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Reconstructing the sequence of an Inca Period (1470-1532 CE) camelid sacrifice at El Pacífico, Peru

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ABSTRACT

Animal sacrifice has played an important role as a material expression of the ritual behavior practiced by different societies around the world. In the South American Andes, the ceremonial immolation of llamas is well documented by both ethnohistoric and ethnographic sources. Nevertheless, archaeological evidence of animal sacrifice remains poorly documented. In this paper, we report the burial of two young camelids from El Pacífico, a Formative Period ceremonial site located on the central coast of Peru. AMS radiocarbon dates suggest the ritual sacrifice occurred when the architecture of the site was no longer in use, around the time of the Inca conquest. Based on the presence of cut marks and fly pupae, we suggest that one of the camelids, a yearling llama, was sacrificed by removal of its heart and buried shortly thereafter. Similarly, given the location of cut marks and representation of skeletal parts, we infer that the second camelid was slaughtered for human consumption prior to burial. In accordance with documented Andean rites, archaeological evidence from El Pacifico suggests that practitioners of camelid sacrifice followed a behavioral script following the selection of the animal to its final interment. We hypothesize the costly performance of this ceremony at an ancestral sacred site was part of a social and political strategy for promoting intergroup social cohesion during the arrival of the Incas to the region.

1. Introduction

Sacrifice is a religious and ritual practice that involves a sense of giving or "renouncing" to receive a benefit from divinity, and therefore, invokes the recognition of and interaction with supernatural entities (Marcus, 2007; Schwartz, 2017; Renfrew, 2007). In general, these social displays are economically costly expressions that aim to achieve a social benefit, transmit to their members trust in beliefs, encourage large-scale social cooperation, and warrant success in intergroup competition (Henrich, 2009). Understanding sacrifice from archaeological evidence has been the concern of researchers around the world (Campbell et al., 2012; deFrance, 2009; Ekroth, 2014; Hesse et al., 2012; O'Day et al., 2004; Pluskowski, 2012; Russell et al., 2012). The archaeological record, which is often hampered by equifinality, is a complementary source to other lines of evidence. Many published archaeological case studies differentiate *sacrifice* as form of offering from *slaughter* for human consumption (feasting), and general domestic refuse (deFrance, 2014; Osborn, 2019; Rosenfeld, 2012; Russell et al., 2012; Schwartz, 2017).

Comprehension of the role that animals play in rituals is fundamental to our perceptions of the Andean worldview. These rituals have involved sacrifices, offerings, and consumption of animals, such as camelids, guinea pigs, dogs, and birds. Although animal sacrifice was widely practiced in the Andes, our knowledge of these practices mainly originates from the historiography of colonial Spanish America (Arriaga, 1920; Ávila, 1966; de Molina, 2010; Sarmiento de Gamboa, 1960; Guaman Poma de Ayala, 1980; Polo de Ondegardo, 1916). More recent ethnographic reports of current Andean communities have also documented the cultural continuity and change of these ritual behaviors (Flannery et al., 2009; Miller, 1977; Nachtigall, 1975; Polia, 1999; Tomoeda, 1993). In many of these accounts, it is often emphasized that

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the Andean people carried out sacrifices as a way of relating to some divinity and that the sacrifice of camelids was among the most important and preferred practices (Duviols, 1986; Eeckhout, 2004; Murra, 1978; Rowe, 1946; Valcárcel, 1943; Zuidema, 1983).

Regarding the Andean archaeological evidence, reports of animal sacrifices are increasingly numerous, but much of the literature comes from archaeological investigations on the north coast of Peru, where most of the data indicate an association with human burials and are sometimes part of mass sacrifices (Altamirano, 1995; Bonavia, 1996; Dufour et al., 2020; Goepfert, 2008, 2010, 2012; Goepfert and Prieto, 2016; Huchet, 2017; Huchet and Greenberg, 2010; Kent et al., 2016; Prieto et al., 2014, 2019; Santana-Sagredo et al., 2020; Shimada and Shimada, 1985; Strong and Evans, 1952; Szpak et al., 2016; Gaither et al., 2016). Other examples have been reported from various localities on the southern coast, the Peruvian highlands (Rosenfeld, 2012; Sandweiss and Wing, 1997; Valdez et al., 2020), and from the Lake Titicaca Basin (Delaere et al., 2019; Webster and Janusek, 2003). In the case of the Peruvian central coast, publications on camelid sacrifice analysis are still scarce despite the many opportunities offered by its uniquely preserved archaeological record (Bonavia, 1996; Erauw et al., 2019; Franco and Paredes, 2000; Giordani et al., 2020; Leyva, 2009; Narváez, 2004; Rodríguez Loredo, 2001; Sánchez et al., 2018; Segura, 2001; Van Dalen et al., 2014; Venegas and Sánchez, 2015; Van Dalen, 2017). For instance, animal remains buried in archaeological sites have been provisionally identified, and in some cases, it has been assumed that they were sacrificed due to their association with human burials. However, few of these studies have provided reliable zooarchaeological evidence to differentiate between animal sacrifice, offering, or consumption.

In recent years, Andean entomology and zooarchaeology have identified archaeologically tractable indicators to reconstruct behaviors associated with the ritual processing of animals (Giordani et al., 2020; Huchet and Greenberg, 2010; Osborn, 2019). For example, Giordani and his colleagues (2020) have recently proposed that these sacrifices involved three successive stages: sacrifice of the animals, exposure of their bodies or specific anatomical regions, and burial of bodies in construction fillings. Despite this important advance in Andean zooarcheology, most studies have focused on describing individual aspects of these events, such as the sacrifice, offering, or consumption, rather than reconstructing the full sequence of these events. Therefore, hypotheses pertaining to the behavioral sequence of events associated with Andean rituals involving animal sacrifice have yet to be systematically tested against the archaeological record.

