

## Chapter 2

# The Nasca Area and Its Environment

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**Abstract** The environment in which the Nasca Culture developed is the valley of the Río Grande de Nasca and its tributaries. The area is a hyper-arid desert with river oases which made possible the development of one of the most important cultural expressions of the south coast. Along the entire Peruvian coastline, the effect of the Humboldt Current causes the lack of rain on the coast, because of the strong winds that remove the hot water from the surface, altering the natural thermal balance between the ocean and the continent. The wealth of marine life and the ability to best use the river valleys for agricultural purposes determined the reasons why there were continual settlements along the coast near the waterways. Human presence in the valley of the Río Grande was linked to its progressive capacity to adapt to this type of climate, environment and ecosystem while basing their subsistence in accord with the available resources for hunting, gathering, and supplies connected with marine products. The seasonal characteristics of the different existing ecosystems in the coastal areas and river oases were the elements that contributed to the creation of permanent and seasonal settlements.

**Keywords** Río Nasca · Hydrography · Hydrology · Ecology · Climate · Marine and land resources

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## 2.1 The Río Grande de Nasca Drainage Basin

The current territory of the Nasca area fits into the hollow of the *Río Grande de Nasca*, which abounds in river systems. Most of these are tributaries of the Río Grande that forms the core of the hydrological system. The watercourses are largely torrential, and the water resources and their extent depend on the amount of rainfall in the mountains on the plateau during the austral summer (Fig. 2.1).

### 2.1.1 Hydrological Resources and Water Regime

The aquifer of the Río Grande consists of important deposits dating from the Tertiary and Quaternary periods and lies on an important impermeable base made up of metamorphic, sedimentary, and intrusive rocks. It is estimated that the maximum thickness of the aquifer is approximately 500 m. The mountains in the area belong to the oldest formations in the Andes and are part of the Western Maritime Cordillera, which runs parallel to the desert coastline, with altitudes ranging from 900 to 1200 m above sea level. This unit consists of Precambrian and Palaeozoic rocks, with widths ranging 15–50 km.<sup>1</sup>

The rocks in this formation are volcanic and sedimentary, dating from between the Jurassic and the Tertiary, while the intrusive rocks are from the Cretaceous and Tertiary periods, originating from alluvial, marine, fluvial, and wind action during the Quaternary, as can be seen from the present accumulations. According to Dollfus (1965), Tricart et al. (1969), Grodzicki et al. (1989) and Grodzicki (1994), the stratigraphy of the rivers enables us to recognize three periods of fluvial sedimentation in the Quaternary that led to the formation of four terraces. There is also marked erosion and subsidence to the north, off the Paracas Peninsula, where the Ballestas, Independencia, and Chincha Islands are located. Areas of depression can be noted even in the most southern parts, in the proximity of the mountains of Tunga and in the Central Plateau of Marcona, where there are also traces of deep-sea crevices with very important stratified deposits of fossil shells.

In the area between the river basin of the Nasca Río Grande and the Acarí site, the sea gradually reaches a great depth, which, about five-kilometers distance from the coast, abruptly falls in a vertical drop of 5000 m, taking the form of a circular depression. We can observe the same situation near the coast between Cañete and Paracas, where there is another very deep, rounded depression. A rock formation rises between the two underwater anomalies and extends onto the land, where it is known as Loma de Ica. In the desert and mountainous areas, like Ica and Nasca, the continual use of water by the early inhabitants constantly created the greatest problem due to the almost total lack of rainfall (5 ml/year) and the fact that there is

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<sup>1</sup>See the Chap. 3 “The Geology of Cahuachi” by M. Delle Rose (2016).

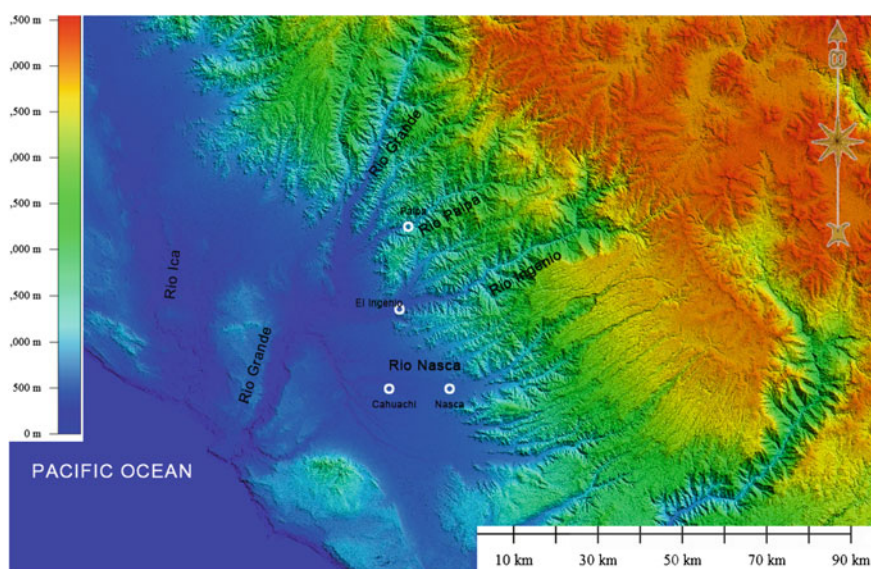


Fig. 2.1 Map of Ica Region (Drawing by Elvina Pieri)

much more subterranean water than can be found on the surface. Currently, around 80% of the water used in the Ica and Nasca valleys comes from wells. Millions of cubic meters are extracted annually from underground, but the size of the water table is unknown.

The hydrogeological resources are invariably related to the porosity and permeability of the geological matter. The rocky ground shows very low levels of porosity and permeability, so its ability to amass and redistribute water depends on its degree of fracturing. When there are deposits on the surface, its porosity and the permeability are associated solely with the empty interconnected spaces. The only way to exploit subterranean water is to make use of the alluvial deposits enclosed in the valleys. Among the best known, the most extensive and the ones offering the most potential, are in the lower basin of the Río Grande and in the alluvial cones of Río Acarí and the Río Yauca: these coincide with the morpho-structural unit known as the Ica-Nasca depression (Fig. 2.2).

