



# FELL CAVE REINTERPRETED<sup>1</sup>

## CUEVA FELL REINTERPRETADA

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Since first excavated by Junius Bird in 1936-1937, Fell Cave has been a key site for understanding the process of human peopling of Fuego-Patagonia. The recovery of extinct faunal remains in association with hearths and fishtail projectile points -now known to be diagnostic of early occupations- suggested to Bird that the deposits dated to the Late Pleistocene age of the deposits, which was later confirmed by radiocarbon dating. A rock fall apparently sealed those early deposits, separating them neatly from the Holocene occupations. The materials recovered on that campaign are stored at the American Museum of Natural History, New York, USA. After that initial season, many more excavations took place, including a return by Bird 39 years later, producing a new collection now stored at the CEHA, Instituto de la Patagonia, Universidad de Magallanes, Chile. We present here a preliminary study of the earlier bone assemblages, offering some comparisons with other early Fuego-Patagonia sites, and present an alternative interpretation of the significance of the rock fall. Finally, we explore some implications for the chronology and history of occupations of the site.

**Key words:** Fell Cave, Junius Bird, human colonization, extinct faunas, South Patagonia.

*Cueva Fell ha sido un sitio clave para conocer el proceso de poblamiento humano temprano de Fuego-Patagonia desde las primeras excavaciones de Junius Bird en 1936-1937. El hallazgo de restos de fauna extinta, asociada físicamente a fogones y puntas cola de pescado -instrumentos diagnósticos de sitios tempranos- sugirieron a Bird que se trataba de un sitio de fines del Pleistoceno. Esta cronología fue posteriormente confirmada por radiocarbono. Un desprendimiento posterior de bloques del techo habría sellado esos conjuntos, generando una separación neta entre las ocupaciones humanas finipleistocenas y holocenas. Los materiales recuperados en esa campaña se encuentran actualmente depositados en el American Museum of Natural History, Nueva York, EE.UU. Tras esa campaña inicial, se realizaron varias excavaciones, incluyendo un retorno de Bird 39 años después. Esos materiales están almacenados en el CEHA, Instituto de la Patagonia, Universidad de Magallanes, Chile. Presentamos aquí un estudio preliminar de los conjuntos óseos más tempranos, ofrecemos algunas comparaciones con otros sitios tempranos de Fuego-Patagonia y desarrollamos una interpretación alternativa del significado de la caída de rocas. Finalmente, algunas implicaciones para la cronología y la historia de ocupaciones del sitio son exploradas.*

**Palabras claves:** Cueva Fell, Junius Bird, colonización humana, faunas extintas, Patagonia Meridional.

The human colonization of South America was a complex and debated process (Borrero 2016; Miotti and Salemme 2003; Méndez et al. 2018; Politis and Prates 2018; Santoro et al. 2017). Many issues are implicated within these discussions, importantly the association of humans with extinct faunas. Late Pleistocene extinct faunas are relatively well represented at several locations in Southern Patagonia, such as Cueva del Milodón, Cueva Chica, Cueva del Medio, Cueva Escondida, Cueva Lago Sofía 1, Cueva Lago Sofía 4, Cueva Fell, Cueva Pali-Aike, Cueva de los Chingues, Cueva del Puma and Tres Arroyos 1 (Figure 1), but very few of these bone assemblages

present evidences of association with humans. Among those few sites, Fell Cave is probably the best known and the most important (Borrero and Franco 1997; Lynch 1978; Morrow and Morrow 1999).

Fell Cave is a world known archaeological site, which, in spite of its name, is a rockshelter (Bird 1938:269). It is located in the Pali-Aike Volcanic Field, Chile (52° 02' 40" S, 70° 03' 23" W (Figure 1), in the Chico River valley, Estancia "Brazo Norte", Magallanes, Chile. It is a northwest-facing exogene shelter that was formed at the base of a cliff characterized by basal stratified crude sandstone, over which conglomerates and lava layers were deposited

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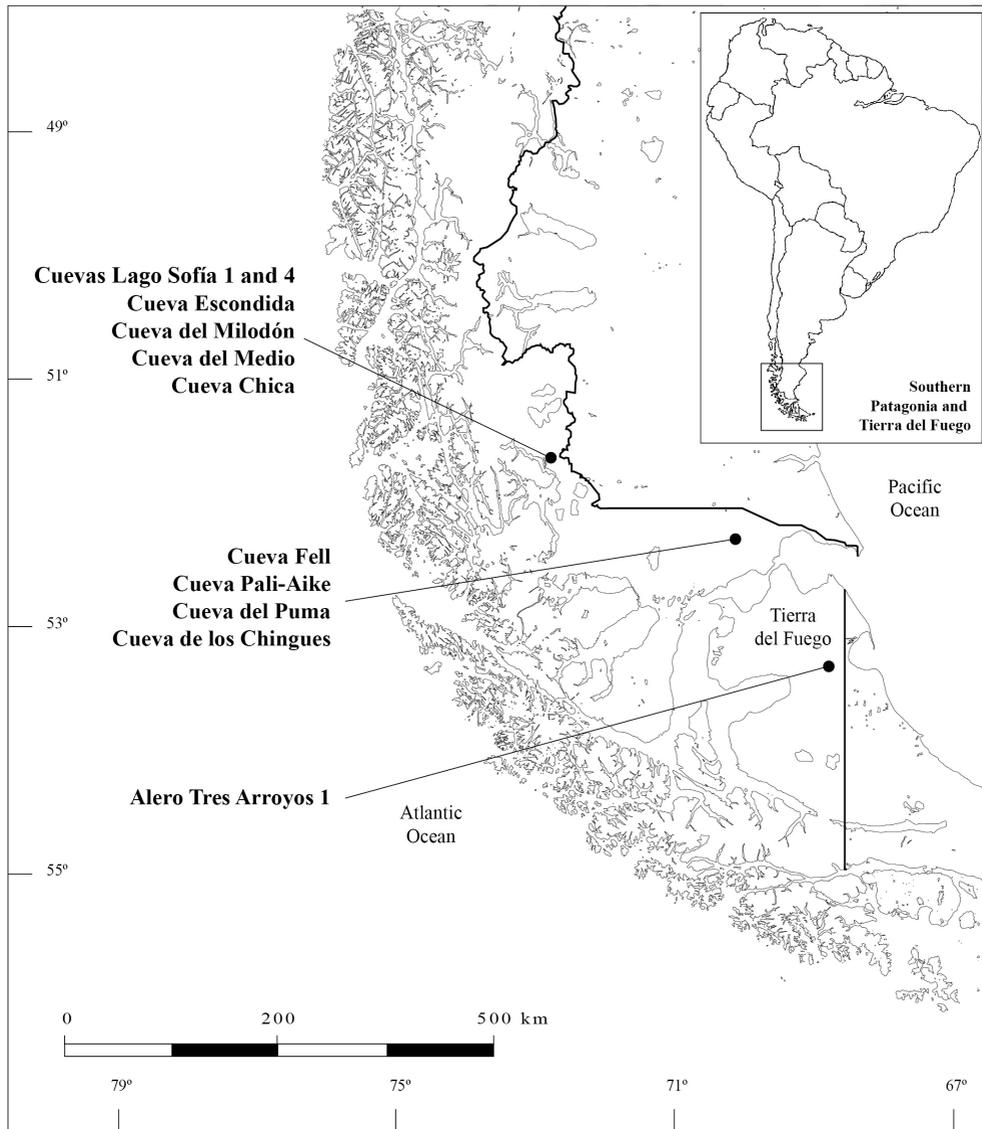


Figure 1. Location of Late Pleistocene archaeological and paleontological sites mentioned in the text.

*Localización de sitios arqueológicos y paleontológicos mencionados en el texto.*

and placed about six meters above the river (Bird 1988) (Figure 2). It was carved on the sandstone by river erosion, leaving a hard clay surface over which human occupations occurred (Bird 1988:134). It has a surface of about 94 m<sup>2</sup> and a roof that now is about three meters from the surface (Bird 1988:134-136; Emperaire et al. 1963:184).

This small but important site is always mentioned in the literature, given the strong evidence of early human occupation provided by hearths and tools -especially the fishtail projectile points- from the lower layers. In spite of its size, it is a complex site not only

for its rich and varied archaeological record but also for its complicated research history. Different teams and people have worked at this site during the last 84 years (Figure 3). Both systematic and amateur work was done, including testing, excavating, cleaning profiles or sectors, and backfilling previous digs. The former owner of the *estancia*, John Fell, excavated before the arrival of Bird and several times after. Each successive campaign produced lithic and bone collections that were sent to different parts of the world. The collections have still only partially been studied and a comprehensive interpretation is lacking.



Figure 2. Fell Cave. View from the Chico River. Courtesy Victor Sierpe.