Miller (1977) put forward a general ethnographic proposal of camelid use for southern Peru, which has been useful to Andean archaeologists. He pointed out that there was a pattern for the sacrifice and slaughter of animals, with certain variabilities for social and spatial reasons. Based on this ethnographic analogy, we can imagine at least two models to explore whether the camelid remains found in the Andes are the product of the offering of animals and/or consumption activities.

Miller (1977) proposed a first model for the ritual sacrifice of animals as a means of divine offering. Felipe Guaman Poma de Ayala (1980) described this first technique, known as the *ch'illa*, in the beginning of the seventeenth century. The *ch'illa* technique differed from "Christian" methods of disgorgement and is characterized by manual extraction of the heart and ascending aorta artery through an incision made at the level of the diaphragm (Miller, 1977: 201). We expect that animals sacrificed with the *ch'illa* method would have suffered greater soft tissue damage than skeletal trauma and that this would be reflected by relatively few, if any, associated cut marks on the bones of the abdominal cavity. Furthermore, archaeologists should expect to find complete and articulated corpses (Delaere et al., 2019; Erauw et al., 2019; Goepfert, 2008). In contrast, we expect that animals sacrificed by the decapitation method would exhibit clear marking on the occipital condyles and/or the atlas. Finally, if corpses were exposed for a period of time before their final interment, we expect to find the remains of insect pupae (Estrada, 2001; Giordani et al., 2019; Huchet, 2017; Huchet and Greenberg, 2010).

In contrast, a second model that focuses on the consumption of the animal, either for domestic or ritual purposes, must follow a different path. Based on this model, camelids are expected to be slaughtered, skinned, gutted, and dismembered for consumption (Miller, 1977). Archaeologists can expect that due to the consumption of the animal, very few parts would make it into the archaeological record, and if any of the parts did make it, then we should find those anatomical portions with less meat and fat (e.g. skull, neck, lower limbs), cut marks in the thoracic cavity, a high proportion of bone fractures, and different bones coloration due to thermal alteration (cooking processes) (Miyano, 2021; Miller, 1977; Rojas, 2017).

Here, we present an interdisciplinary archaeological study that calls upon analyses from zooarchaeology and forensic entomology to describe a joint burial of two camelids recovered from the El Pacífico archaeological site on the central coast of Peru. This study identifies and reconstructs behavioral processes involved in Andean rituals of animal sacrifice. We hypothesize that these rituals included a sequence of five distinct phases: choosing the animal, sacrificing or slaughtering the camelid, offering or consumption of the animal, transferring the camelid to an ancestral (monumental) place, and burying the animals. Finally, we assess the social implications for understanding these costly displays in the ancient Andes at a time when the Inca empire was trying to establish itself in new territory.

2. Material and methods

El Pacífico is located within the urban sprawl of the city of Lima on the central coast of Peru. Specifically, it sits between the valleys of the Chillón and Rimac rivers, on a low hill that is about 126 m above sea level, and less than six kilometers to the east of the Pacific Ocean (Fig. 1). The site consists of two mounds with an occupation mostly dated to the Middle Formative period (1200–800 BCE) but with evidence of later reuse (1450–1500 CE) (Flores-Blanco, 2017). Archaeological excavations at El Pacífico were carried out in 2016 and included a 2x2m grid in the southeast quadrant (S3E4) on the top of mound B, which was subsequently expanded to the north with an additional 2x2m unit (S3E5). Two late prehistoric camelid burials (C1 and C2) were recovered resting on a plant matter litter. The burials were recorded using stratigraphic forms, digital photographs, and line drawings, which were later digitized in AutoCAD.

We performed faunal analysis to determine the camelids' species, age, sex, skeletal completeness, and cause of death (Altamirano, 1987, 1995; Binford, 1984; Fernández Baca, 1962; Gutierrez et al., 2010; Kaufmann and ĹHeureux, 2009; Pacheco et al., 1986; Wheeler, 1982; Wing, 1977). Botanical material followed standard procedures for taxonomic identification macroscopic analysis using modern comparative samples and employing an AmScope SE305 10x-30x binocular stereo microscope. In addition, we analyzed two ceramic sherds that were recovered near the C1 skull following macro-techno-morphological criteria. Burial C1′s skull was also associated with four small, green stones which we analyzed using X-ray diffraction.[1]

Three Accelerator Mass Spectrometry (AMS) radiocarbon dates were analyzed at The Pennsylvania State University's Radiocarbon Dating Lab (PSUAMS). We processed samples taken from desiccated plant matter using the standard ABA method, and from bone using ultrafiltration pretreatments. Samples were calibrated with the OxCal 4.4.2 program (Bronk Ramsey, 2020) using the SHCal20 curve (Hogg et al., 2020).

We found and collected more than one hundred insect puparia

[1] For the samples preparation, a fragment of each one was pulverized in an agate mortar. Then a diffractometer with a Cu tube (40kV, 40mA) with KAlfa1 and KAlfa2 was used. The identification was carried out with data from the International Center for Diffraction Data (ICDD).