Higher than 4000 m above sea level, in the highlands of Huancavelica, rainfall reaches 1000 mm per year, but only 15–25% of the rainfall flows on the surface: a portion evaporates and the rest seeps into the ground to form underground aquifers, whose size and capacity are unknown. This volume of water may flow from the higher area to the sea, using an escape route formed by a system of interconnected faults and fractures, which would allow it to make contact with the alluvial base of each valley and then reach the coast. Several deposits of igneous–hydrothermal origin may be found in the region, with copper, lead, zinc, and silver in the form of sulphurous concretions. Furthermore, in the provinces of Nasca and Ocoña, there are important deposits of native gold. On the South Coast, the genesis and mineralization of deposits are characterized by the presence of copper and gold deposits located in the batholith of the coastline and are identified on the map as the Nasca-Ocoña metallogenetic gold-bearing area. At the top of the Western Maritime Cordilleras, there are also seam deposits of metasomatic copper and silver.



**Fig. 2.2** DEM from Shuttle Radar Topography Mission: detail of Ica Region including the Río Grande and Río Ica drainage basins

The entire 3080 km of Peruvian coast is very arid land, crossed by around fifty rivers with very low water flows, descending from the western side of the mountain range. The Nasca region, with its plains, mountains and coasts, is one of the most challenging regions for human settlement (Figs. 2.3 and 2.4).



**Fig. 2.3** Majuelos: deep furrow in the sandy soil left by the occasional alluvial deposits in the desert land of Nasca (Photo by Giuseppe Orefici)





**Fig. 2.4** The sparse vegetation survives due to underground water and moisture derived from the large strong temperature variations between day and night (Photo by Giuseppe Orefici)

The only possibility of subsistence, as in the rest of the desert coast, comes from some river oases, where abundant natural vegetation grows and the soil is more fertile, thanks to the humus-rich debris that are brought by the rivers during the summer floods (Figs. 2.5 and 2.6). The desert climate has a wide temperature range and considerable variation in relative humidity between night and day, especially during the winter months. Temperature measurements oscillate between 5 °C during the night and 32–40 °C during the day, while the relative humidity varies from 97–100 to 20–30% (ONERN 1971; Skibinski 1991). The scarcity of rain [2.2 mm (ONERN 1971)] and the above-mentioned geographical and geological characteristics bring about a unique ecosystem that, according to palaeoclimatic studies, must not have been very different in the past.

### ***2.1.2 Ecology and Different Ecosystems. Effects of the Humboldt Current***

It is also important to add that, in the coastal area in question, beyond the desert area, there are different ecosystems that depend on multiple factors which are as much environmental as exogenous (Fig. 2.7). Here we refer to the coastal

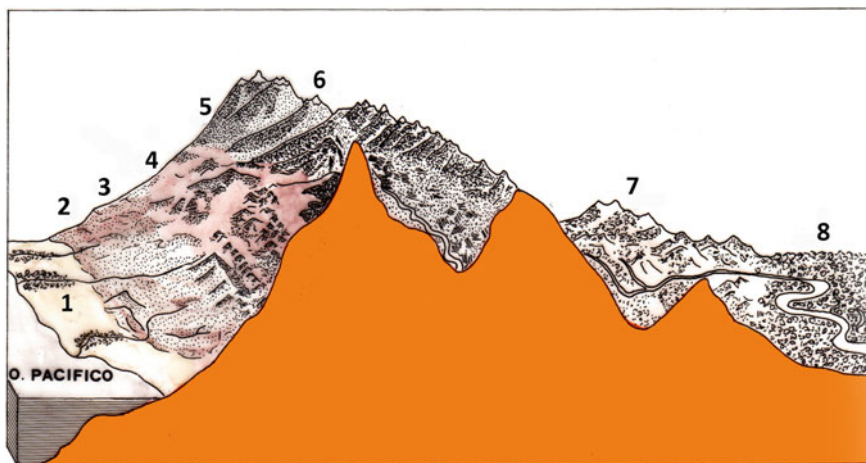


**Fig. 2.5** Nasca river valley in the area of Cahuachi. The green zone area contrasts with the clay and sandy soil where the buried temples of the ceremonial center can be found (Photo by Giuseppe Orefici)



**Fig. 2.6** Río Ingenio valley. Typical landscape of river oases where vegetation grows and is maintained due to the constant presence of water in the river (Photo by Giuseppe Orefici)

ecosystem up to 500–800 m above sea level, *Chala*, without taking into consideration the area between 500–800 m and 2000 m above sea level (called *Yunga seca*), with sporadic rainfall of around 150 mm per year (Pulgar Vidal 1987). Among the factors specific to the desert climate, we can mention wind erosion,



**Fig. 2.7** Geographic pattern of the eight regions of Peru according Pulgar Vidal (1987) (Drawing by Elvina Pieri). Their Spanish or Quechua names are: Costa or Chala (1), Yunga marítima (2), Quechua (3), Suni or Jalca (4), Puna (5), Cordillera or Janca (6), Selva Alta or Rurarupa (7), and Selva baja or Omagua (8)

especially in the months between August and October, as winds blow very strongly, sometimes lasting three or four days in a row, and paralyzing all human activities outdoors. This phenomenon is commonly known by the name of *Paraca*.

Another factor that has a decisive influence is the system of sea currents flowing parallel to the entire coastline. The most important of these is the Humboldt Current or Peruvian Current, a constant flow of cold water that forms off the coast of Chile, Peru, and Ecuador due to the action of the wind, dragging away the warm surface water, thus altering the natural thermal balance between the ocean and the continental mainland. The result is that the water cools by 5–10 °C below what it otherwise would be, a phenomenon that occurs as far north as the equator. This natural phenomenon was discovered and documented in 1800 by the German naturalist and explorer Alexander von Humboldt, who measured the temperature of the sea in the southeast area of the Pacific Ocean, off the coast of Callao (Peru). The Humboldt Current flows from south to north along 4000 km of coastline and does not form a single stream, but is divided into a coastal branch and an ocean branch, to a depth of between 30 and 400 m, respectively. Hence, it is referred to as the Humboldt Current system. It is one of the most biologically productive phenomena in the Pacific, primarily because of the presence of areas of resurgent sea water or surfacing produced by the action of the wind, causing the displacement of extensive surface water, and creating spaces which are filled by the water rising from a depth fluctuating from between 150 and 300 m, which is lower in temperature and richer in oxygen. The cold water contains nitrates and phosphates from the seabed, essential substances for the growth and maintenance of life throughout the food chain that feeds all the species of ocean animals, from microorganisms to larger