*Cueva Fell. Vista desde el Río Chico. Cortesía Victor Sierpe.*

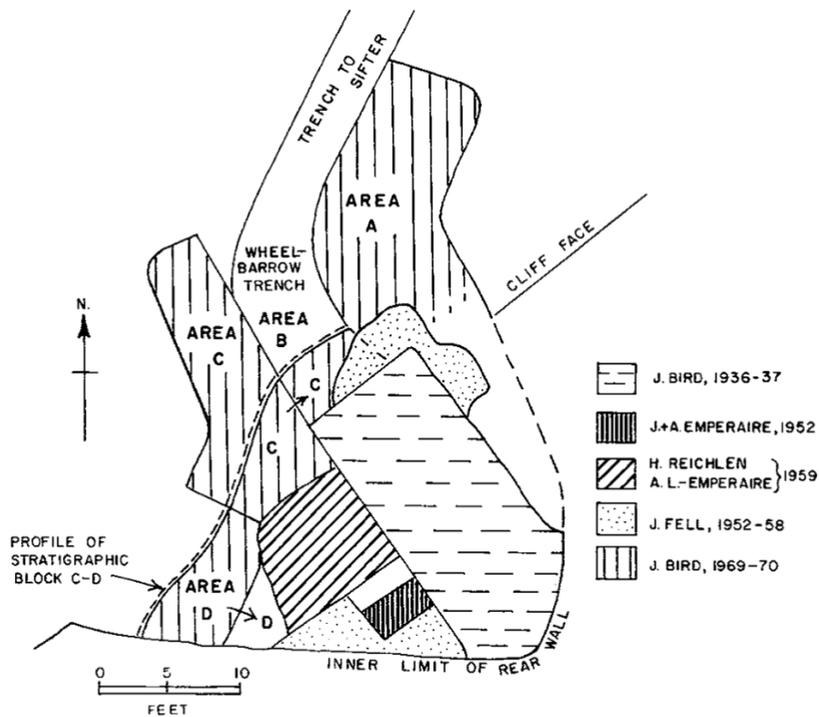


Figure 3. Plan view of Fell Cave depicting areas excavated by different researchers (from Bird 1988:164, Figure 65). Image Courtesy of the Division of Anthropology, American Museum of Natural History.

*Vista en planta de Cueva Fell, indicando áreas excavadas por diferentes investigadores (tomado de Bird 1988:164, Figura 65). Imagen cortesía de Division of Anthropology, American Museum of Natural History.*

Reports for the two main excavations were published by the excavators or by Hyslop, based on notes and diaries (Bird 1938, 1946, 1988; Emperaire et al. 1963). John Hyslop's monumental and successful work in compiling the information from Bird's excavations at Fell Cave and several other Patagonian sites must be acknowledged. Even when the treatment of the information is not always detailed, the most important results were covered. The flux of studies by people not involved in the excavations was discontinuous, but in the last few decades there has been an increase in the number of specialized studies.

The presence of extinct faunas was important and mentioned many times, but no systematic studies of the bones were made. The initial publications by Junius Bird (1938, 1988), and by members of the French Mission (Emperaire et al. 1963; Poulain-Josien 1963) included stratigraphic and contextual information, but only the report by Poulain-Josien (1963) presented a relatively detailed analysis of the faunas. Thomas Amorosi prepared a list of the bones recovered by Bird in 1936-1937 (Bird 1988:153, 155, 158) and Earl Saxon (1979) produced a list of the bones recovered by Junius Bird in 1969-1970.

Most of the materials resulting from Bird's excavations are stored at the American Museum of Natural History (AMNH), in New York, USA with a smaller sample from the 1969-1970 excavations at the CEHA, Instituto de la Patagonia, Universidad de Magallanes, Punta Arenas, Chile. Some of the materials collected by John Fell in 1958 and after are also stored at the CEHA. Part of the materials recovered by the French Mission, originally taken to France, were recently returned to Chile, and are stored at the CEHA.

Publications focused on Fell Cave or presenting detailed studies of its materials are numerous (Amorosi and Prevosti 2008; Clutton-Brock 1988; Flegenheimer and Cattáneo 2013; Markgraf 1988; Martín 2012, 2013; Morello Repetto 2016; Nami 1998; Politis 1991; Scheinsohn 2016; Waters et al. 2015, are among the most important), but few of these studies have focused on the Late Pleistocene large vertebrate bones from the lower layers stored at the AMNH. Only the studies by Alberdi and Prieto (2000), Amorosi and Prevosti (2008) and some observations by Borrero (Borrero and Martín 1996) have focused on those bone materials. In addition there have been studies of the lower bone assemblages resulting from the 1969-1970 excavations by Saxon (1979), Humphrey et al. (1993) and Martín (2012, 2013). We present

here a preliminary study made on March 2019 of the original early bone assemblage recovered by Bird in the 1930s and stored at AMNH, offering some comparisons with our previous studies of the John Fell collection and the 1969-1970 collection made by Bird, both stored at the CEHA. Based on the original notes, photos, and drawings made by Bird, we also discuss the stratigraphy and chronology, and make some general references to other early sites in Southern Patagonia. As a result we offer new interpretations and suggestions concerning the lower layers of the site.

### Paleoenvironment

The environmental conditions at the time of the initial occupations of Fell Cave are not very well known. Most of the available paleoenvironmental information was obtained near the Andes, more than 100 kilometers west of the cave in more humid settings. What is locally available is the pollen column at Fell Cave itself (Markgraf 1988) and the records from the Sediment Archive Drilling Project at Potrok Aike maar lake. At least part of the period of early occupations at Fell is represented in the records of Potrok Aike corresponding to 12800-11400 cal BP (Zolitschka 2013), and overlaps with the Younger Dryas chronozone of the Northern Hemisphere (12700-11500 cal BP). Possibly warmer summers and a decrease in the lake levels are indicated for that time (Haberzettl 2006). It was suggested that, as a result of this warm and dry phase, the region was gripped by drought conditions were imposed on the region (Gilli 2003; Haberzettl et al. 2007; Zolitschka et al. 2018), which is concordant with the location near the Chico River.

Vera Markgraf, on the basis of her studies of pollen in *Mylodon* dung from Cueva del Milodón, and a column at Fell Cave, found evidences for an important reduction in the grassland area before faunal extinction, thus lending weight to environmental causes being responsible for the extinctions over human hunting pressure (Markgraf 1985, 1988). Effectively, she found that the pollen record for the period 11000-10000 <sup>14</sup>C years BP at Fell Cave, during its first occupations, indicate the presence of xeric steppe taxa, suggesting increases in temperature and moisture stress (Markgraf 1988).

A long list of megamammals and large mammals roamed the plains of Pali Aike during the end of the Late Pleistocene. This diversity is well known from both archaeological and paleontological sites

excavated during the last 84 years. These faunas that coexisted with humans included *Mylodon darwini*, *Hippidion saldiasi*, *Lama gracilis*, and an extinct clade of guanaco (*Lama guanicoe*) among the herbivores, and *Arctotherium*, *Panthera onca mesembrina*, and *Dusicyon avus* among the carnivores (Alberdi and Prieto 2000; Amorosi and Prevosti 2008; Bird 1988; Martin 2013; Martin et al. 2004; Metcalf et al. 2016; Prevosti and Martin 2013; Prevosti et al. 2003; San Román et al. 2000). The list of species is shorter than that recorded at Cerro Benítez, since there are still no records of *Smilodon* or *Macrauchenia* at Pali-Aike.

### Excavations

The first important excavations by Bird were completed between December 24, 1936 and January 8, 1937. He selected the place based on the presence of lithics on the surface and the results of John Fell's previous tests on the talus, identifying the age and richness of the deposits (Bird 1988).

The initial excavation comprised about 18 m<sup>2</sup> (Bird 1988:137) (Figure 3) and exposed a stratigraphic sequence down to sterile clays. Five layers were identified (Figure 4), with layer I on top, immediately below the surface (a thick 60 cm layer mostly formed by sheep manure and loose dirt). During his 1969-1970 excavations, Bird subdivided the same sequence into 20 cultural layers (at least two are lens within layers). It was very difficult to match both sets of

layers given the number of interventions suffered by the cave during the 39 years between both visits, the stratigraphic differences at different sectors of the shelter and the dearth of recognizable materials during the 1969-1970 excavations (Bird 1988:170). Effectively, Bird remarked that his initial tasks at the time were "to clear out all of the loose dirt and debris left inside the shelter ... deepen the wheelbarrow runway" (Bird 1988:165). The lower occupations identified in 1936-1937 were encompassed within layer V, immediately above the sandstone and clays deposited by the river at the end of the Pleistocene. This layer fluctuates between 7.5 cm and 22.8 cm in thickness, and included stone tools, flakes and bone fragments. Four hearths were also found, containing the fragmented and burned bones of native horses (*Hippidion saldiasi*), guanaco (*Lama guanicoe*) and ground sloth (*Mylodon*) associated with lithics (Bird 1988:134). The hearths were excavated on the floor, measured about 12.7 cm in depth and 65 cm in diameter, and "were full of fine black powder, burned bones, and stone flakes" (Bird 1988:142). All these evidences were assigned by Bird to the lower occupations of the site, which he integrated into his Period I. Later, when Hyslop was compiling the book about Bird's work in Patagonia, he attributed layers 18-20 to Bird's Period I, and layers 13-17 to Period II, of Holocene age (Bird 1988:184), but this should be considered tentative. After this occupation, a rock fall took place, which according to Bird sealed the