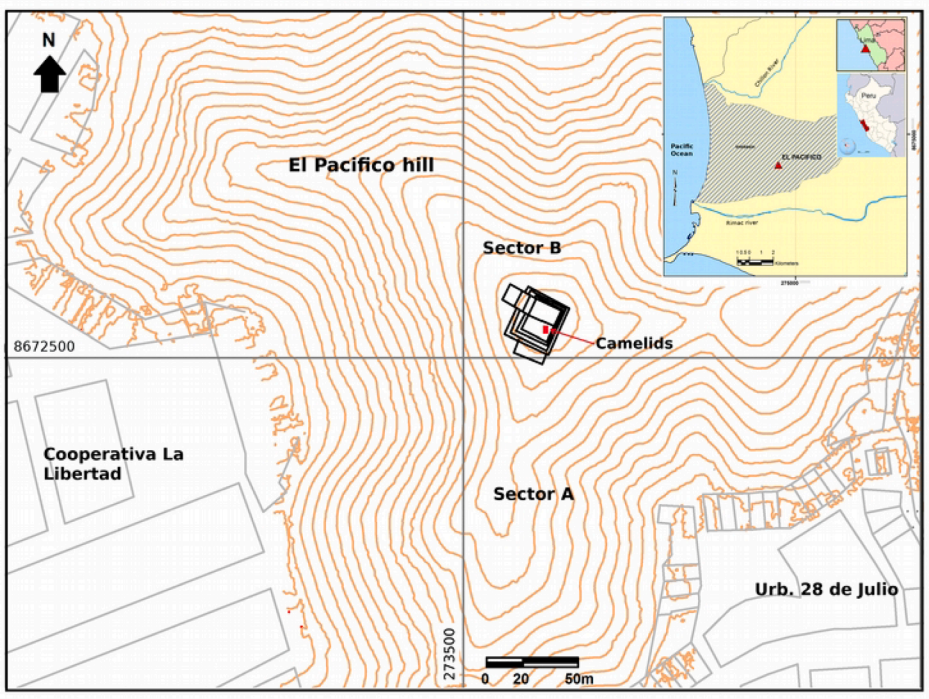

Fig. 1. Location map of the camelids found at the El Pacífico archaeological site.

remains located in the surroundings and above the stomach of the C1 camelid. These remains were not washed but only cleaned in some cases with a small, fine brush. Entomological identification analysis was carried out by comparing the shape of the posterior spiracles, arrangement of the spiral slits as well as distribution of spines on the body segments. Puparia remains were compared against modern insect species that were previously identified and raised in the Peruvian Institute of Legal Medicine. We performed microscopic analyses using a Leica S8 APO stereomicroscope and photographed all samples with an integrated Leica MC190 HD camera.

3. Results

3.1. Archaeological context and stratigraphic relationships

A team of Peruvian archaeologists excavated the Formative Period site of El Pacifico in 2016 (Flores-Blanco, 2017). This paper describes the discovery, archaeological context, and interpretation of two camelid carcasses (referred to as C1 and C2) found at this site. Excavators discovered the remains of the camelids inside a pit filled with construction fillings. Those who made this cut removed the original layer of construction debris from the collapse of the early walls (UE 15) and destroyed the floor of the last mound occupation in sector B of the Formative period. The size of the C1 burial was 1.10 × 0.60 × 0.10 m, while the C2 was 0.40 × 0.30 × 0.10 m. Almost all C1 bones were present as well as remains of skin, brown fur with yellowish-white spots, and even stomach content. C1 was found flexed in a left lateral decubitus position, facing south. Burial C2 was located immediately northeast of C1, near the lower extremities of the first camelid. A few body parts (only 30%) were recovered from C2, including its head and some skeletal elements from the distal extremities, but the majority of the animal's limbs and rib cage were not found, so its anatomical layout is unknown. The burial pit was filled with a layer of sandy clay soil and small stones that was approximately 0.7 m deep (UE 02). Finally, a thin layer < 0.1 m, of aeolic origin (EU 01), formed the surface (Figs. 2 and 3).

Based on stratigraphic associations, we identified that those who performed the burial of the C1 and C2 camelids did so at the same time, placing them on the organic remains of a textile litter. However, due to the nature of the C2 remains, it seems that they were the disaggregated

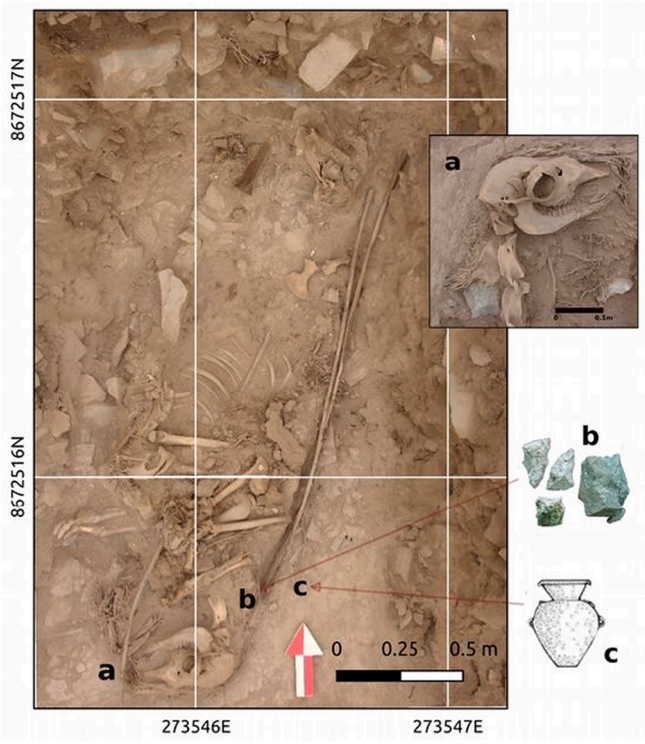

Fig. 2. Orthophoto of the archaeological context. Camelids and their associated grave goods. (a) Magnified view of C1 camelid skull. Note the location of one of the green stones. (b) Green stones and minerals found near the C1 camelid skull. (c) Hypothetical shape of the associated ceramic vessel (drawing taken from Vallejo, 2004: Fig. 20).