fish. This means that the Peruvian sea is one of the richest in the world in terms of the abundance of fish, creating an irreplaceable source of food for birds and marine mammals, as well as a steady source of income for the fisheries sector. This cold current is the main cause of the heavy mist and stratified fog that condense along the Peruvian coast, often producing very fine rain known as the *garua*, which benefits and sustains the Lomas area (von Ellenberg 1959; Pulgar Vidal 1987). During the winter, the Cordillera Mountains closest to the sea are covered in vegetation, able to spread thanks to the humidity held by the terrain, despite the scarce rainfall in this arid zone. It is a very peculiar phenomenon well known to the ancient inhabitants of the valleys of Peru and Nasca, who used the vegetation that developed in this ecosystem (Orefici and Drusini 2003). Nevertheless, abnormal events periodically occur when the Humboldt Current is unable to emerge because the north winds push the warm waters from the Gulf of Guayaquil (Ecuador) to the south, leading to the formation of a warm current, known as *El Niño*, which replaces the natural cold current. This phenomenon, which continues while the action of the equatorial current lasts, causes an increase in surface water temperature of between 6 and 10 °C, causing torrential rains, floods, and alterations in the marine habitat; it also brings with it tropical fish and causes a decrease in the plankton typical of cooler currents, bringing catastrophe for the survival of wildlife and fishing in the coastal areas.

In the drainage basin of Río Grande de Nasca, there are signs of more dramatic alluvial phenomena that caused alterations in the morphology of the land in ancient times, even affecting structural damage to the buildings of the ancient settlements, as became clear from the archaeological excavations of the Nasca Project at the Cahuachi ceremonial center (Orefici 1989, 1990; Orefici and Drusini 2003; Grodzicki 1989, 1990, 1994). It is possible that these changes had to do with phenomena connected with *El Niño* called Super ENSO or Mega Niño (Mörner 1986, 1992; Orefici and Drusini 2003). In particular cases, the coastal rain may depend on masses of very warm air from the Amazon Cyclone if it manages to surpass the natural barrier of the Andes.

This area, despite being characterized by a desolate appearance and a habitat that appears unfavorable to any kind of life, has a fairly varied natural vegetation, as well as animal life that has adapted to the coastal ecosystem. Currently, agricultural crops have increased significantly, as has the indiscriminate felling of trees, especially due to the growing demand for charcoal for restaurants. Even the intensive use of groundwater resources and grazing have caused profound changes and irreversible damage in the valleys, dramatically altering the natural ecological balance. At present, we are unable to determine with certainty the reconstruction of the palaeoclimate of this habitat, but some studies (Cardich 1977; Lynch 1982; Dollfus and Lavallée 1973; Dollfus 1981; Rick 1980) have established a subdivision of the main climatic phases in the territory. One of the main sources is the documented evidence for the presence of continental ice, which enables us to go back in time almost one hundred and fifty thousand years (Lories et al. 1985; Thompson 1993 for the palaeoclimatic fluctuations over the last millennium). Other archaeological data regarding phenomena capable of damaging the cultural remains

of the coast, such as the effects of *El Niño*, are still being studied in order to understand the relationship between the environment and human presence. Comparing the stratigraphy of various sites in order to determine the real cause of these events, it was possible to develop experimental models to build upon in order to ascertain the chronology of the more dramatic phenomena (Macharé and Ortlieb 1993).

### 2.1.3 Marine and Land Resources

Human presence in the valley of the Río Grande in Nasca was closely linked to their gradual capacity to adapt to this type of ecosystem and was based on subsistence activities in line with available resources.

A major source of food supply was undoubtedly the coastal strip closer to the ocean, rich in marine life and easy to reach by moving along the river valleys to their mouths. Thanks to the Humboldt Current, the maritime area of the Nasca territory is most certainly among the richest in marine wildlife on the planet. The complexity of the food chain characterizing this system includes various levels, starting from the abundant zooplankton and phytoplankton and ending with their exploitation by fish, marine mammals, and birds, and consequently also by humans. Among the birds found on the coast, there are large numbers of pelicans, gulls, cormorants, flamingos, gannets, and many other species. Many of these form huge colonies on the rocky coast or on the islands near the mainland, where they deposit thick layers of guano, which has been used since ancient times as a fertilizer and for trade purposes.

The huge amount of fish, crustaceans, and molluscs found here is an enormous food resource and formed the staple diet of the ancient mussel pickers and coastal fishermen. Among the most common species, both now and in Pre-Colombian times, are sardines (*Sardinops sagax*), anchovies (*Engraulis ringens*), silver smelt (*Odontesthes regia*), Pacific bonito (*Sarda chiliensis*), mackerel (*Scomberomorus maculatus*), some sciaenidi such as *lomas* and *cocos* (*Sciaena deliciosa* and *Paralonchurus peruanus*), corvinas (*Cilus gilberti*), palm ruff (*Seriolella violacea*), grey mullet, tuna, and others. An alternative source of protein was provided by the large variety of marine molluscs, whose remains were amply identified in the archaeological excavations conducted by the Nasca Project at the Cahuachi ceremonial centre and in other sites with dwellings where its influence was felt. The most common were varieties of mussels (*Choromytilus chorus* and *Choromytilus ater*), pectinidae (*Pecten purpuratus*), tellinidae and clams (*Mesodesma donacium* and *Mulinia edulis*), as well as numerous snails (*Thais* sp., *Tegula atra*, *Trophon peruvianus*, etc.) and echinoderms, including sea urchins (*Loxechinus albus*). There are also numerous types of shellfish such as the purple crab (*Platyxanthus orbigny*) and the MuyMuy (*Emerita analoga*). The analysis and recording of fish remains, carried out during various archaeological projects along the coast, have revealed the presence and use of various species of fish and shellfish beginning from the Preceramic

Period. Thus it has been possible to demonstrate the importance of the presence of marine produce left as offerings as part of temple ceremonies. Freshwater streams are the habitat of the changallo shrimp (*Cryphiops caementarius*), abundantly documented in Nasca textile and ceramic images and of which numerous remains were found in Cahuachi. Today, because of overfishing, these crustaceans are significantly fewer in number and can be consumed only thanks to the many farms situated along the rivers, especially in the areas most distant from the sources.

The variety of coastal fauna is also seen in the number of mammals that feed on marine resources, including two species of carnivorous pinnipeds of the otariid family, commonly known as sea lions, including the South American sea lion (*Otaria flavescens*, formerly *byronia*) and the South American fur seal (*Arctocephalus australis*), who live along the rocky coast and on the beach; there is also a small saltwater coypu (*Lontra felina*) or *chungungo*, also known as the sea cat. The Peruvian waters have numerous species of cetaceans, including several varieties of whales and dolphins, the largest of which is the orca marina (*Orcinus orca*), depicted as one of the main gods of the Nasca Paracas pantheon.