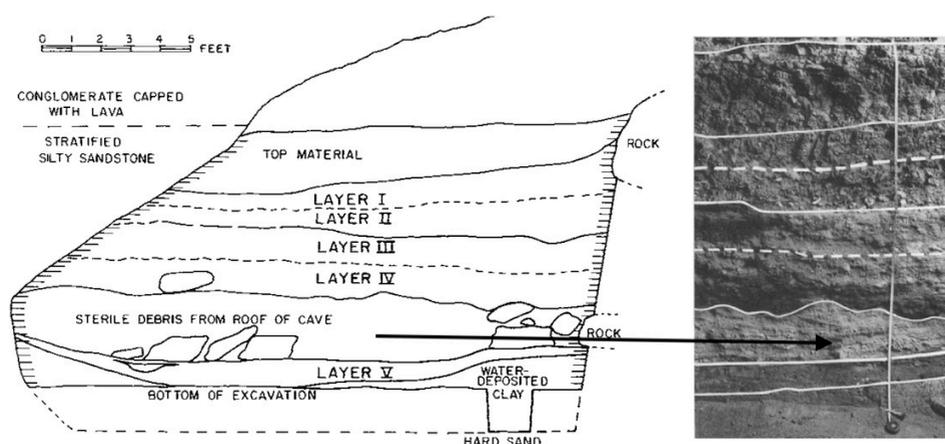


Figure 4. Comparison of western profile and photograph of west-facing excavation section (detail) of Fell Cave (from Bird 1988:140, Figure 51; 141, Figure 53). In both figures, the thickness of the sterile layer formed by fallen rocks and dirt can be observed. Image Courtesy of the Division of Anthropology, American Museum of Natural History.

Comparación del perfil oeste y fotografía de la cara oeste de la excavación (detalle) de Cueva Fell (tomado de Bird 1988:140, Figura 51; 141, Figura 53). En ambas figuras puede observarse el espesor del nivel estéril formado por la caída de rocas y sedimentos. Imagen cortésia de Division of Anthropology, American Museum of Natural History.

older deposits of Period I, an interpretation that we will comment on below.

### Chronology

Bird originally made three radiocarbon dates which supported the claim that the site was among the oldest in the Americas. His three standard radiocarbon dates bracketed the occupations between 11000 and 10080 <sup>14</sup>C years BP. Two radiocarbon dates on ground sloth and *Hippidion* bones from the lower layers stored at the CEHA were subsequently made (Martín 2012, 2013), both generally falling within the same time interval established by Bird. Finally, Waters and collaborators (2015) dated two subsamples for each of the original curated charcoal samples from the hearths initially dated by Bird. The results were more precise but similar, tightly concentrated within the interval 10395-10835 <sup>14</sup>C years BP (Table 1). On that basis they rejected Bird's original dates. They ignored both bone published dates from the lower occupations, which is important because they considered that it is still unknown whether the extinct fauna (horse and sloth) was associated with the Fell Cave projectile points, highlighting the need for taphonomic studies. However, the contextual analysis of the lithics, bones (some with cutmarks), original field notes, photos and publications by Bird left little doubt that this is a bonafide association (Martín 2013). This was evident for Bird himself when he wrote "we had found the first evidence that this ancient horse was hunted and eaten by the early natives of South America" (Bird 1988:153) while Margaret Bird commented that "Junius lifted the large, ground sloth bone while they were there visitors, so we have witnesses as to its association with the horse bones" (Bird 1988:162). More importantly, commenting about the ground sloth bones, Margaret Bird emphasizes that Bird "found scrapers and points around and *under* them" (emphasis added) (Harry Bird 2012:437). We are now reporting on more horse bones with cutmarks, reinforcing that pattern of exploitation of now-extinct fauna.

Table 1 presents the full list of radiocarbon dates known for the lower layers of Fell Cave. If we stick only to the AMS chronology, the early layers associated with extinct fauna present evidences for occupation between 10295-10835 <sup>14</sup>C years BP. The total number of radiocarbon dates for the lower occupations is eleven, and not 20 published recently (Flores Coni et al. 2020:9).

Waters et al. included graphic information about the location of the hearths providing the dated

samples (Waters et al. 2015:379). There are some anomalies or inconsistencies in this presentation. First, they locate the hearths using plans from Bird's 1969-1970 excavations, when in fact the samples attributed by Waters et al. to Layers 19 and 20 (Bird samples W-915 and I-3988) were collected before, in a completely different part of the cave. This is clearly explained by Hyslop: "The first two dates produced were from samples extracted from the lowest part of the occupational debris (Period I) before the excavations in 1969-1970. One was sample (W-915) secured by John Fell in 1960", the other was a sample (I-3988) removed by Bird in 1968 (Bird 1988:175). The location of the areas excavated in 1969-1970 is clearly described (Figure 3) and is confirmed by Bird when he declares that part of blocks C-D lies "under the overhang ... a little of it just outside of it [south end of area C], but it is from that section that we can anticipate getting fire hearths [for radiocarbon dates] for some are visible in the exposure now" (Bird 1988:165).

In his description of Layer 20, Bird highlights the presence of a horse metacarpal and "A reworked fishtail" in block C-D (Bird 1988:185), but Waters et al. locate the fishtail in block B, which was part of the wheelbarrow trench. Finally, Waters et al. (2015:379) drew the C-D blocks in relation to the rear of the cave. But at the time of the 1969-1970 excavations the rear was already practically exposed. Blocks C-D were relatively parallel to the drip line at the front of the cave (Figure 3). There is no published drawing of Layer 20 by Bird or Hyslop, and it is not clear on what evidence Waters et al. made that map.

The information attributed by Waters et al. to Layer 18 is also inconsistent. In Bird's Figure 71 "Plan view of layers in C-D block, 1969-1970 excavation" (Bird 1988:174), the drawing shows no hearth for layer 18. Hearths are indicated for Layers 17 and 19, especially Layer 17 where there are several. The description made by Bird of Layer 17 mentions, among other things, "Several fire hearths here. Hearth 4 lay just below hearths 1, 2, and 3 in a depression 9 cm deep, its bottom reaching almost to the surface of the underlying sterile clay. Such pits could easily have brought up horse and sloth fragments. A horse phalanx was found under the layer's surface 5 cm from the cave wall." (Bird 1988:175). This shows Bird trying to explain the presence of extinct fauna in what was considered Period II; and Waters et al. confounding Layers 17 and 18, probably disoriented by Table 17 from Bird's book. However, Bird wrote

Table 1. Radiocarbon chronology for the initial occupations of Fell Cave.  
*Cronología radiocarbónica de las ocupaciones iniciales de Cueva Fell.*

Material dated	Laboratory Number	<sup>14</sup> C Date (BP)	Observations	Collector	Source
Charcoal [Layer 17 or 18]	I-5146	10,080 ± 160	Discussion in text	Bird in 1969-1970	Bird 1988:187
ABA-N-Charcoal Layer 18, sensu Waters et al. 2015	UCIAMS-104660	10,395 ± 30	Same sample of I-5146, redated	Bird in 1969-1970	Waters et al. 2015:378
ABA-Charcoal Layer 18, sensu Waters et al. 2015	UCIAMS-106044	10,395 ± 40	Same sample of I-5146, redated	Bird in 1969-1970	Waters et al. 2015:378
Charcoal	W-915	10,720 ± 300		John Fell in 1960	Bird 1988:34, 175
ABA-Charcoal Layer 19, sensu Waters et al. 2015	UCIAMS-104662	10,675 ± 40	Same sample of W-915, redated	John Fell in 1960	Waters et al. 2015:378
ABA-Charcoal Layer 19, sensu Waters et al. 2015	UCIAMS-106043	10,760 ± 60	Same sample of W-915, redated	John Fell in 1960	Waters et al. 2015:378
Charcoal	I-3988	11,000 ± 170	(SE corner of cave); Layer 20 is thin streak on SW side of dig	Bird in 1968	Bird 1988:34, 175, 187
Humic Acids Layer 20, sensu Waters et al. 2015	UCIAMS-106048	10,810 ± 50	Same sample of I-3988, redated	Bird in 1968	Waters et al. 2015:378
ABA-Charcoal Layer 20, sensu Waters et al. 2015	UCIAMS-106047	10,835 ± 50	Same sample of I-3988, redated	Bird in 1968	Waters et al. 2015:378
<i>Mylodon</i> , innominate Layer 17	Ua-34249	10,295 ± 65	Date similar to UCIAMS-104660 and UCIAMS-106044	Bird in 1969-1970	Martin 2012 Patty Fell list
<i>Hippidion</i> , ds sesamoid	Beta-247710	10,600 ± 40		Bird in 1969-1970	Martin 2013

very clearly that he attributed the vertical migration of extinct fauna bones to the digging of hearths from Layer 17. In Layer 19, he found sloth and horse bones and remarked that this is the one that he identifies with his Period I, “This layer could be equivalent to the occupation (Period I) before the rockfall of sterile debris so evident in 1937 trench” (Bird 1988:175).