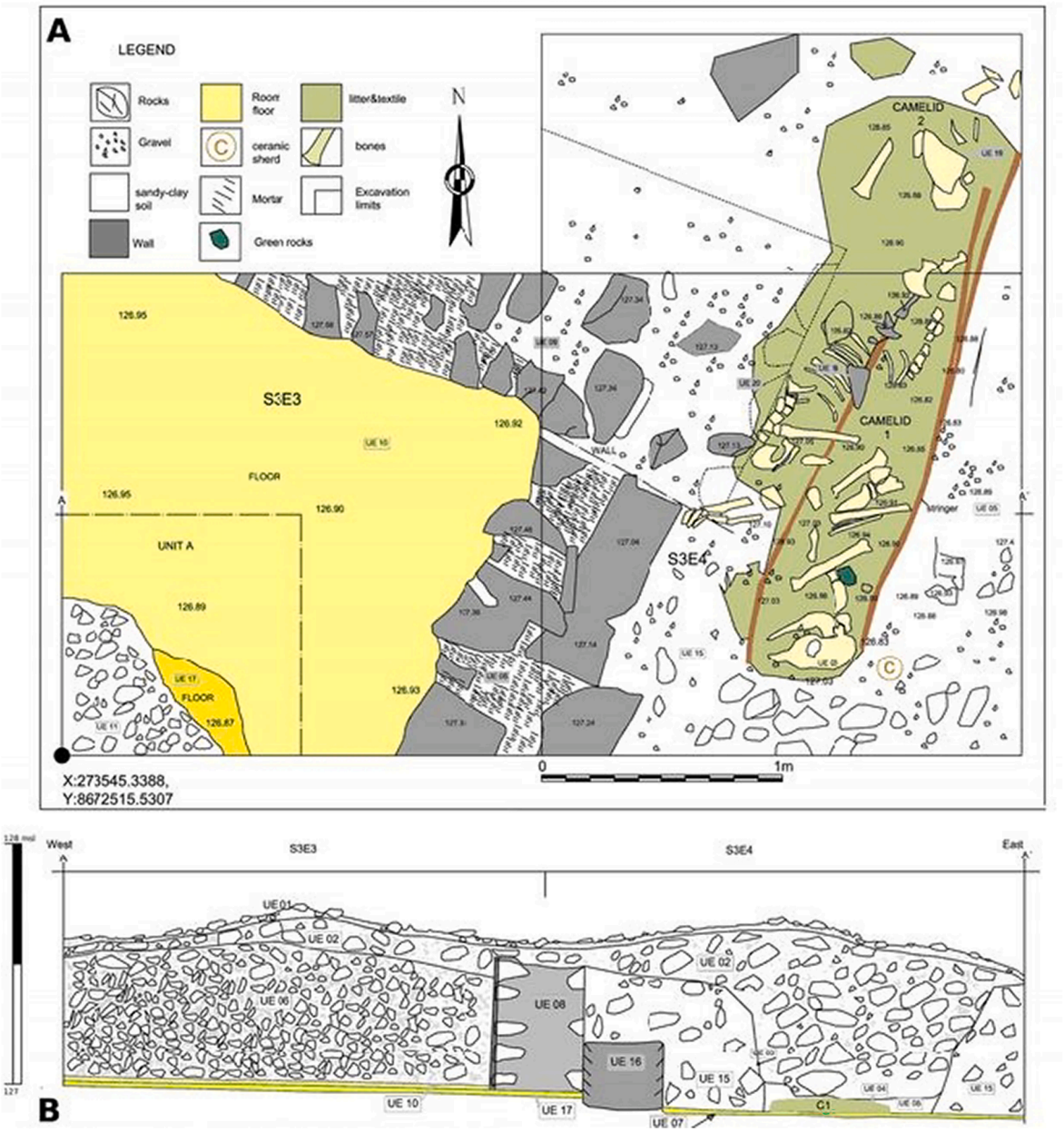

Fig. 3. Archaeological context map and (A) and stratigraphic section (B) (digital drawing by Luis Loza, edition by L. Flores-Blanco).

remains of a camelid placed on the litter, in the lower part of the archaeological context of C1 (Figs. 2 and 3).

3.2. Dating and isotopic results

Collagen extracted from a metatarsal bone (PSUAMS-6446) was dated between 1445 and 1500 CE, indicating that C1 was likely killed at the beginning of the Inca Period also known as the Late Horizon (1470-1532 CE) (Table 1). A dried *Tillandsia* sp. sample attached to the skull of burial C1 (PSUAMS-6119), produced a much earlier date, suggesting that the litter used in this burial was made during the Yschma Late Intermediate Period (1300–1395 CE) occupation. C1 and C2 burials, and

Table 1
AMS dating of the camelids identified during the excavation of the El Pacífico archaeological site (Peru).