As was noted before, the desert territory where the Nasca culture developed has different ecosystems, including areas defined as river oases. It is necessary to distinguish between them on the basis of characteristics and morphology, resulting in three different environmental classifications:

1. oases caused by water from water tables or *puquiales*, at sources of various types and sizes (Schreiber and Lancho Rojas 1995; Lasaponara and Masini 2012; see also Chap. 13 by Lasaponara et al. (2016));
2. river oases occupying both sides of the rivers perpendicular to the coast and making up the cultivated areas most widely used throughout the Peruvian coastal desert areas;
3. nebulo genetic oases, arising from the concentration of moisture contained in the fog and falling to the ground which cause the phenomenon known as *lomas*.

The fluvial oases provided the determining factor favoring the first human groups in the Early Preceramic Period who considered them as sites for seasonal exploitation of resources or permanent settlement. The ancient hunter-gatherers migrated into the river valleys during specific seasons, following the wildlife as it moved towards the coast. The river oases therefore constituted an important geographical environment where they could settle for certain periods. Together with the *lomas*, the river valleys provided an important reserve of wild plants, seeds and tubers. During the Pre-Hispanic period, this type of initial socio-economic activity was supplemented by hunting and, perhaps, some incipient forms of agriculture.

Although there is currently scarce land fauna, in Pre-Columbian times, the coast was well-populated with cervids (*Odocoileus virginianus*), guanacos (*Lama guanicoe*), and foxes (*Dusicyon* sp.), as well as felines like *Felis colocolo*, an endemic species also known as the Andean cat and/or *pajonales*. At present, numerous bird species dwell in the huarango forests (*Prosopis pallida*), including hummingbirds, *vencejos*, *chaucatos* (*Mimos longicaudatus*), swallows,

*huerequeques* (*Burhinus superciliaris*), green parrots. There are also large numbers of falcons and owls, which feed primarily on rodents, insects, and reptiles, in addition to condors at particular times of the year when they come down from the mountains to the coastal areas in search of food.

In ancient times, as is well documented by archaeological research, there were already many domestic species such as the llama (*Lama glama*), the alpaca (*Vicugna pacos*), the guinea pig (*Cavia porcellus*, *Cavia cutleri*), the dog (*Canis familiaris*), and possibly a few birds such as the duck. The presence of dogs in Peru is well documented, both in iconography and in ceramics: dog remains have been found in tombs in Paracas, Nasca, Moche, and other archaeological contexts. After the Spanish conquest, the fauna in the area included almost all the species introduced by the Europeans, and the Andean camelids are mainly bred in the Sierra today. Spontaneous endemic trees and shrubs grow at the oases: there are large huarango forests (*Prosopis pallida*), *espinos* (*Acacia macracantha*), willows (*Salix chilensis*), Peruvian pepper (*Schinus molle*), pájarobobo (*Tessaria integrifolia*), paloverde (*Cercidium praecox*), mata burro (*Parkinsonia aculeata*), and others.

As humans began to settle, this was possibly the most suitable habitat for some temperate plants to adapt to the environment, even in very ancient times. The types of edible species found here depend on the agricultural development of the valleys: they are numerous and include the most ancient cultivated plant species from the early stages of the cultural development of the area introduced after their domestication. The best known are those used for sustenance, including the cucurbitaceae (*Cucurbita maxima*, *Cucurbita moschata*, *Cucurbita ficifolia*, which could be eaten as well as used for practical purposes such as the *Lagenaria siceraria*), maize (*Zea mays*), various legumes such as *pallar* (*Phaseolus lunatus*), beans (*Phaseolus vulgaris*), canavalia (*Canavalia plagioperma*), peanuts (*Arachis hypogaea*), and all varieties of peppers (*Capsicum* sp.). Of the edible tubers and roots, in addition to the potato (*Solanum tuberosum*) originally from the Andes, we can mention the camote or sweet potato (*Ipomoea batatas*), the manioc (*Manihot esculenta* or *utilisima*), the *achira* or arrowroot (*Canna edulis*) and the *jiquima* (*Pachyrhizus tuberosus*) whose rhizome is used for food.

Other plants were used industrially or for other practical purposes, e.g., cotton (*Gossypium barbadense*), the *caña brava* (*Gynerium sagittatum*) and the *tatora* (*Typha domingensis*), scirpus (*Scirpus* sp.), and sedge (*Cyperus laevigatus*), while *carrizo* or common reed (*Phragmites communis*) was used to make mats of woven vegetable baskets, the roofs of buildings, and utensils. Among the endemic fruit trees were the *lúcumo* (*Pouteria* sp.), whose fruit or kernels are very frequently found at the excavations of the Cahuachi ceremonial centre, the *pacae* (*Inga feuillei*), used for its wood and seeds, and the *chirimoyo* (*Annona cherimola*). Other plant species used include one of the cactus family, the prickly pear (*Opuntia ficus-indica*), whose presence is documented in native patterns from about 9000 ACE. In addition to being a source of fruit, this plant was very important for breeding a parasitic insect, the cochineal (*Dactylopius coccus*) whose body contains a haemolymph based on carminic acid, a natural red pigment used to dye fabrics and currently adopted as a colorant in food, cosmetics, and pharmaceuticals.

## 2.2 Subsistence Economy and the Dynamics of Settlements in Coastal Southern Peru

In these environmental conditions, the first human groups had to adopt a number of strategies to control the natural produce, thus adapting to a completely different ecosystem, leading to a new order in the structural relationships between the various social categories and the creation of an economic basis founded on food production.

During the transitional period corresponding to the final stage of the last Pleistocene ice age (c. 10,000 BCE), prehistoric Peruvian man had to adapt to sequential climate changes, as well as to various changes in the morphology of the ground, which altered his habitat and reduced the varieties of plants and animal resources available. At the same time, the gradual thaw following the end of the Ice Age allowed bands of hunters to move to areas, which, up to then, had been beyond their reach, such as the *Puna* and the grasslands on the plateau, rich in fauna and various plants, exploiting them for a very long period of time. These groups of hunters who fed on deer and camelids, smaller animals, and the fruits of wild plants, which they gathered as they went, camped near lagoons, springs, or rivers, where they were more likely to run into the local fauna. In the Preceramic Period, there was already evidence of long-term occupation of some of the sites with these features, so it is impossible to hypothesize an on-going nomadic existence, because this does not correspond to reality. There were certainly periods of transhumance, depending on the rainy season or seasonal movements of herds of animals, and many human activities were tied in with the rhythms of nature.