The sample dated by Martin (Ua-34249), obtained by Bird during the same 1969-1970 season, provided a similar date to those obtained by Waters et al. (UCIAMS-106044 and UCIAMS-104660) and was attributed to “Layer 18”. The three <sup>14</sup>C measurements

overlap by one standard deviation. All the evidence points to the fact that the hearth located by Waters et al. in Layer 18, was from Bird’s Layer 17 which have many hearths (as opposed to the absence of hearths inferred from Bird’s drawing and description) and was positioned above the rock fall by Bird (Bird 1988:141, 187).

Highly relevant is that a bone list prepared by Patty Fell mentions five *Hippidion* bones and 12 *Mylodon* bones from Layer 17, certainly important numbers. Extinct fauna remains are also present at Layer 16 (Bird 1988:171), where a small sloth bone

was recovered. Among the sloth bones, two juveniles were recognized in the collections at the CEHA, one of which is very small, presented cutmarks and has been dated at  $10,295 \pm 65$  BP (Ua-34249) (Table 1). Bird clearly indicate that “The [horse] foot bone and two other fragments of sloth bone found in clearing around the hearth marked the highest occurrence of such remains in the deposit” (Bird 1988:187). Hearth 4 from layer 17, as well as the three hearths found above, is described as an excavated circular hole, a shape classically associated with early occupations in southern Patagonia. Massone and Prieto (2004) considered them as representative of their Cultural Mode Fell I. The confusion about the provenience of Hearth 4 was already observed by Martín in 2013, when she wrote “*Es evidente que el status estratigráfico de esta muestra no es claro... La evidencia parece indicar la presencia de una fecha creíble de unos 10.000 años AP procedente de un depósito que contenía megamamíferos ubicado por encima del que Bird consideraba como final de su Período I*” (Martín 2013:113). The information compiled here sustains that observation.

There is a strong possibility that Layer 17 should be integrated into Period I, instead of its stated position within Period II. This is the moment to remember the uncertainties surrounding Period II. There are problems with its definition and with its very existence. Researchers were usually intrigued by this cultural unit without lithic projectile points and focused on the exploitation of foxes. It was not impossible, of course, since projectile points do not need to be present at all sites; although the absence of guanaco bones was harder to explain. Certainly, the excavations by the French Mission were not able to confirm its existence. They also studied materials recovered by John Fell that were separated according to Bird’s original subdivision into five layers. They noted that “*objets d’os de cette couche ne sont pas proportionnellement plus nombreux que dans la couche précédente ou que dans les couches suivantes*” and recorded three triangular points (Empereire et al. 1963:176). Scheinsohn described one bone point that Bird established as indicative of Period II and found wear marks suggesting that they were “actually devices used in pairs to attach another (stone?) tool, like hafts or oversized foreshafts” (Scheinsohn 2014:45). Several authors observed discrepancies and problems with the chronology of this period (Massone 1981:102-105; Morello Repetto 2016:49; Nami 2010:281; Orquera 1987:358). In 1938, Bird mentioned that Period II

was also present at “the bone point period of Pali Aike” (Bird 1938:270), which he never confirmed. Bate (1982:134) considered the possibility that this period was expressed at coastal sites, but after almost 40 years in which several coastal sites were excavated and published with none showing anything similar, this idea is no longer tenable. Finally, Borrero considers that this layer does not represent any existent cultural configuration (Borrero 1989:127) and Massone et al. confirmed that “*estos contextos son discutibles, difíciles de evaluar, y no tienen confirmación empírica en otros sitios regionales*” (Massone et al. 2016:451).

## Results

### Some taphonomic observations

All skeletal remains were examined macroscopically with a 6-8x hand lens, and some observations were complemented using a binocular lens with variable magnifications of up to 60x. A digital caliper was used for the measurements of the marks in millimeters. Taphonomically relevant observations were made on the bones, which will be succinctly mentioned here, since they will be discussed in detail in another publication.

The general preservation of the bones stored at the AMNH is regular, with some specimens well preserved. A few are partially cracked and it is extremely difficult to recognize other marks under that condition. The bones from the smaller CEHA collection are mainly well preserved.

Weathering (sensu Behrensmeyer 1978) is not important, suggesting rapid burial of the bone assemblage. This is in line with stratigraphic evidences for the rock fall (Bird 1988) that protected some of the bones from weathering and also perhaps from flooding by the river. It might be that this protection also provided some physical integrity to the hearths dated by Bird and Waters and collaborators<sup>1</sup>. Indeed, there was great stratigraphic coherence in the dates obtained from these hearths. However, the areal extension of the surface that was really affected by the roof fall appears to be restricted to part of the shelter (Figure 4). As we will see, this forms part of our argument for reinterpreting some of the layers attributed to Period II.

In the study of surface modifications on the bones, we were following Binford (1981) and the general protocol and referential framework already presented by Martín (2013). We observed that carnivore marks are minimally represented in this

bone assemblage. This low incidence is concordant with the predominantly cultural context exhibited by the lower layers of the cave. The absence of large carnivores, with the exception of one rib (an animal larger than a puma), which are well represented at Late Pleistocene archaeological and paleontological sites in Patagonia, is surprising. Only at Cueva Lago Sofía 1 (Prieto 1991), another predominantly cultural context, have we found the same pattern. Large carnivore marks in the CEHA collection were recognized on a few Mylodontinae bones, which include a fragment of a very large innominate and a vertebra of a juvenile sloth (Martin 2012). These marks were attributed to large extinct felids, probably *Panthera onca mesembrina*. It was argued that these bones were collected from felid kills and transported to the cave. An alternative explanation is that these bones are the remains of animals that were hunted by humans and later gnawed by carnivores (Martin 2012), but as we will see below, this is very difficult to support for sloths and makes little sense in the context of an archaeological site where the evidences for large carnivore gnawing are limited to these sloth bones.

For trampling marks, we followed criteria published by Haynes (1986), Fiorillo (1989) and Dominguez-Rodrigo et al. (2009) among others. Notably, at Fell Cave there is very little evidence of trampling, contrasting strongly with sites such as Pali-Aike, a difference probably caused by ground sloths using the shelter as a den (personal observations).

In the study of fire alterations, we considered the basic distinction between burnt and calcinated remains (Brain 1981), but also recorded the presence of jagged edges characteristic of bones exposed to fire (Binford 1963). The abundance of burned and calcinated bones, already recognized by Alberdi and Prieto (2000:153) for horses, require some explanation. Some of these bones present evidences of stability, which suggest that they are not the result of cooking activities. Also, some of the bones exhibit a burning pattern that suggests they were burned after being defleshed (Buikstra and Swegle 1989). This fact may indicate that bones were probably used as fuel. In a review about the human peopling of Patagonia under very cold conditions, Borrero (2012) listed the available tactics required for adaptation to a cold environment, among them the use of bones for fuel. At that time he was only able to list one case for the Pleistocene-Holocene Transition, and that case was outside of Patagonia, in the Pampas (Joly et al. 2005). This evidence of Fell suggests the utilization of that

tactic, an example of what Borrero (2011) calls a sleeping technology, in a key site concerning the early peopling of Southern Patagonia.

Fire was probably an important factor in the lower occupations, not only for bone modification but also for destruction. Bird was aware of the degree of fragmentation. This process surely diminished taxonomic and anatomic resolution, probably explaining the high frequency of specimens classified as Mammalia. Burning affected only part of the bone assemblage, particularly near the hearths, where lots of highly fragmented calcinated bones were recovered. It must also be said that the evidences classically associated with bone marrow breakage (percussion marks) are not abundant, which is rare, particularly for camelids. These markers might signal a cold but not particularly risky environment, in which there was no need for the intensive processing of the faunal remains. Certainly this will be the subject of further exploration in the future.

Deposition of manganese spots, sometimes continuously covering important surfaces of bones is probably associated with flooding from the river (C. French, pers. comm. 2006). This information together with that on burning offers insights into several cases of bone stability (sensu Borrero 2007), which is concordant with a minimally disturbed bone assemblage.

At least one indeterminate fragment of Mammalia cf. Mylodontinae bone is mineralized. Perhaps this will lead us to reconsider the case of a glyptodont bone recovered from the lower layers by the French Mission (Emperaire 1988; Marshall and Salinas 1989-1990).

Table 2. NISP marks by taxon. Percentages are obtained from NISP values excluding osteoderms and teeth.

*NISP marcas por taxón. Los porcentajes se obtuvieron a partir de valores de NISP que excluyeron osteoderms y dientes.*

Sitio	NISPcutmarks	NISP*	%NISPcutmarks
Camelidae AMNH	6	119	5,04
Camelidae CEHA**	0	2	-
<i>Hippidion</i>	9	109	8,25
<i>Hippidion</i> CEHA**	5	36	13,9
<i>Mylodon</i> AMNH	2	26	7,6
<i>Mylodon</i> CEHA**	2	19	10,5
Mammalia AMNH	9	260	3,4
Mammalia CEHA**	1	18	5,5

\*Osteoderms and teeth excluded, \*\*Martin 2013.

Cutmarks were already reported for the initial occupations of Fell Cave, and, comparatively speaking their percentages are more important for *Hippidion* and *Mylodon* than for Camelidae or Mammalia (Table 2), an unusual situation in South Patagonia. This important conclusion will be the subject of more detailed studies in the future.