Lab Code	Sample	Archaeological Context	Date (BP)	Cal. 2 sigma (95.4% probability)	Cal. 1 sigma (68.2% probability)	C:N
PSUAMS-6446	Bone of C1	Burial C1	445 ± 20	1445–1500 (89.6%) cal CE 1597–1611 (5.8%) cal CE	1450–1480 (68.2%) cal CE	3.22
PSUAMS-6119	Plant matter	Burial C1	670 ± 15	1301–1367 (73.1%) cal CE 1374–1394 (22.3%) cal CE	1310–1327 (22.5%) cal CE 1340–1360 (28.3%) cal CE 1378–1391 (17.3%) cal CE	
PSUAMS-6120	Plant matter	Final period of mound B	2700 ± 20	895–866 (8.9%) cal BCE 850–793 (86.5%) cal BCE	830–801 (68.2%) cal BCE	

OxCal v4.4.2 Bronk Ramsey (2020); r.5; SHCal20 atmospheric curve (Hogg et al., 2020)

the associated plant matter litter were placed over a much older Formative Period deposit that was dated (PSUAMS-6120) to the Middle Formative Period (895–795 BCE). Additionally, we identified two ceramic sherds that were associated with the burial. These shreds were not stylistically diagnostic but can be broadly classified as a late period ware. Based on this information, we hypothesize the sacrifice and burial of C1 and C2 occurred during the beginning of the Inca expansion on the central coast. It is known that Inca troops entered the valleys of Lima after 1470 CE (Adamska and Michecsynski, 1996; Eeckhout, 2004; Ogburn, 2012) and brought with them a change in burial patterns, including increased numbers of funeral goods (Cornejo, 2004; Díaz, 2004; Eeckhout, 2004).

Results from stable isotopic analysis of collagen from the C1 sample suggest that the sacrificed camelids originated east of El Pacífico. Specifically, these data ($\delta^{13}C = -16.8$, $\delta^{15}N = 6.3$, C = 42.6%, N = 15.5%, C: N = 3.2) overlap closely with values of camelids raised with mixed crops in intermediate valleys and with lower values of camelids raised in highland pastures (Szpak et al., 2015).

3.3. Age and species

Both camelids were likely domesticated llamas, but the specific identity of C2 could not be categorically established at the species level. The C2 camelid could only be classified as a llama or guanaco based on traces of brown and spotted coat color. The C1 camelid had llama/guanaco tooth incisor morphology and its mandible exhibited a diagnostic llama morphology that included a vertical back of its jaw as opposed to the guanaco's curved sinuous rear (Adaro et al., 1992; Altamirano, 1982).

Teeth eruption and wear suggest that both camelids were juveniles (Altamirano, 1987; Wheeler, 1982). In the case of C1, we identified the presence of primary or deciduous dentition, as well as central and lateral incisors and the first three-cuspid premolars, suggesting an age range of 12 ± 2 months of age. In contrast, the C2 camelid has an eruption cleft on the mandible coronoid process, also at the height of the chin hole, and the incisors, canines, and third molars had not yet erupted. Therefore, we have estimated that the C2 camelid was approximately age was of 10 ± 2 months in age. In part due to their young age, we were not able to sex either specimen.

3.4. Anatomical units

The skeleton of C1 was fully complete and articulated. The C2 camelid was mostly incomplete and disarticulated (Fig. 5). Represented elements of C2 included parts of the skull, mandible, a minor part of the vertebral column (21.4%), and only one sternebrae segment (16.7%), with is upper (greater than10%) and middle extremities almost absent (12%) and its lower extremities (metatarsals and phalanges) somewhat better represented (40%), although quite fragmented. The correlation between the %MAU and the types and amounts of resources in each anatomical region (Miyano, 2021) indicates that the missing parts of C2 correspond to those that provide the greatest amount of meat and marrow.

3.5. Cutmarks on C1 and C2 bones

Perimortem lesions are injuries that occur shortly before or after death when the mechanical properties of the organic matrix of bone are still retained (Guerrero et al., 2016; Rodríguez-Martín, 2006). C1 exhibited a series of perimortem injuries that were localized to the cranial and caudal thorax (Figs. 4 and 5). The first fracture was identified at the junction between the neck and thorax on the 7th cervical vertebra. A second fracture was identified on the left articular costal facet of the second sternebrae and a third fracture was located on the third sternebrae. In addition to these fractures, seven cut marks were identified on the sternal end of the left, first rib. Taken together, the locations of these cut marks suggest attempted dismemberment, or at least an attempt to strongly bend the entire neck of the C1 animal just where it joins the thorax.

In addition to the cut marks found in the cranial thorax, a second group of marks was identified in the caudal thorax of C1. A fracture of the ventral border of the right, twelfth rib, and a shaft fracture of the caudal border of the left eleventh rib were present. All these injuries serve as pieces of evidence of a sacrifice technique aimed to extract soft tissue organs from the base of the ventral thorax.

In C2, the only fracture identified occurred in the apophysis of the

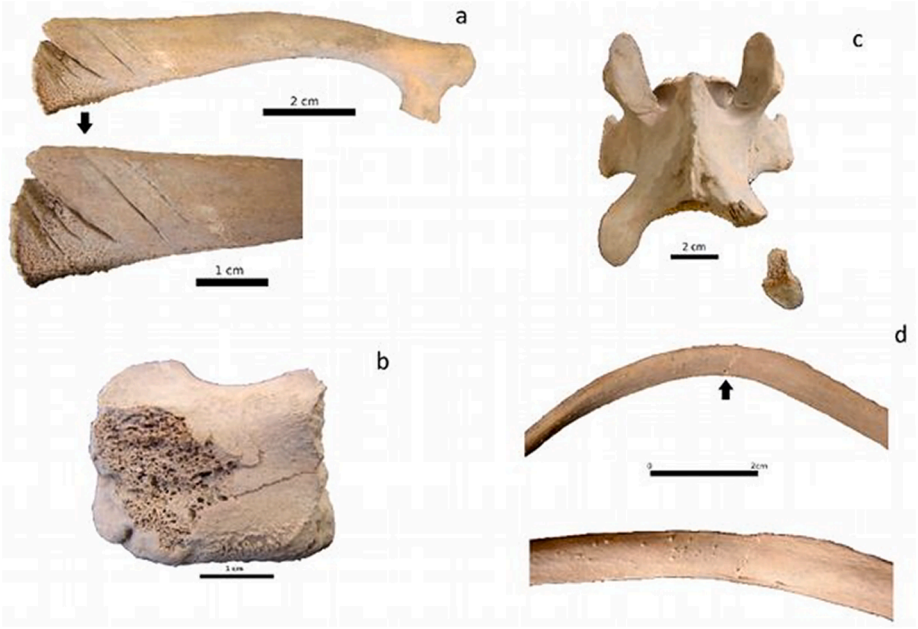

Fig. 4. Marks on the camelid C1 bones. a: The first rib on the left side has seven cut marks on its sternal end. b: The second sternebra includes a fracture in its costal articular facet on the left side (posterior view). c: The seventh cervical vertebra presents perimortem fracture. d: The twelfth rib on the right side shows a perimortem fracture at the anterior border.