The vertical morphology of the Andes and the close relationship between the climate and the topography enabled the population access to a variety of ecosystems at higher altitudes, despite the relatively short distances. This clearly explains the efficiency of transhumance in its various forms, based on seasonal circulation from the bottom of the valley's western slope to the plateau and back, as well as human adaptation to the fluvial oases of the Pacific side. This then was an important time in the creation of the conditions that led to the gradual domestication of plants and animals. The availability of abundant fauna and a constant supply of vegetation, along with the possibility of staying in the same region for a long period of time and an increasing knowledge of environmental resources, meant that the first agricultural practices could develop, and flocks of gregarious animals such as camels could be brought together so as to tame them and develop the rudiments of farming. The hunter-gatherer thus assimilated the knowledge necessary to practice an early form of agriculture at a very early date, since the plants growing on the plateau appeared around 8000 BCE and on the coast from 6000 BCE onwards. This form of socio-economic innovation brought about new models of experimentation to make use of the resources, which began to be increasingly independent of periods of short-term meteorological or climatic change. Gradual limitation or reduction of natural food reserves brought about a profound change within the societies that would develop later.



This was not a homogeneous stage in the Central Andes due to the fluctuations in the climate and the environment that led to significant changes in the availability of the natural resources, greatly influencing the stability of early human occupation, with a marked impact on subsistence models. In the transition from the Pleistocene to the Holocene, in areas with marginal water and food, the rapid environmental transformation was the main cause of changes in the way of life of the hunter-gatherer, increasing volatility in the way he made use of resources. Moving to areas with less environmental stress and the acquisition of new production methods were phenomena conducive to an increase in population in the coastal desert areas, in parallel with a new form of agricultural experimentation: these factors favored greater autonomy despite the diminished reserves of natural foodstuffs.

From the current palaeo-climatological evidence relating to the Mid-Holocene, we know that the effects of the melting ice, which lasted until 6000–5500 BCE, brought about a so-called *climatic optimum* or *thermal optimum*, meaning a phase in which the temperature stabilized with an increase in rainfall and humidity in the northern area. Unfortunately, quite unlike other areas, there are no specific studies on the extent of this phenomenon along the coast, although it can be assumed that the same process took place (Unkel et al. 2006), as is evident from what is known from palynological, sedimentological, and stratigraphic data which provide information on the sedimentary deposits and their composition. There are also cultural and historical data from studies of maritime settlements from the Terminal Pleistocene (De France and Umire Álvarez 2004). Analysis of the results of the Proyecto Quebrada Tacahuay, 1997–2001, which provided evidence of catastrophic flooding caused by El Niño sealing the remains of the first cultural level dating back to around 8700 BCE, shows a later reoccupation of the site, albeit on a smaller scale, due to the presence of mollusc remains. Among the most interesting findings are stone tools, remnants of stone processing, items showing the preparation of food in certain hearths [see also Sandweiss (2003)].

There is sufficient information about the oldest prehistoric sites located in the plateau to construct a reliable chronology for the various archaeological stations in the High Lands (Cardich 1974, 1980; Mercer and Palacios 1977; Lynch 1980, 1982, 1983; Dollfus and Lavallée 1973; Dollfus 1981; Rick 1980; MacNeish 1972, 1981).

The contemporaneous existence of human groups in the coastal area has been analyzed, especially along the North Coast. Chauchat's studies prove the existence of an ancient culture such as the one known as Paijanian, which developed in the period of transition from Pleistocene to Holocene and gave rise to a very well-documented lithic tradition found in many places on the coast, supplying knowledge of technological development and the socio-economic model achieved, in addition to forms of adaptation to the territory, the environment, and the existing natural resources. For Chauchat (1982, 1992), Paijan man developed between 6600 and 4000 BCE and lived at a time when the sea level was rising sharply, in the midst of a serious environmental crisis, which saw gradual desertification of the coastal strip and the consequent reduction of wildlife resources. Currently, there is

evidence of the submersion of the entire current central-north coastal strip, until around the fifth millennium BCE. For Richardson (1981), only four sites avoided submersion: Vegas in Ecuador; Amotape–Sichesin Peru, dated 11200–6000 BCE, Cupisnique, in the Valley of Chicama, dated 9800–7000 BCE, and Las Conchas, in Chile, dating from 9600–9400 BC. Applying his analysis to the South Coast, Richardson concluded that the dividing line between land and sea before the ice withdrew must have been between 10 and 30 km inland from the coast, and this would also explain the presence of large deposits of prehistoric shells that have been identified 10–15 km inland from the current shoreline, while others were submerged and are therefore no longer accessible.

Studies conducted by the Proyecto Nasca in the Río Grande valley, including the Río Nasca, Río Atarco, and neighboring valleys examined erosion and accumulation during the Quaternary Period, enabling the identification of four terraces. On the Pacheco site, on the oldest terrace, 12 sedimentation processes can be observed. By dating the second sedimentary layer, it was possible to fix the date at  $10,600 \pm 800$  BP (Grodzicki 1994). Moreover, based on the presence of saline layers formed by evaporation, underlying the sediments from dissolved mudflow caused by ancient climatic anomalies, it was possible to confirm a desert climate existed at that time. It could thus be imagined that the ancient inhabitants of the area had to face significant problems arising from the scarcity of water, in addition to the relationship with the vegetation and wild products, and sources of animal protein. They therefore had to combine the need for procuring raw materials for subsistence with their preservation and storage in times of scarcity, a need to develop systems for adaptation to the territory and the increasingly common system of herding that naturally also provided for the conservation of dairy products and animal protein. The cultivation of the land was later adapted to times of sowing and harvesting, as well as subsistence during seasonal periods of dry soil. This evolution in terms of adaptation was therefore the first step towards the formation of new types of complex, agro-pottery-based societies, adequately prepared to deal with the conditions of arid and desert land.