## Faunas

The recorded NISP for the lower layers of Fell Cave is 785 (Table 3). Lots of very small fragments, many resulting from burning or from recent breakages in the bags are not included in our counts. Two bone tools were recorded, and are not considered for the NISP. The Mammalia category presents the highest frequency of specimens, followed by *Hippidion*, Camelidae and Mylodontinae (excluding osteoderms). Location of the bones for the lower layer of the cave was marked by Bird with field labels F6-F8.

### Camelids

The presence of *Lama gracilis*, a species that is not particularly abundant in Patagonian bone assemblages must be noted. However, most of the sample can be assigned to a *Lama guanicoe*

morphotype. Contrary to what happens at most early sites in Fuego-Patagonia, camelids are not abundant at the lower layers of Fell Cave. In fact by NISP counts (128) they are less abundant than horses, which is unusual in Fuego-Patagonia (Table 4). It must be said to that, from the AMNH collections, we recorded 128 camelid bones, 99 more than the 29 listed by Amorosi (Bird 1988:155), but that number is still lower than for horses. This is confirmed with a NISP of only four camelid bones recorded from the CEHA collection. Sampling of camelid bones by Bird during his excavations appears to have been normal, since several small carpal-tarsals and phalanges are present. In comparison, the camelid and horse list of specimens are very different. Camelid long bones are more frequent than for horses. The differential degree of fragmentation could be part of the explanation, since there are several complete horse elements. The axial skeleton is clearly much better represented for horses and Mammalia.

The low representation of the axial skeleton for camelids is limited to a few head remains, ribs, three innominates and only 16 vertebrae fragments. Camelid teeth are not abundant, which is in line with a low representation of head parts.

In sum, the classic camelid pattern of more abundant appendicular bones is present here, even

Table 3. NISP values for large and medium-sized mammals from Junius Bird's excavations of 1936-1937 (AMNH) and 1969-1970, plus John Fell's private collection (CEHA).  
*Valores de NISP para mamíferos de tamaño grande y mediano en excavaciones de Junius Bird de 1936-1937 (AMNH) y de 1969-1970 más colección privada de John Fell (CEHA).*

Taxon	NISP (AMNH)	NISP (Martin 2013)
Camelidae	95	4
Mammalia cf. Camelidae	33	
<i>Hippidion saldiasi</i>	143	50
Mammalia cf. <i>Hippidion</i>	9	
Mammalia cf. <i>Hippidion</i> ?		2
<i>Mylodon darwini</i>	3	1
Mylodontinae cf. <i>Mylodon</i>	1	18
Mylodontinae	215	
Mylodontinae?		1
Mammalia cf. Mylodontinae	22	2
Mammalia cf. Carnivorae	1	
Mammalia indeterminate	263	19
Total	785	97

Table 4. NISP values for Camelidae. AMNH collection.  
*Valores de NISP para Camelidae. Colección AMNH.*

Element	Camelidae	Mammalia cf. Camelidae	Total
Maxilla	1		1
Mandible	1		1
Teeth	9		9
Rib		3	3
Vertebrae		16	16
Innominate	1	2	3
Humerus	8	2	10
Radio-cubitus	6	3	9
Femur	4	2	6
Tibia	13	2	15
Patella	2		2
Metapodial	10	1	11
Carpals-tarsals	25		25
Phalanges	15		15
Indeterminate		2	2
Total	95	33	128

when it is less notorious than usual. The relatively limited use of the camelid axial skeleton is repeatedly observed in Holocene Patagonian sites (De Nigris 2004; Mengoni Goñalons 1999; Muñoz 1997), and is in line with ethnohistorical accounts of guanaco exploitation (Claraz 2008).

The low incidence of percussion marks in both internal and external faces of the long bones of camelids is notable, and the high fragmentation of part of the collection is better explained by burning (Table 5). This is exceptional because camelid bones in Patagonia are regularly highly processed for marrow extraction. The value of the NISP cutmarks for Camelidae is six out of 119 bones, excluding teeth (5,04%) (Table 2). This information can be considered, together with the higher frequency of *Hippidion* bones, as an indication of an adaptation that does not fall squarely within the known parameters of guanaco hunters dominant in Patagonia.

### Horse

The recorded NISP for horses is 152 (Table 6). As already mentioned, more horse elements are present compared with those of camelids (Table 3). A NISP for horse of 52 was recorded from the CEHA collection, a value well above the four specimens recorded for camelids, which confirms their importance at Fell Cave. Teeth excluded, nine out of 109 bones, present cutmarks (8.25%) from the AMNH collection and five out of 36 (13.9%) from the CEHA collection (Table 2). Based on the presence of cutmarks and burning on horse bones from both the AMNH and CEHA collections, Alberdi and Prieto (2000) also suggested the importance of

the horse at Fell Cave. The abundance of *Hippidion* vertebrae is interesting, signalling more systematic use of the horse axial skeleton in comparison with camelids, although some of the Mammalia vertebrae may alter these numbers. Horse teeth are also more abundant than for camelids, which is in line with a high representation of head parts.

The presence of a femur and a humerus of an *Hippidion saldiasi* fetus must be noted, because it is one of the few evidences useful in discussing seasonality of the occupation<sup>2</sup>. Effectively, Fell Cave presents a good record of newborn/unborn horse bones, suggestive of deposition during a relatively limited part of the year. As a measure of the relatively good preservation of bones at Fell Cave, it must be said that newborn/unborn horses at Cueva del Milodón are only recorded by hooves (personal observations), probably the result of carnivores destroying the rest of the skeleton. These contrasting patterns show how

Table 6. NISP values for *Hippidion saldiasi*. AMNH collection.

Valores de NISP para *Hippidion saldiasi*. Colección AMNH.

Element	<i>Hippidion</i>	Mammalia cf. <i>Hippidion</i>	Total
Skull	3		3
Maxilla	2		2
Mandible	10		10
Hioides		1	1
Teeth	43		43
Sternum		1	1
Rib		4	4
Scapula	1		1
Vertebrae	47		47
Innominate	1		1
Humerus	1	1	2
Radio ulna	3		3
Ulna		1	1
Femur	2		2
Tibia	1		1
Patella	1		1
Metapodial	4		4
Carpals-tarsals	9		9
Phalanges	8		8
Sesamoids	6		6
Indeterminate	1	1	2
Total	143	9	152

Table 5. Frequency of cultural marks by taxon (AMNH). Some specimens presented more than one class of mark. Teeth and osteoderms are included, except for cutmarks.

Frecuencia de marcas culturales por taxón (AMNH). Algunos especímenes presentan más de una clase de marca. Están incluidos dientes y osteodermos, excepto para huellas de corte.

Taxon	Burnt	Calcinated	Cutmarks	Chop marks	Percussion marks*	NISP taxon
Camelidae	54	64	6	3	3	128
<i>Hippidion</i>	15	3	9	1	0	152
Mylodontinae	7	5	2	0	0	241
Mammalia	104	78	9	3	2	263
Carnivora	0	0	0	0	0	1

\* Both internal and external flaking recorded mostly on long bones.

anthropic activities were less destructive than those of Late Pleistocene carnivores, whose preservation is helped by the faster burial associated with human occupations. It also emphasizes the absence of large carnivores modifying bones at Fell Cave.

A comparison with other early archaeological sites is in order. Both at the cultural layers of Cueva Lago Sofia 1 and Tres Arroyos 1 there are chop and percussion marks on *Hippidion* bones (sensu Binford 1981), but they are more abundant at Fell Cave. We already observed that there is no significant evidence for bone marrow extraction. The evidence for anthropic activities on horse bones derives mainly from cutmarks.

Certainly, *Hippidion* bones at Fell Cave, similar to other early sites in Patagonia, display cutmarks on skulls and mandibles, lateral metapodials, proximal femur and phalanges 1 and 2 (Figure 5). This appears to be a classical pattern for horse exploitation. Effectively, at different early sites of Patagonia (Fell Cave, Cueva de los Chingues, Cueva del Medio, Cueva Lago Sofía 1, Tres Arroyos 1, several sites at the Deseado Massif), horses appear to have been consumed, sometimes as the only representative of the extinct faunas. Independently of their frequency, the evidence for human consumption of horse appears to be strong. It is interesting that at Piedra Museo, another site located on the steppes, five out of 15 horse bones present cutmarks (Marchionni and Vázquez 2012). Therefore, a Patagonian pattern of horse repeatedly associated with humans is replicated at Fell. What Fell Cave adds to that pattern is that, beyond their

consumption, there is a possible preference for horses. It was interesting that Nami's excavations at Cueva del Medio in the 1980s and 1990s showed an unusual prominence of horses (Nami and Menegaz 1991), but camelid remains were still more abundant (Borrero and Franco 1997), and anthropic traces on horse bones were less prominent than for camelids (Martin et al. 2015:185).

In the CEHA collection there is a metapodial and a phalanx 1 that were probably extracted in anatomical position, similar to other cases observed during the first field season at the site (Bird 1988:154). Bird described the articulated bones that he found at the lower layer of Fell Cave: "the complete articulated foreleg and shoulder of a horse, the bones in their natural positions as if the leg had been freshly butchered, the bones protected by flesh when the slab fell. Below another slab on the same surface were the articulated neck vertebrae and basal skull section of a horse, the skull broken open to remove the brain" (Bird 1988:212). These anatomical parts correspond to a young, well preserved individual. There are cutmarks in one of two mandible fragments found inside one hearth.