first thoracic vertebra (Fig. 5). The only bone recovered from the cervical vertebrae was the atlas, which does not show any cut marks. No ribs were recovered, so it is not possible to know if C2 also had fractures and perimortem cuts comparable to those observed in C1.

3.6. Grave goods

Camelids C1 and C2 were found buried on a litter made up of stringers of willow branches (*Salix humboldtiana*) and algarrobo (*Prosopis* sp.). The body of the litter was a kind of textile made from vegetable fiber (*Tillandsia* sp.) using an interlacing technique. In addition, burial C1 included a fragment of green malachite copper ore, three greenish-white rock fragments containing muscovite and copper carbonate, and two ceramic sherds (Fig. 2b). The two ceramic sherds were large, included thick paste, and had a rough finish suggesting they belonged to a simple jar or pitcher-like object, which is a common shape in Yschma and Yschma-Inca associated sites (Vallejo, 2004) (Fig. 2c). In addition, the ceramic sherds exhibited traces of soot on their surfaces suggesting that vessel was likely used for cooking.

3.7. Insect remains

Our archaeological team discovered one hundred insect pupae from the ventral part of the C1 camelid. We identified these remains as members of the Diptera and Coleoptera insects. The Diptera species *Cochliomyia macellaria* (Fabricius, 1775) represents 99% of the sample (Fig. 6). This blowfly is a species native to tropical and subtropical areas of the New World, whose distribution ranges from southern Canada to Argentina. In Peru it is a dominant species on the deserted central coast, reaching up to 2,500 m above sea level; but it is also found in the Amazon Basin below 1900 m (Baumgartner and Greenberg, 1985). It is one of the most common flies and one of the first to colonize corpses, having been identified in other pre-Hispanic Andean contexts for the burial of camelids (Giordani et al., 2020; Huchet and Greenberg, 2010; Huchet, 2017) and humans (Riddle and Vreeland, 1982).

In addition, a coleopteran hemieliter was identified, most likely of the Tenebrionidae family. Tenebrionids are generally distributed in many of the regions of Peru (Giraldo and Flores, 2016). Coleoptera have been reported in contexts of pre-Hispanic burials of humans and camelids (Giordani et al., 2019, 2020; Huchet and Greenberg, 2010).

Fig. 6. Remains of puparia of the species Cochliomyia macellaria (Fabricius, 1775) of the dipteran Calliphoridae found in the camelid C1 (photos by Marco Villacorta).

4. Discussion

The Andean sacrifice of animals, especially camelids, has been described by Spanish chronicles and ethnographic information (Duviols, 1986; de Molina, 2010; Miller, 1977; Nachtigall, 1975; Polia, 1999; Rowe, 1946; Sarmiento de Gamboa, 1960; Tomoeda, 1993; Valcárcel, 1943; Zuidema, 1983; Guaman Poma de Ayala, 1980; Polo de Ondegardo, 1916). However as demonstrated in this study, important new evidence can be gleaned from detailed osteoarcheological, archeoentomological, and forensic studies to better understand this ritual process. Based on this information and the good preservation of the remains, we can point to five behaviorally distinct phases associated with the sacrifices: animal selection, sacrifice, ceremony, transportation, and burial (Table 2), which a supported and consistent with other archaeological and ethnographic information from the Andes (Miller, 1977; Giordani et al., 2020).

4.1. Selection

At El Pacífico, the practitioners of the sacrifice selected two young camelids, of which at least one (C1) was a llama with a brown coat

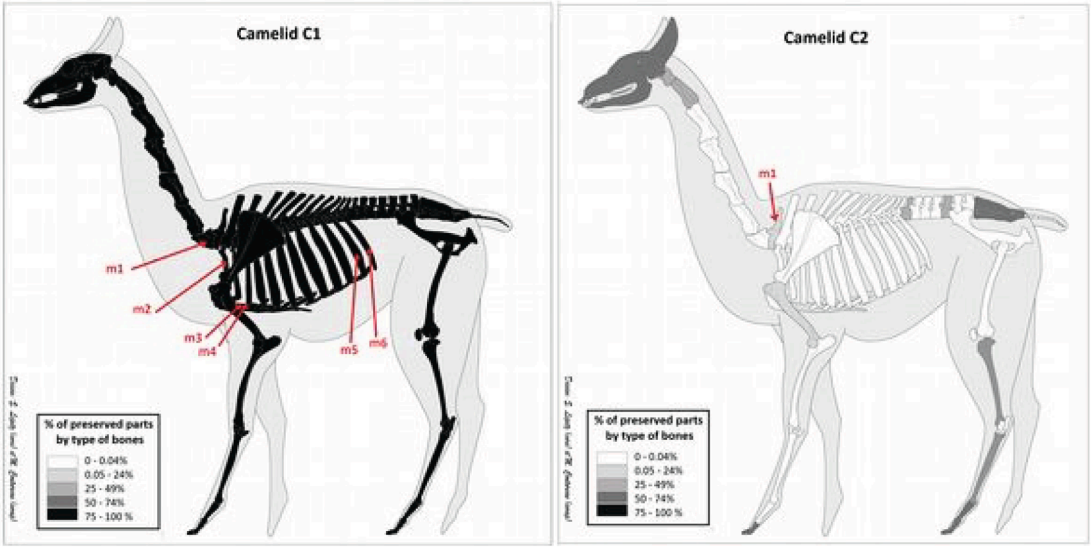

Fig. 5. Drawings of the bones of camelids C1 and C2 where the conserved parts are counted by type of bone and where the identified marks/fractures on the bones are located (Drawing by S. Lepetz and Coutureau (2005). https://www.archeozoo.org/archeozootheque/upload/2021/04/09/20210409082601-5bc1c707.pdf, then edited by Luis Flores-Blanco).