It is not possible to define models able to explain the whole process of plant domestication in the Andes, but it must be considered that the experience gained by human beings in contact with various ecosystems over thousands of years in the territory, and the needs arising from fluctuations between abundance or scarcity in the availability of resources, were the driving force in the development of the first forms of agriculture. The oldest dated presence of crops growing on the plateau are chilli, beans, *pacaе*, and the *lúcumo*, along with other species of minor importance already domesticated by 8000 BCE, and the pumpkin and the *Pallar* or Lima bean, between 8000 and 6000 BCE. Maize was already used around 6000 BCE and the cultivation of other food crops spread later. The potato is not easily datable due to its widespread use, although the importance of this tuber in the Andean diet meant that it was one of the main items on the list of plants used for food. The remains found in the Central Plateau cannot be dated properly, so its earliest use cannot be ascertained with any precision.

On the coast, the documented appearance of cultivated plants indicates a later date: there is evidence of the presence of the *Lagenaria* genus between 6000 BCE and 4200 BCE, such as maize, *paca*, the peanut, manioc, chilli pepper, the *guayabo*, the *lúcumo*, the *achira*, and cotton, to name just some of the species of edible and industrial use. Cotton (*Gossypium barbadensis*) appeared on the coast around 2500 BCE introducing a radical change in the use of technologies applied to fibers for the manufacture of fabrics.

In the Nasca valleys, this cultural phase is poorly represented, which is mainly due to the shortage of studies and analysis related to this chronological period, while there is significant evidence in ancient sites along the coast that already show features of village life, confirming the abandonment of, or at least a reduction in, the use of seasonal camps. The first to cultivate probably made use of hotter and more humid ecosystems, such as the bottoms of the valleys, the *lomas*, or the lowland areas, where the silt deposited by the seasonal floods on the river margins formed fertile ground for germination. Nevertheless, this is mere hypothesis, although it is very likely that the people who lived in the Nasca geographical area, including the coastline, had to adopt special strategies to supplement their diet so as not to depend only on sustenance from the sea.

The terminology used here to establish the chronology of the sites of the coast in the central-south, is mainly based on the classification used by scholars for what is referred to as the Archaic Period, i.e., until the introduction of pottery. The Archaic Period began around 8000 BCE and ended approximately 1800 BCE, when the cultural period also called Formative began. It is broken down into Early Archaic (8000–6000 BCE), Middle Archaic (6000–3000 BCE) and Late Archaic (3000–1800/1500 BCE). These dates may vary depending on the interpretations of archaeologists based on their research (Lumbreras 1969; Shadi Solis 1995). Other archaeologists (Lanning 1967; Rowe 1967; Rowe and Menzel 1967; Ravines 1970) use the term Preceramic, dividing it into six eras or five periods, otherwise (Chu Barrera 2008) into Early, Middle, and Late Preceramic, a dating that will be used also in this text.

The earliest evidence of human activity in the Southern Coastal area was found in sites offering varied food resources that required a great knowledge of the surrounding environment on the part of those who exploited it. The only way to understand the degree of development reached by the people using this land and to know whether their survival strategies were similar is by comparison with other settlements of the same period, recorded and analyzed archaeologically. Until now, the only known site is Ilo, called Ring or Anillo (Richardson III et al. 1990) on the South Coast that can be dated as Early Preceramic. It reveals a society specializing in the exploitation of marine resources which followed an economic model already well-established along the coast. It dates from between  $10575 \pm 105$  to  $7415 \pm 65$  BP.

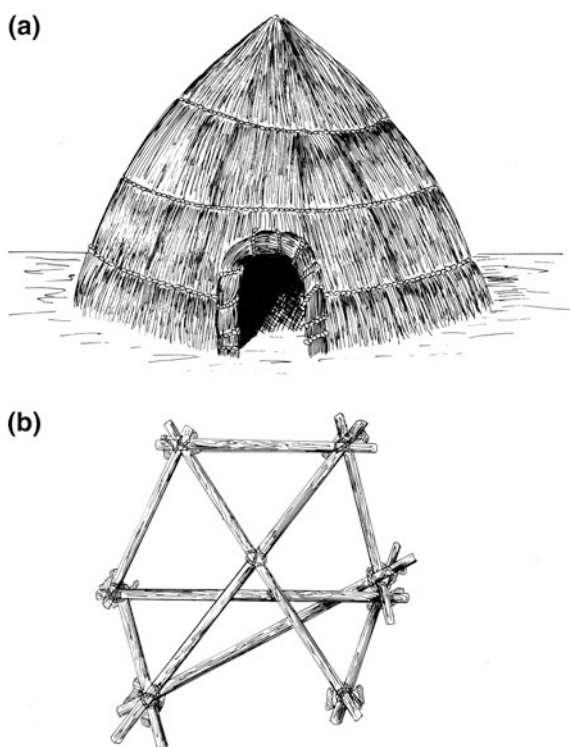
Along the central and southern Peruvian coast, among the Middle Preceramic settlements are those of Paloma (Río Chilca), dated by F. Engel between 5200 BCE and 2800 BCE, with groups of circular, ovoid, and quadrangular dwellings, built with structures supported by trunks and roofs with plant fibers. The inhabitants