The mere frequency of horse bones is suggestive of human agency. This is because horses are always notably less frequent than camelids in the Late Pleistocene paleontological sites of Southern Patagonia. This is the case in the Pali-Aike area, for example at Cueva de los Chingues (Martin 2013; San Roman et al. 2000) and Cueva del Puma (Martin et al. 2004). The ranking of carnivore prey appears to be similar at the different den sites, with Camelidae highest,

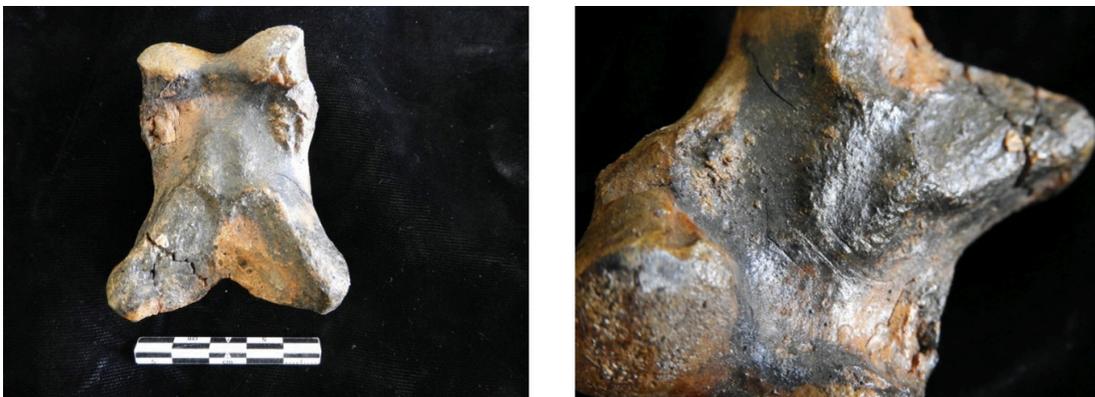


Figure 5. Burned first phalanx of *Hippidion* and detail of cutmarks on plantar view. Artifact catalog number SAA/0969 A01. Images Courtesy of the Division of Anthropology, American Museum of Natural History.

*Falange primera quemada de Hippidion y detalle de huellas de corte en vista plantar. Número de catálogo de artefactos SAA/0969 A01. Imágenes cortesía de Division of Anthropology, American Museum of Natural History.*

followed by the horse and ground sloth. The order of Camelidae-horses is also more or less the case at early archaeological sites. Given that horses are larger mammals than camelids, other things being equal they are more attractive prey, but they are not always numerically more important at archaeological sites. The reason for this is not immediately clear. The reason why the horse is prominent at Fell Cave in comparison with sites at Última Esperanza could be related to the fact that the Pali-Aike Volcanic Field was an open and arid landscape, which is adequate for horses and, accordingly, their availability was higher than usual (Burke 2006; Prado and Alberdi 2017). However, this explanation is not sufficient to explain the differences with other assemblages on the eastern steppes.

Given the number of horse bones found at Fell Cave and their anatomical coherence, it is fair to accept that whole animals were obtained not very far from the site. There are a number of alternative tactics to hunt horses, which are considered dangerous animals. Ambush tactics, sometimes combined with driving herds are among the most plausible for foot hunters (Burke 2008; Olsen 1989). The rugged topography of the volcanic apparatus scattered across

the plains of the Pali-Aike Volcanic Field made the use of these tactics plausible (Figures 6, 7). The use of long-distance weapons needs to be considered to explain a regular supply of horses and camelids, and fishtail projectile points and spearthrowers are good candidates. Studies were made for fishtails from other regions, where the analysis of impact fractures, fatty acids and sterols showed that it is possible to consider them as hunting weapons (Flegenheimer and Weitzel 2017). Two cases at Cueva del Medio, in Patagonia, are worth mentioning. One complete Fell Cave projectile point presents an impact fracture on the tip, while a stem presents a fracture probably produced by an impact (Nami 2019:16). Even more important, Nami (1998) also observed fractures associated with use in the fishtails from Fell Cave. In this context, we must also mention an experiment with thrusting weapons tipped with fishtails, which concluded that these points were resistant, and liable to resharpening (Flegenheimer et al. 2010). Indeed, resharpening of fishtails was important at Fell Cave (Nami 1998; Politis 1991). On the other hand, much discussion exists about the existence of spearthrowers at the end of the Pleistocene. Scheinsohn (2016) mentioned two spearthrower hooks from Fell Cave, recovered



Figure 6. General view of the Pali-Aike Volcanic Field, Pali-Aike National Park, Chile.

*Vista general del Campo Volcánico Pali-Aike. Parque Nacional Pali-Aike, Chile.*



Figure 7. Troop of guanacos at the Pali-Aike National Park, Chile.

*Tropa de guanacos en el Parque Nacional Pali-Aike, Chile.*

at Layers 12 and 11, above the initial occupations, as well as hooks found at Early Holocene layers of Cerro Casa de Piedra 7 in Santa Cruz and Baño Nuevo in Aisén. Also, one bone object, possibly a foreshaft (V. Scheinsohn, personal communication 2007) was recovered by Bird at the lower layers of Fell Cave and another was found by the French Mission (Empereire et al. 1963). These are similar to bone pieces used as parts of spearthrower projectiles (Frison 2004; Nami 2010; Scheinsohn 2010). Therefore, no local record can be invoked to assess the existence of these weapons at the end of the Pleistocene, beyond its plausibility. An alternative to be considered is the use of these points as heads of lances or javalines, weapons more difficult to use successfully against fast prey like horses. The issue is still open to discussion.

### *Mylodon*

241 Mylodontinae specimens are recorded at the AMNH, of which 29 are skeletal bones and 212 are osteoderms (Table 7). 234 sloth bones are mentioned in the list made by Amorosi (Bird 1988:158), 230 of which are osteoderms. From the CEHA collection there are 22 Mylodontinae bones, only three of which are osteoderms, but proportions are less reliable in

Table 7. NISP values for *Mylodon*. AMNH collection.  
*Valores de NISP para Mylodon. Colección AMNH.*

Element	<i>Mylodon darwini</i>	Mylodontinae cf. <i>Mylodon</i>	Mammalia cf. <i>Mylodon</i>	Total
Skull			1	1
Teeth	3			3
Vertebrae		1		1
Rib		2	6	8
Humerus		1		1
Femur			1	1
Fibula			1	1
Indeterminate long bone			1	1
Osteoderm		212		212
Indeterminate			12	12
Total	3	215	22	241

this collection. Importantly, out of 19 Mylodontinae bones from the CEHA, 15 are from juveniles. At least two juveniles, a very small individual and one large adult, are represented (Martín 2013) by two juvenile innominates and two juvenile calcanea from the same side, and a fragment of a very large innominate that has been gnawed heavily by carnivores. A majority

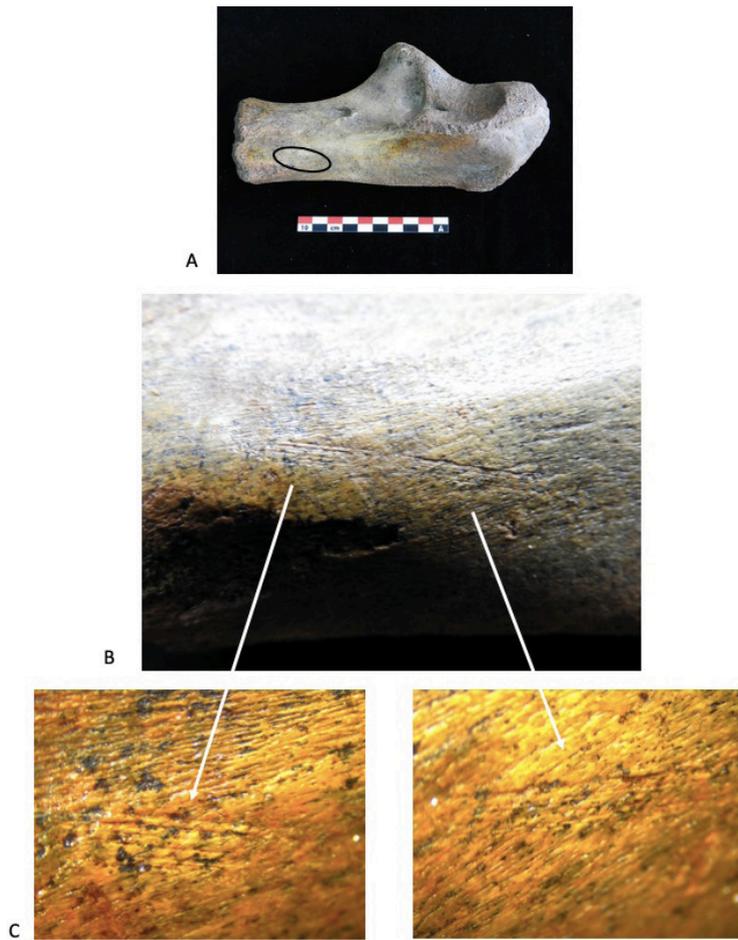


Figure 8. (A) *Mylodon* juvenile ulna with cutmarks, (B and C) details of cutmarks. CEHA Collection.