Table 2
The different acts in the proposed sequence of ritual sacrifice and their respective lines of archaeological evidence for the El Pacífico camelids data and other Peruvian archaeological cases presented. According to our proposal, C1 from El Pacifico and the samples from Pachacamac and Huaca 33 are examples of model 1 *(sacrifice/display/offering)*, while C2 and Cajamarquilla are examples of model 2 *(slaughter/consumption/)*.

Hypothetical Acts of the Sacrifice Ritual	Lines of Archaeological Evidence	Archaeological cases of the Peruvian coastal zone				
		El Pacifico, inter-basin of the Chillón and Rímac valleys		Other archaeological sites on the central coast		
		C1	C2	Pachacamac, Lurin valley (Erauw et al., 2019; Giordani et al., 2020)	Huaca 33, Rimac valley (Sánchez et al., 2018; Venegas and Sánchez, 2015)	Cajamarquilla, Rimac valley (Narváez, 2004; Segura, 2001)
1. Choice of a type of camelid	Age profile	Young	Young	Young	Young and adult	Young
	Camelid type	Llama	Llama-guanaco	Llama	Alpaca and llama	Llama?
2. Sacrifice	Cut marks	Ribs	Absent	Absent	Absent	Absent
3. Offering / Exhibition / Consumption	Pupae of insects	Present	Absent	Present	Present	NA
	Body presence percentage	100%	30%	100%	100%	Low percentage
	Articulation	Articulated	Fragmented and disarticulated	Articulated	Articulated	Fragmented and burned
4. Move	Implement used	Litter	Litter	Rope	Rope	NA
5. Final burial	Burial place	Construction fill in ancient place	construction fill in ancient place	Construction fill in ancient place	Construction fill in ancient place	Pit fill
	Burial companions	Camelid C2	Camelid C1	Present (other animals)	Present (humans)	Ceramic sherds, plant remains, etc.

mottled with white spots that likely originated from the interior of the valley or the highlands. The other camelid, a llama or guanaco (C2), also had a similar coat. Interestingly enough, early Spanish chronicles indicated that the Inca typically sacrificed young camelids of white, brown, black, and mottled colors (Sarmiento de Gamboa, 1960; Guaman Poma de Ayala, 1980; Polo de Ondegardo, 1916). Andean archaeologists have also reported this recurrence of burials of young animals (Altamirano, 1995; Delaere et al., 2019; Goepfert, 2012; Goepfert and Prieto, 2016; Prieto et al., 2019; Valdez et al., 2020; Van Dalen et al., 2014).

4.2. Sacrifice

Osteological results from El Pacífico show a peripheral fracture on the right side of the twelfth rib and a shaft fracture at the caudal border of the left eleventh rib. Specifically, these perimortem fractures may have been caused by a cut at the level of the diaphragm that was made to insert a hand into the thorax of the young C1 llama. The location of these cut marks may provide evidence that individuals practiced the *ch'illa* sacrifice technique (Miller, 1977), which Guaman Poma de Ayala (1980) described more than 400 years ago. The location of the pupae around the C1 camelid abdomen is consistent with our expectation that the animal exhibited open wounds with profuse bleeding as the first colonization of necrophagous insects occurs in body orifices (Byrd and Castner, 2009). Although ethnographic evidence suggests that we should not be able to find significant bone damage associated with the *ch'illa* (Miller, 1977), our study documents a substantial amount of bone damage, which may be explained by the young age of the sacrificial animals, the skill level of those who handle the heart extraction technique or even the coarser tools used to make the incisions.

Archaeologists have used the absence of cut marks on camelid bones found on the central Peruvian coast as an indirect indicator to suggest that the animals were sacrificed by the *ch'illa* technique (Sánchez et al., 2018). Other archaeological evidence from the north coast of Peru includes marks on the third and fourth ribs as well as on the second and third sternebra indicating that the practice of heart extraction may have left more substantial bone damage (Altamirano, 1995; Goepfert and Prieto, 2016; Prieto et al., 2014; Prieto et al., 2019). However, researchers did not find any mark on the last rib next to the diaphragm, so they concluded that the evidence of cut marks differs from that described ethnographically (Prieto et al., 2019). Another possibility is that the cut marks observed in C1 were made in the process of opening the animal's chest to remove its viscera. A fracture in the seventh cervical vertebra and in the articular surface of the second sternebrae might support this assertion. Nevertheless, if this were the case a greater amount of trauma would be expected at the sternal ends of the ribs or at the point where the costal cartilages articulate with the sternum, something we have not found.