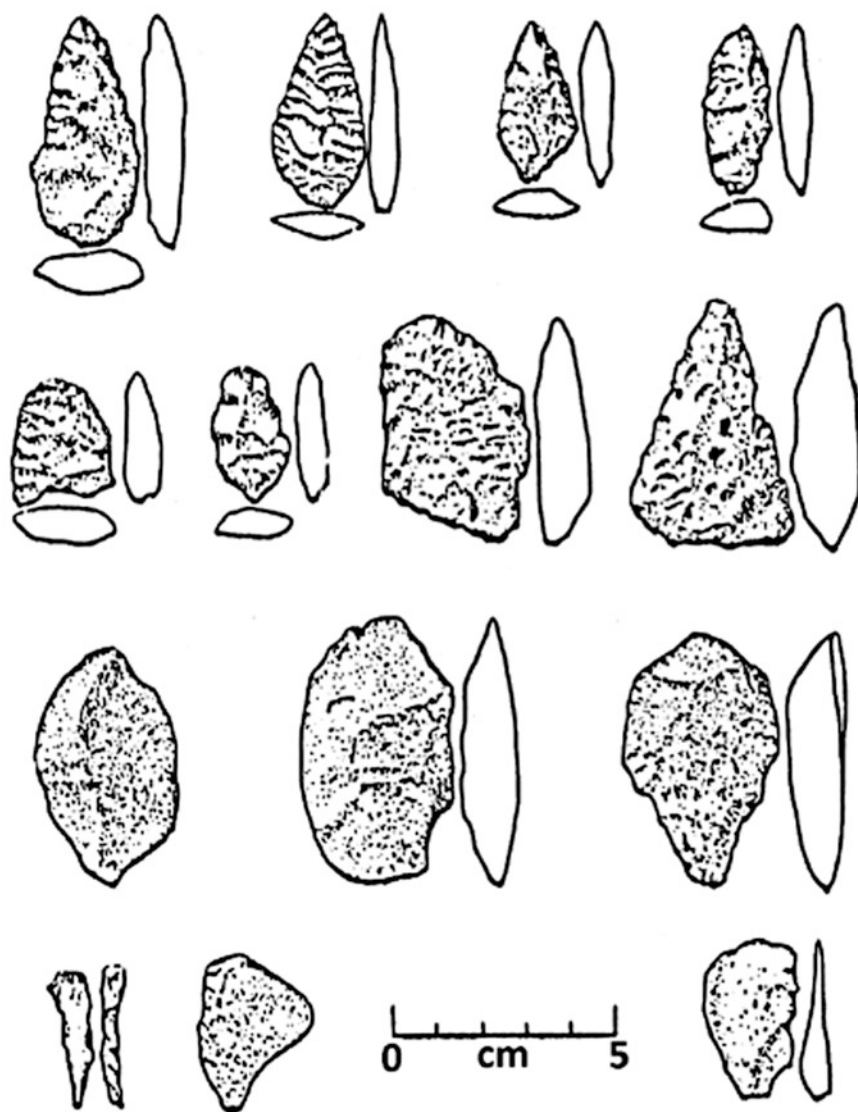
practiced complex forms of ancestor worship (Engel 1980; Benver 1982, 1984) and stored their food in warehouses. Another important site was Casavilca (named after its discoverer), called Boca del Río Ica by F. Engel, dating from 5570 to 3500 BCE (Engel 1957a: 57–62), together with the Salinas de Otuma. At the mouth of the Río Grande de Nasca, there is a site called Santa Ana, with traces of continuous occupation, where Engel (1963) reports the discovery of marine mammals, sea turtles, fish, molluscs, crustaceans, birds, and unidentified terrestrial mammals among the materials found, as well as cucurbits and beans, with no further specification (Fig. 2.8a, b). During his research along the Nasca coast, archaeologist W. D. Strong analyzed some shell deposits from the San Nicolás sites in the bay of the same name.

He identified three different occupations from the same period, all from 4000 BCE. In his report, Strong (1957) describes the finds, which included remains of sea urchins, shells of various shellfish, ash, coals, bones of birds and sea lions, and the remains of work in stone, as well as scrapers, chisels, bits, blades, and black and red obsidian microliths (Fig. 2.9). During his research, Strong also unearthed residues of woven plant fiber and a little botanical produce, briefly mentioning the remains of only pumpkin and corn. Geological analysis highlighted eight different lines of beach, a natural rocky dam encrusted with freshwater algae, which must probably

**Fig. 2.8** a Hypothetical reconstruction of a hut in Chilca (Engel 1966).

**b** Diagram of the supporting structure of a house in Santa Ana, at the mouth of the Río Grande de Nasca (Engel 1987)





**Fig. 2.9** Stone tools found by W.D. Strong in San Nicolás III (Strong 1957)

have once closed off a lagoon or a dry canal. Other deposits from the same period were found in Lomas and Chaviña, south of Nasca, in the department of Arequipa, but for the moment they do not have enough data to include them in an accurate chronological framework.

Further north, on the Paracas Peninsula, Engel analyzed numerous settlements and pre-agricultural and Preceramic sites at Cabezas Largas and Santo Domingo



dating from approximately 4000 BCE. [Some of Engel's datings have been criticized and revised. On this subject see Velarde (2002)]. During the 1988 campaign, in the Gran Pirámide 2 at Cahuachi (CAH88Y10EXP37), the Nasca Project found a small structure associated with a burial, as well as lithic, mollusc, and plant material, whose antiquity, as evidenced by the various calibrated C14 datings, gave an average result of around 4200 BCE. All of these sites belong chronologically to a period of occupation of the coastal areas by human groups whose economy was based on marine or mixed resources.

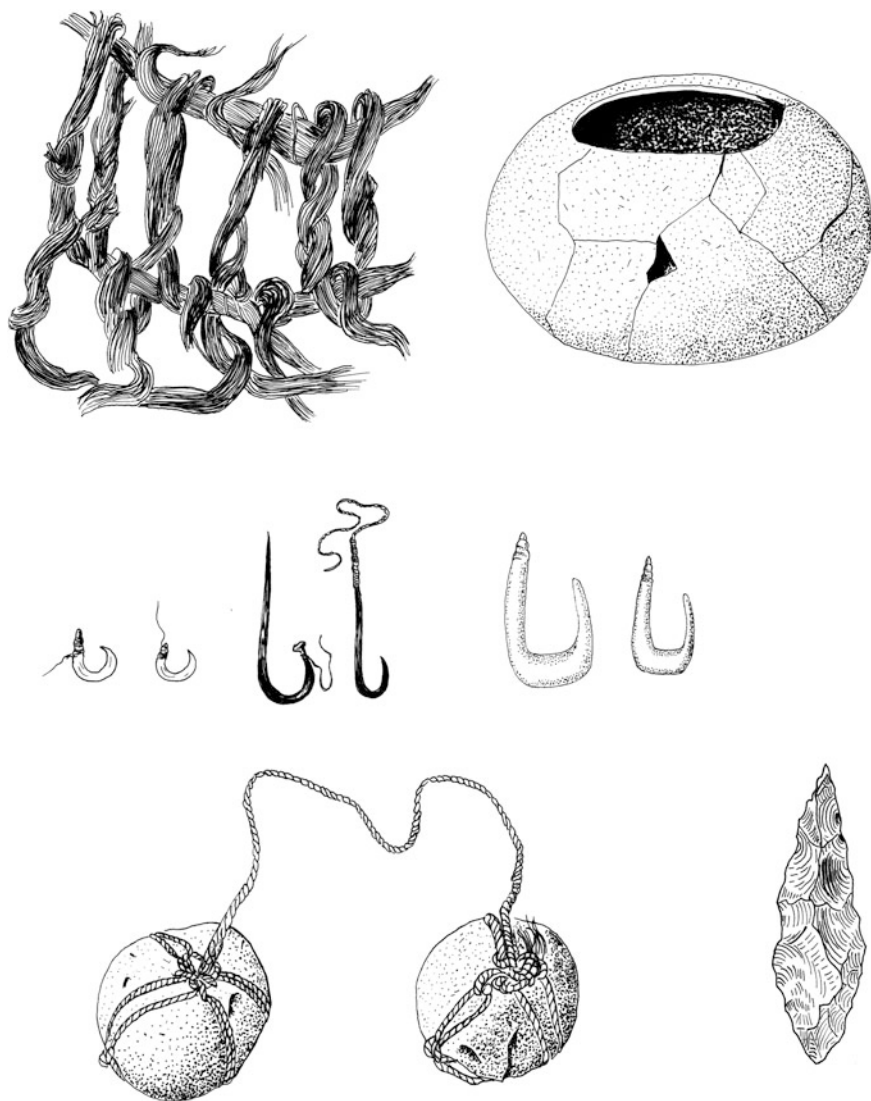
Scarce as it may be, the archaeological documentation for the area is very interesting on account of the information that it offers concerning the dietary habits of the inhabitants of the coastal settlements and helps to establish the economic model on which they were based.