(A) *Ulna de Mylodon juvenil con huellas de corte, (B y C) detalles de las huellas de corte. Colección CEHA.*

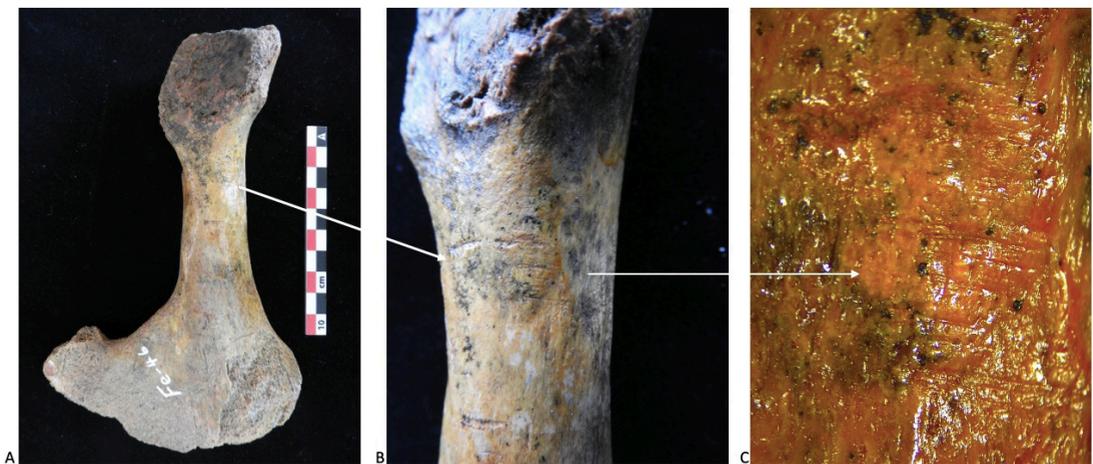


Figure 9. (A) *Mylodon* juvenile coxal with cutmarks, (B and C) details of cutmarks. CEHA Collection.

(A) *Coxal de Mylodon juvenil con huellas de corte, (B y C) detalles de las huellas de corte. Colección CEHA.*

of sloth juveniles are also present in the AMNH collection.

Out of the 19 Mylodontinae bones recorded by Martin (2013:104) from the CEHA collection, only two specimens present large carnivore marks (10,5%). Two *Myiodon* bones with cutmarks were recorded at the AMNH (7,6%, excluding teeth and osteoderms) (Tables 2, 3). Cutmarks on two sloth bones were also observed from the CEHA collection, particularly on the smallest juvenile (Figures 8, 9). These are among the few existing records in South Patagonia together with that of Piedra Museo. Out of six sloth bones, only one rib presents cutmarks at Piedra Museo (Marchionni and Vázquez 2012). At Fell Cave, there are not only cutmarks, but also a good representation of *Myiodon* skeletal bones, where both skull and postcranial bones are represented, together with the already mentioned importance of juveniles. The representation of juvenile megamammals is not fortuitous, since they are the expected prey for humans. In comparison, *Myiodon* bones are not abundant at sites formed by carnivores, which generally are dominated by osteoderms and small bones such as carpal-tarsals and phalanges. All this information is concordant with Bird's interpretation that, at Fell Cave, sloths were behaviorally associated with human activities.

The frequency of carnivore marks on *Myiodon* bones in both collections from Fell Cave is very small, in comparison with those recorded at carnivore dens. Anyway, our previous inference about the absence of large carnivores modifying bones of horses or camelids lends support to our previous interpretation of the *Myiodon* bones resulting from scavenging episodes occurring outside of the cave (Martin 2012). *Myiodon* was probably a dangerous and costly prey to pursue. The use of spearthrowers and darts is a possibility for large mammals, but it was probably inadequate for animals equipped with an armor of osteoderms such as sloths. An alternative is the use of lances, which appears to offer a way to approach an animal with strong claws, protected by an osseous shield (Borrero and Martin 2012). Giving all these conditions, preying on the young makes complete sense.

Fell Cave is characterized by a relatively high frequency of *Myiodon* bones in comparison with osteoderms. On the other hand, it appears that carnivores were not transporting to their dens many *Myiodon* bones, except for juveniles as well as pieces of skin, as at Cueva Lago Sofia 4, where more than 4,000 osteoderms were recorded (Borrero et al. 1997). It is possible that the

Table 8. NISP values for Mammalia indeterminate. AMNH collection.

*Valores de NISP para Mammalia Indeterminados, Colección AMNH.*

Element	NISP
Skull	14
Maxilla	2
Mandible	1
Teeth	3
Vertebrae	54
Rib	40
Innominate	4
Scapula	1
Humerus	1
Femur	3
Tibia	1
Metapodial	6
Carpals-tarsals	1
Indeterminate	132
Total	263

transport of meat and a few bones, excluding the skin, was the rule for hunter-gatherers dealing with sloths.

### *Mammalia*

Bones of several megamammals are included within this category (Table 8). Only one Mammalia diaphysis presents anthropic marks from the CEHA collections (cutmarks, chop marks, and percussion marks) [5,5% (1:18)]. In comparison, the AMNH collection presents higher frequencies of cutmarks (3,46%) (Figure 10, Table 2). A higher frequency of burnt and calcinated Mammalia bones must also be noted, confirming the impression that fire was an important factor for taxonomic identification. Beyond those burnt bones, there are also many non-diagnostic fragments of ribs and vertebrae, as is common in Late Pleistocene archaeological and paleontological sites in southern Patagonia. Using Bird's field locational information, we observed that the higher frequencies of burnt and calcinated bones for Layer V are found at F6 and F7, with materials in and near fireplaces 2 and 3 respectively.

### Discussion

According to Bird, a sterile deposit varying in thickness between 38 and 70 cm separates the

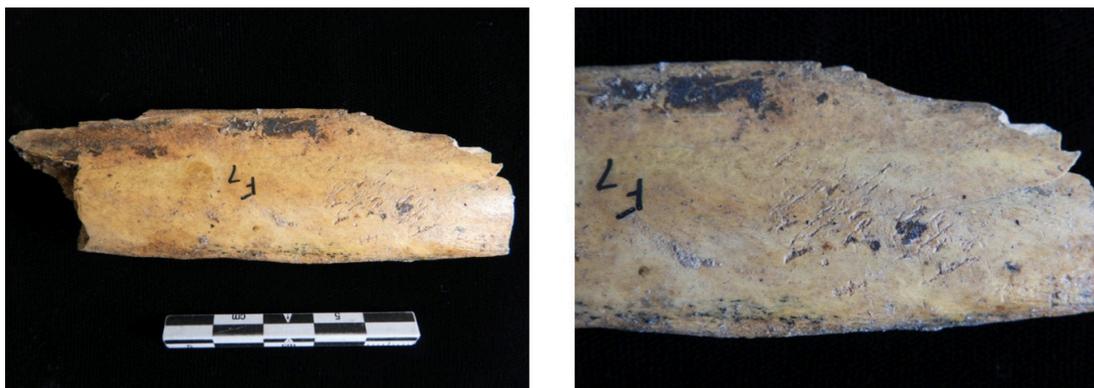


Figure 10. Mammalia rib and detail of chopping marks, Layer V, F7 zone, fireplace 3. Artifact catalog number SAA/0970 A01. Image Courtesy of the Division of Anthropology, American Museum of Natural History, New York.

*Costilla de Mammalia y detalle de marcas de percusión, Layer V, zone F7, fogón 3. Número de catálogo de artefactos SAA/0970 A01. Imágenes cortesía de Division of Anthropology, American Museum of Natural History.*

lower occupations of the site from the layers above, representing an unknown time interval (Bird 1988:134, 139). This layer was mainly formed by the already mentioned rock fall. Borrero (1994-1995) suggested that, given its catastrophic nature, this event should have been very short. However, Bird also explained that “it was not until the gradual accumulation of small stones and dirt had leveled it up again that it was [used] once more” (Bird 1988:142). Therefore, even when the fall was probably a short event, the deposition of this sterile layer took some time. As we already observed, the rock fall did not cover the whole of the site floor (Figure 4), thus making it difficult to compare sequences recorded at different sections at the cave. In fact, Bird did not find a comparable deposit of fallen rocks during his 1969-1970 excavations, except outside the drip line<sup>3</sup>.

Moreover, Bird dug through this sterile deposit, and his Layer IV above produced the lower material count of the sequence (Bird 1988:145). His Period II was defined on the basis of the materials recovered in Layer IV, and we already mentioned the existing difficulties for accepting it as a valid cultural unit. The lithic finds in 1969-1970 (Bird 1988:176-179) indicate that, except for scrapers, he found very little in layers 18, 19 and 20, and only a little more in layer 17 (which also has extinct mammal bones, as for Layer 16 above). Two “bone/lance points” were found in Layer 17, but Hyslop indicates that they are probably bone awls (Bird 1988:179). We already saw Scheinsohn’s reinterpretation of one “bone point” recovered by Bird from his Period II. We therefore have a situation in which the notion

of a Period II probably needs to be forgotten, but we still need to understand the significance of the tools found in those layers.

