Chauvet. *Antiquity* 77 (295), 134–141.
- Piana, E.L., 1984. Arrinconamiento o adaptación en Tierra del Fuego. *Antropología Argentina*, Buenos Aires, pp. 14–110.
- Podesta, M.M., Paunero, R.S., Rolandi, D.S., 2005. *Arte Rupestre de Argentina Indígena*. Patagonia. Academia Nacional de la Historia, Buenos Aires.
- Rabassa, J., Coronato, A., Bujalesky, G., Salemme, M., Roig, C., Meglioli, A., Heusser, C., Gordillo, S., Roig, F., Borromei, A., Quattrocchio, M., 2000. Quaternary of Tierra del Fuego, Southernmost South America: an updated review. *Quaternary International* 68–71, 217–240.
- Rivas, P., Ocampo, C., 2006. La Adaptación Humana al Bosque en la Isla de Chiloé. Estrategias Adaptativas en el Litoral Septentrional de Los Canales Patagónicos. Trabajo presentado en el XVI Congreso de Arqueología Chilena. Simposio Arqueología En Zonas Boscosas: Propuestas Metodológicas y Teóricas. (Unpublished manuscript).
- San Román, M., Morello, F., Prieto, A., 2002. Nuevos antecedentes sobre la explotación de recursos faunísticos en el mar de Otway y canales adyacentes. *Anales Instituto Patagonia, Serie Cs.Hs* 30, 147–154.
- Stein, J.K., 2000. *Exploring Coast Salish Prehistory: the Archaeology of San Juan Island*. University of Washington Press/Burke Museum of Natural History and Culture, Seattle.
- Vila, A., Estévez, J., 2010a. La excepción y la norma: las sociedades indígenas de la Costa Noroeste de Norteamérica desde la Arqueología. In: Treballs d'Etnoarqueologia, vol. 8. CSIC, Madrid.
- Vila, A., Estévez, J., 2010b. El factor marginado en CR: de la Tierra del Fuego a la Costa Noroeste. In: Vila, A., Estévez, J. (Eds.), *La excepción y la norma: las sociedades indígenas de la Costa Noroeste de Norteamérica desde la arqueología*. Treballs d'Etnoarqueologia, 8. CSIC, Madrid, pp. 183–218.
- Vila, A., Ruiz, G., 2001. Información etnológica y análisis de la reproducción social: el caso yámana. *Revista Española de Antropología Americana* 31, 275–291.
- Ward, B.C., Wilson, M.C., Nagorsenc, D.W., Nelsond, D.E., Driverd, J.C., Wigene, R.J., 2003. Port Eliza cave: North American West Coast interstadial environment and implications for human migrations. *Quaternary Science Reviews* 22, 1383–1388.
- Wessen, G., 1988. The use of shellfish resources on the Northwest coast: the view of Ozette. In: Isaac, B.L. (Ed.), *Prehistoric Economies of the Pacific Northwest Coast*. Research in Economic Anthropology (Suppl. 3), JAI Press, Greenwich, CT, pp.179–207.
- Wilson, M.C., Kenady, S.M., Schalk, R.F., 2009. Late Pleistocene *Bison antiquus* from Orcas Island, Washington, and the biogeographic importance of an early post-glacial land mammal dispersal corridor from the mainland to Vancouver Island. *Quaternary Research* 71, 41–61.