Most of the artefacts found in the deposits on the early sites are associated with fishing, as evidenced by the presence of hooks made from bone and shell, nets made from plant fibers (mainly *cattail* and bulrush, as cotton was not yet in use), stone weights, floating gourds, and pointed harpoons (Fig. 2.10). This indicates a specialist knowledge of fishing for very diverse fauna, which includes not only harvesting shellfish or catching fish, but also hunting sea lions and possibly certain types of cetaceans. The discovery of the skeleton remains of these species in refuse dumps, and archaeological evidence of their use in the manufacture of small pieces of armour, are proof of their use, as is the constant use of pinnipeds or cetaceans for food and in tool manufacture. Of course, a diet based only on produce from the sea had to be supplemented by terrestrial hunting and taking advantage of the presence of wild vegetation as well cultivated plant material.

As mentioned earlier, many settlements were situated by the *lomas*, and others were located in the river terraces along to the coast, or in places protected by marine terraces. Analysis of the sites where research has been conducted, especially by Engel, leads to the hypothesis that the number of residents per village did not exceed 50 to 60. The remains of dwellings Engel found in Santa Ana had a skeleton structure made up of poles in willow (*Salix humboldtiana*), onto which the walls and the roof were lashed. This was probably made of rushes or reeds, like the *carrizo* (Fig. 2.10).

It is very difficult to reconstruct the way of life of these ancient societies with their fairly homogeneous cultural base, even if they had different food resources and were located in different ecosystems. In all probability, an atomized socio-economic model was formed, centered on independent families acting with no centralized authority, but coming together in times of collective necessity. In any case, their activities were family or clan-centered, mainly exploiting the resources or assets needed by small groups.

Despite these limitations, this production system, which lacked any kind of economic stratification, came to be able to process a large number of cultivated plants and, over a period of time that is difficult to establish for each cultural area, introduced more complex social organization, until a time when agriculture became



**Fig. 2.10** Instruments and tools used in fishing, including a fragment of a net of plant fiber, a container of *Lagenaria* sp., hooks made from shell, bone and thorns of *huarango*, weights, and a tip of harpoon (Drawing by Dolores Venturi)

the main source of sustenance. However, the continual exchanges of non-food products, such as obsidian, show the importance of communication and trade between different ecological niches, as indicated by the presence of this material at San Nicolás and the older structure found at Cahuachi, cited previously.

During the third millennium BCE, there was a gradual transformation accompanying the development of agriculture and a radical change in settlement patterns.

### ***2.2.1 The Emergence of Complex Society in the Late Preceramic Period***

The transition period culminates in sedentarization, as well as the parallel development of agricultural techniques, irrigation, and water use. The earlier model of the dispersed village or seasonal camp gradually gave way to a new type of agglutinated settlement, with the dwellings arranged in a concentrated pattern, with strong autarkic characteristics and a marked trend towards more extended and self-sufficient models of urban development. These characteristics facilitated population growth and led to new standards in terms of the organization of society and production systems. It is a settlement model that considers the concentration of villages in the areas as more favorable, with priority of choice going to the territories of the lower river valleys, where it is easier to make the best use of the oncoming floods with their contribution of fertilizing silt. These settlements were usually located near the sacred sites or ceremonial centers that arose at the end of the third millennium BCE. The organization was community-based, under the control of incipient forms of theocratic government.

At this stage of development, between the Middle and Late Preceramic, albeit with different modes of application, the coast was already being cultivated with well-known traditional plants. The first irrigation systems and water-control methods were improved, and there were numerous goods and artefacts that circulated even in distant territories through bartering systems. Around 2500 BCE, the extensive use of cotton enabled the development of very important technological innovations, such as increased textile weaving using specialist techniques which developed before those of ceramic work.

With the use of cotton fibers, fishing techniques also changed, as it was possible to make larger nets, leading to larger catches. Only later on, on the Paracas Peninsula and in the Nasca area, during the Early Horizon, called the Middle Formative by some archaeologists (Lumbreras 1969; Kaulicke 1994), weaving techniques reached levels of perfection and beauty unmatched elsewhere in the world in terms of both the refinement of the yarn and the variety of techniques used, as well as the inimitable colors. Around 2200–2000 BCE, the evolutionary process accelerated and coincided with increased urbanization throughout the country, higher levels of specialization in food production, and, at the same time, an early social hierarchy. Increased availability of goods also led to a surplus in production that enabled society to maintain an elite dedicated to the management of joint activities, the manufacture of highly specialized products in the fields of ceramics and textiles, and the implementation/enforcement of shared regulations which involved the population in the construction of monumental buildings such as El Paraiso, Aspero, Las Haldas, and Asia. In the valley of the Río Grande de Nasca, as along the rest of the South Coast, there is no clear evidence of this transition, if we exclude some dating in the deeper stratigraphy of a building at Cahuachi (Y13EXP 49) which, however, offers significant data on the presence of ceremonial architecture of the era. What is lacking is the comprehensive research on most of the



**Fig. 2.11** Aerial view of Río Nasca valley: detail including the riverbed and the ceremonial center of Cahuachi (Photo by Giuseppe Orefici)

coastal valleys needed to clarify the obscure points of this vital stage of development, especially if we relate it to the earliest ceramic production in the area, around 1800–1500 BCE (Fig. 2.11).

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The Ancient Nasca World

New Insights from Science and Archaeology

Lasaponara, R.; Masini, N.; Orefici, G. (Eds.)

2016, XIII, 670 p. 358 illus., 286 illus. in color.,

Hardcover

ISBN: 978-3-319-47050-4