4.3. Offering and consumption

The body of C1 was left exposed for at least two or three days as suggested by the presence of a species of fly pupae that are considered one of the first colonizers of exposed corpses (Greenberg and Szyska, 1984). In this first stage of organic decomposition, it is not uncommon to observe species of the Muscidae and Sarcophagidae families. Subsequently, some beetles that feed on keratin-rich matter may also appear, so it is not uncommon to find all these groups of insects present on a corpse exposed for over a week. This has been documented in some human bodies recovered from other archaeological sites of the Peruvian central coast but not in El Pacífico (Byrd and Castner, 2009; Giordani et al., 2019, 2020; Huchet and Greenberg, 2010; Huchet, 2017). Moreover, the discovery of sherds of a vessel found next to C1 could suggest the consumption might have occurred in situ.

While the absence of most of the C2 animal's body (most of its vertebral column vertebral, ribs, pelvis, upper limbs, etc.), and the high level of fragmentation of the only middle limb bone found, a tibia, suggests that the animal was butchered and consumed shortly after its slaughter or it was cremated or buried elsewhere, as indicated by Andean ethnohistoric data (Cobo, 1956; Eeckhout, 2004). Our results show that the absenting anatomical units of C2 coincide with those that provide the greatest amount of meat and marrow. Several Andean archaeologists have interpreted that when only certain parts of an animal, mostly with a low yield of meat, reached the archaeological context, it is because most of it was for human consumption (Franco Salvi and Salazar, 2014; Goepfert, 2008; Narváez, 2004; Prieto et al., 2014; Segura, 2001). Thus, we conclude that the C2 camelid was butchered from human consumption prior to burial.

4.4. Moving the camelids to ancestral places

The presence of a vegetable litter containing the camelid remains initially suggested that officiants transported the camelids from a nearby place. For instance, a Late Intermediate and possibly Inca Period site has been identified in Cerro Muleria (Luján, 2011), located only 650 m away

from El Pacífico. But other than the presence of the vegetable litter and the absence of most of the C2 elements, no additional data support this possibility nor their transportation or relocation from an even further location (Charabidze et al., 2017). Nor do we have data to say that the sacrifice was made at the same site.

4.5. Burial

The chosen burial place for the camelids was the highest mound of an earlier Middle Formative site and as such, El Pacifico is comparable to other early sites where human and animal burials from late periods have been reported, suggesting a connection to "ancestral" places (Cancho, 2017; Flores-Blanco, 2018; Fuentes, 2007; Machacuay and Aramburu, 1998; Vega-Centeno et al., 2006; Venegas and Sánchez, 2015). Moreover, El Pacifico was likely considered a powerful landscape because many landmarks of the region, such as Fronton and San Lorenzo islands, can be visualized from its summits (Flores-Blanco, 2017). The burial of the llamas must have been rapid given that in addition to the fly pupae, we only have a part of the elytra of a species of beetle in the family Tenebrionidae. The presence of *C. macellaria* puparia remains would indicate that the individuals that colonized the bodies completed their larval development satisfactorily and that the adult insects were able to reach the surface through the air spaces of a landfill without being trapped.

5. Conclusions

The analysis of the archaeological context along with the analytical results of the camelid remains and insect pupae from the El Pacífico site allowed us to show a ritual practice that involved at least five successive stages. In addition, we were able to identify two models of this practice. The first model involves the sacrifice and complete offering of a llama, and the second model involves the slaughter, consumption and offering of lower meat yield remains of a second animal during the beginning of the Inca occupation on the central coast (Fig. 7).

The camelid ritual sequence involved various acts and both models of this behavior. The officiants chose young camelids for this ceremony. One of the camelids, C1, was sacrificed using the *chi'lla* killing method and was left exposed to bleed for a few days as demonstrated by the concentration of fly pupa in the abdomen. The other camelid, C2, was likely consumed and lower meat yield skeletal elements were deposited in the offering. Lastly, the officiants of the ritual carried the remains of the camelids in a litter for their final burial at the top of the El Pacífico site. Precisely, they chose an ancestral burial place, it was located on top of a mound of the Formative period. Andean archaeologists should further study this interesting relationship, late burials interred in the early monumental buildings.

Finally, we hope this case study illustrates how the remains of animal sacrifices reach the archaeological context, and how an interdisciplinary team of specialists can collaborate to help to reconstruct significant ritual practices. Certainly, this observed costly ritual display which was carried out during a crucial moment in the history of the region, the arrival of the Incas, was meant to maximize intergroup participation, large-scale cooperation, and social cohesion. Although at present we cannot conclude if this was done in favor of the new political scenario brought by the Incas or rather to seek some local resistance against the new regime. We hope that in the future interdisciplinary research will help to improve our understanding of the treatment of animals in Andean rituals.

6. Data availability statement

All data to support our analysis and make it reproducible are provided in the manuscript.

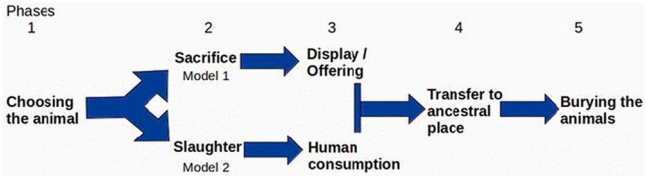

Fig. 7. Proposal of the sequence of the Andean ritual that involved the sacrifice of camelids.

CRediT authorship contribution statement

Luis Flores-Blanco: Writing – original draft, visualization, directed and supervised research. **Alfredo J. Altamirano:** Zooarchaeological analysis. **Marco Villacorta:** Entomological and forensic analysis. **José M. Capriles:** Writing – original draft, radiocarbon dating, stable isotopes. **Flavio Estrada:** Zooarchaeological and forensic analysis. **Katia Herrera:** Fielwork & lab work. **Melchor Llosa:** Archaeometric analysis. **Eduardo Chávez:** Ceramic analysis. **Carmela Alarcón:** Paleobotanical analysis. All authors reviewed the manuscript.

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