Archaeological findings from both main field seasons led by Bird differ substantially in their significance. One important difference is in regard to the 15 fishtail projectile points recovered during the first season (to which four recovered by the French Mission must be added) compared with only one (Layer 20) recovered in 1969-1970. This is not necessarily unexpected, since different parts of a site should differ in intensity of use and rate of tool deposition. However, in this particular case, we must recall that Bird was finding it difficult to isolate his initial occupation layers giving the dearth of recognizable materials.

These reasons, and others offered above, lead us to sustain that the sample obtained by Bird in his last campaign at the site was from layer 17, which was indeed above the rock fall, separated by rocks at some places of the site, and only by dirt at others. His radiocarbon date (I-5146), as well as the redating results by Waters and collaborators (2015) fall within the Late Pleistocene, which is also the case for the date obtained by Martin (2012) for her bone sample from the 1969-1970 collection.

In synthesis, a rich deposit of lithics and bones was recovered from the lower layers during the 1936-1937 field season, and these results were not reproduced in 1969-1970, probably showing differences in the deposition rate of dirt and/or tools.

The older date published by Bird immediately above his sterile deposit is  $9100 \pm 150$  <sup>14</sup>C years BP

(I-5144) for his Layer 13, which is not assigned to a Period by Hyslop (Bird 1988:187). Its provenience is from Layer 13, but the date is wedge between Periods I and II. Hyslop published a footnote for sample I-5145 [9030 ± 230 BP] (Layer 17, assigned to Period II) explaining that the soil and charcoal of the sample could not be separated in the lab, and that the sample was small and had to be diluted for the counting. All this means that the chronology of Period II is far from clear.

The significance of our reassignment of Bird's Sample I-5146 and the corresponding new dates obtained by Waters et al. to Layer 17 is a merging of at least part of what Bird called Period II with his Period I. If this is so, then the seal hypothesis about the rockfall protecting the remains of the early occupations does not appear to be completely sustained. In several sectors of the cave, there was simply no layer of rocks separating the earliest layers from above, as evident by inspecting Bird's field drawing of the profile of his 1969-1970 excavations (Bird 1988:180-181). Therefore, according to our reading of the stratigraphy, there are three radiocarbon samples (plus I-5146 by Bird) indicating human use of the cave at the end of the Pleistocene, and these occupations occurred after the rock fall that covered part of the lower floor. The presence of extinct fauna in those layers can be seen as confirmatory. Accordingly, at least part of the materials assigned to Period II belong in fact to the initial occupations of the shelter. The use of the rock fall as a marker probably disoriented Bird during his 1969-1970 fieldwork. Independently of the number of occupation events, always a tricky subject, deposits that can be identified with the presence of extinct fauna persisted longer in the sequence of the cave than originally established. As we have seen, this does not mean that those layers dated to the Holocene or were the result of vertical migration.

Bird mentions that the original floor of the first occupations excavated in 1969-1970 contained several bones and that hearths contained broken and burnt horse, ground sloth and guanaco bones. The presence of horse bones "so far down" in the site was initially shocking for Bird (Field notes, January 2-5 1937) and he was trying to find an explanation in the potential vertical migration of European horse bones. But he noticed that the bones belonged to a slightly smaller, stocky horse, and finally recognized that he had stumbled across the first evidence for hunted and consumed American horse by humans. Bird was also impressed with the association of horses and ground

sloths. Given the evidences of human interaction with both animals, the importance of this unusual assemblage is even more appreciated.

During Bird's last excavation at the cave, on January 27, 1970 he observed that a horse foot bone and two fragments of sloth bone found near a hearth "marked the highest occurrence of such remains in the deposit" (Bird 1988:187). He did not consider this as proof of Holocene survival, but of probable vertical migration of bones. We already saw how Bird was trying in 1969-1970 to explain the presence of extinct fauna in Layer 17 as the result of people digging the soil to prepare hearths. At that time he was trying to explain the presence of extinct fauna bones in layers that he considered to be Holocene. This forced interpretation of the movement of large mammals bones while making hearths is no longer needed. As we discussed above, the available evidence now suggests not only that Period II does not describe any significant and different cultural unit, but also that those layers were deposited at the end of the Pleistocene and were at least in part related with the initial occupations of the site.

We already saw that the faunal remains recovered from those early layers of Fell Cave are well preserved and are adequate for some inferences. The presence of *Lama gracilis*, with very few records in Fuego-Patagonia, is a confirmation of regular -but not intensive- interaction with humans. The proportion of horse/camelids was a surprise, marking the first patagonian site at which the horse is dominant. On the other hand, analysis of the bones recovered during the 1936-1937 fieldwork not only sustains the argument for human interaction with ground sloths, adding another two bones with cutmarks, but also shows that the previous argument about ground sloth parts collected by humans at felid kill sites remains possible (Martín 2012).

We have already mentioned the importance of the use of bones as fuel to explain the fragmentation of the bone assemblage. This is the first evidence, based on a relatively large sample of burned bones, of this tactic in Fuego-Patagonia. The use of bones for hearths is a recurrent tactic in cold environments, and as such, it is an important marker of human adaptations in high latitude environments.

Finally, we should mention that test pits have recently been made in front of Fell Cave showing that sediments of a relatively old age are present outside the cave, including evidences for possible Early Holocene open-air occupations (Martín and

San Román 2010). Of course, early human occupation outside the cave cannot be discarded, but it will be difficult to substantiate. 44 meters away from the cave, within the alluvial plain, we recorded archaeological evidences between 20 and 100 cm deep. Immediately below those materials, between a depth of 120 and 130 cm, a *Pseudalopex* sp. left upper canine recovered and dated to  $8400 \pm 50$   $^{14}\text{C}$  years BP (Beta 259596). Between the locus of these findings and the Chico River, a peat layer dated to  $8090 \pm 40$  BP (Beta-247715) was found 130-140 cm deep and, further up the river, we have dated evidences of Late Pleistocene sediments (Martin and San Román 2010). These are reasons to be optimistic about the possibilities of identifying open air archeological loci in the future.

### Conclusions

Junius Bird worked in two different worlds, before and after the radiocarbon revolution. He made all conceivable efforts to reconcile both and it can be said that he was successful. His Fell Cave sequence provided a backbone for Patagonian archaeology for decades, but inevitably the advance of Patagonian archaeology required adjustments, including those that we present here.

Cutmarks were recorded on all the large mammal taxa present in the initial occupations, *Mylodon*, *Hippidion saldiasi* and camelids. Moreover, these cutmarks are more abundant when compared with those recorded at contemporary early sites such as Cueva del Medio, Cueva Lago Sofía 1 and Tres Arroyos 1. what this indicates is that the qualification of Fell Cave as an occupational node made based on the frequencies of lithics and hearths (Borrero and Martin 2021) can be sustained by the faunal remains.

In spite of both chronological and stratigraphic evidences for discontinuity, there is no recorded major cultural change, at least up to Layer 16. Late Pleistocene chronologies, extinct mammals and excavated hearths continue to characterize those layers above the rock fall. Only the changing frequencies of bones and lithic tools, including projectile points, are different, probably the result of changes in the intensity of use of the shelter.

Our interpretation of the complicated sequence at Fell Cave is that at least part of the materials that Bird attributed to his Period II are not distinguishable from those from his Period I. The evidence that the rockfall did not affect the entire floor of the cave, plus

other arguments presented above, lead us to sustain that his Period I is represented at least up to his Layer 17, and perhaps 16. Accordingly, human occupation from the Late Pleistocene was still reliant on extinct fauna for their subsistence after the rock fall.

In summary, the importance of Fell Cave is fully confirmed. The evidence for even more intensive use than previously considered underscores its role within the archaeology not only within the Pali-Aike Volcanic Field, but also in Southern Patagonia. The magnitude of this intensity is highlighted when compared with the rest of the early sites in South Patagonia. Moreover, the dominant role of horses within the human diet opens alternatives for our understanding of the significance and location of habitational places. Confirmation of the elusive ground sloths within the diet points in a similar direction. It must be added that this primal role of Fell Cave for our models of early human peopling is amplified to the whole Holocene by the significance of the long sequence of recorded occupations.

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## Notes

<sup>1</sup> It must be noted that Bird (1988:212) entertained the possibility that the individuals buried in Cerro Sota were killed by the rock fall at Fell Cave. For some time it was considered that those bones were of Late Pleistocene age (Bird 1938; Turner 1992), until three samples of human bone were dated around 3700 <sup>14</sup>C years BP (Hedges et al. 1992).

<sup>2</sup> Horse deciduous teeth were also found.

<sup>3</sup> The available radiocarbon information sustains the existence of a chronological discontinuity in the occupation of the shelter, while the information about the sterile deposit indicates a stratigraphic discontinuity in at least some sectors of the site (O'Connor et al. 1999).