



**HAL**  
open science

# Rock art, marine hunting and harpoon devices from the Atacama Desert coast, northern Chile

Benjamin Ballester

► **To cite this version:**

Benjamin Ballester. Rock art, marine hunting and harpoon devices from the Atacama Desert coast, northern Chile. Sang-mog Lee. Whale on the Rock II, Ulsan Petroglyph Museum, pp.93-115, 2018, 979-11-964700-3-6. <hal-02870753>

**HAL Id: hal-02870753**

**<https://hal.science/hal-02870753v1>**

Submitted on 24 Jun 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

한국의 선사미술 II | Korean Prehistoric Art II |



# 고래와 바위그림 II

WHALE ON THE ROCK II



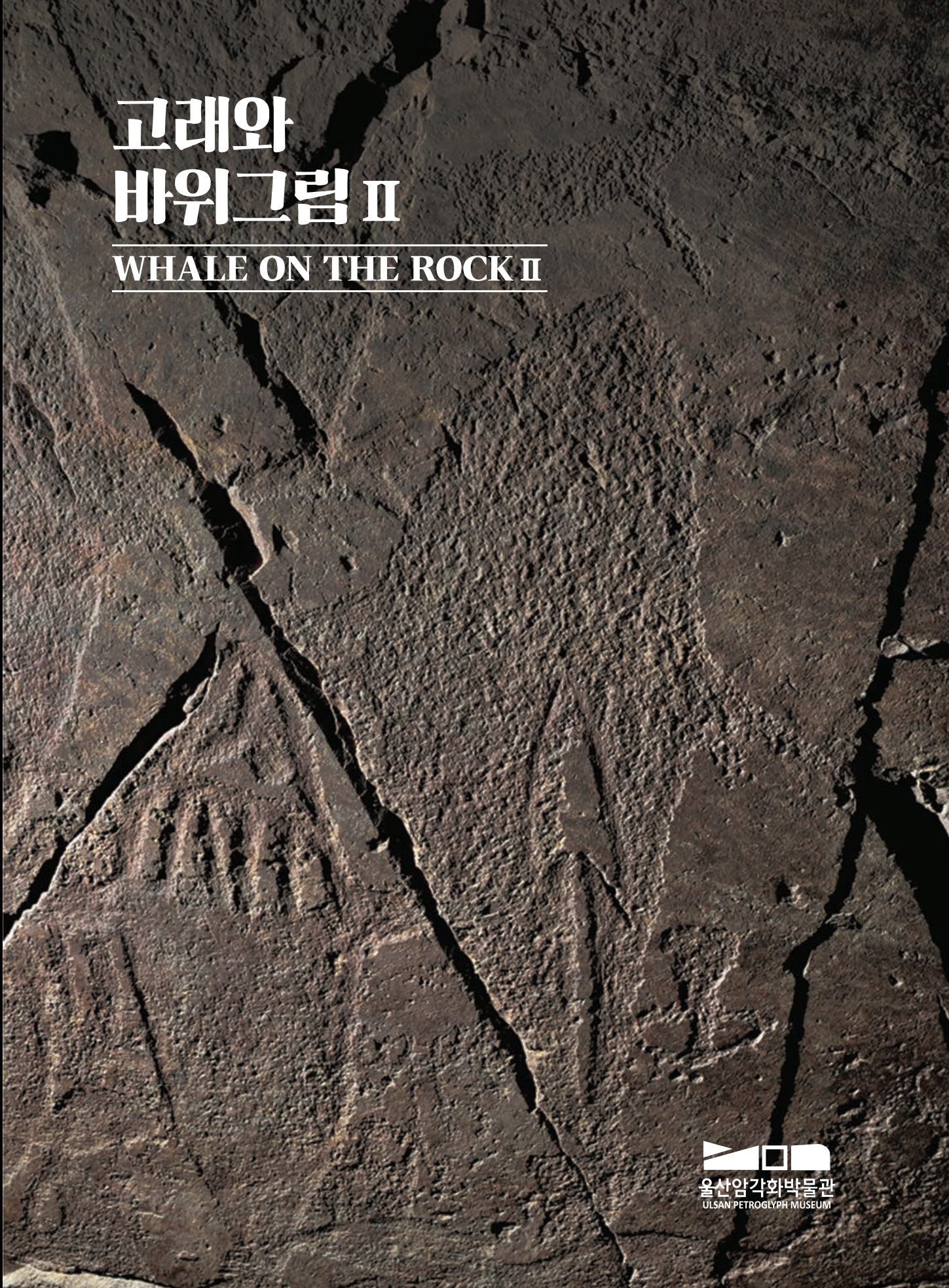
비매품 / 무료  
9 791196 470036 93900  
ISBN 979-11-964700-3-6

울산암각화박물관  
ULSAN PETROGLYPH MUSEUM

고래와 바위그림 II WHALE ON THE ROCK II

# 고래와 바위그림 II

WHALE ON THE ROCK II



한국의 선사미술 II | Korean Prehistoric Art II |

# 고래와 바위그림 II

WHALE ON THE ROCK II



한국의 선사미술 II

# 고래와 바위그림 II

총괄	이상목
진행	이현정
교정, 교열	이현정, 박준철
지원	박준철, 이일락, 박수진, 공서연
번역	GNM
자료 제공	부산북천박물관
행정지원	오경용, 박해경
편집/인쇄	그린애드컴
발행처	울산암각화박물관 울산광역시 울주군 두동면 반구대안길 254 전화 052-229-4797 팩스 052-229-4799 <a href="http://bangudae.ulsan.go.kr/">http://bangudae.ulsan.go.kr/</a>
발행일	2018년 12월 14일
발간등록번호	57-6310000-000626-01
ISBN	979-11-964700-3-6

## 일러두기

1. 이 책은 암각화 전문 국제학술지로, 울산암각화박물관 2018년 대곡천 암각화 국제학술대회(2018년 10월 23일 개최) 발표 원고와 추가 원고를 수정 보완하여 수록하였다.
2. 인명, 지명 등 고유명사는 가능한 한 우리말 발음을 표기하고, 필요한 경우 원어를 병행하여 표기하였다.
3. 학술지에 게재된 사진과 도면 등의 저작권은 명시된 소유자들에게 있으며, 무단 복제 및 다른 용도로 사용하는 것을 금한다.

Korean Prehistoric Art II

# WHALE ON THE ROCK II

**Publication**

Ulsan Petroglyph Museum

254, Bangudae-angil, Dudong-myeon, Ulju-gun, Ulsan Metropolitan City

TEL. +82-52-229-4797

FAX. +82-52-229-4799

<http://bangudae.ulsan.go.kr/>

**Publication date**

2018. 12. 14.

**ISBN**

979-11-964700-3-6

**Note**

---

1. This book is an international academic journal specialized in petroglyphs, and contains a revised version of manuscripts from the Ulsan Petroglyph Museum's 2018 Daegokcheon Petroglyphs International Symposium (held on October 23rd, 2018).
2. Proper nouns including personal names and place names are written as they are pronounced in Korean, and the original words are written in parallel if necessary.
3. The copyrights of photographs and drawings in the journal are owned by specified copyright holders, and reproduction of materials and use for other purposes without permission are prohibited.

---

## 집필진

**클레어 알릭스**

프랑스 파리 1 대학교

**오웬 메이슨**

미국 콜로라도 대학교

**로렌 노르만**

미국 캔자스 대학교

**벤자민 발레스터**

프랑스 파리 1 대학교

**황상일**

경북대학교 지리학과

**윤순옥**

경희대학교 지리학과

**얀 마그네 예르테**

노르웨이 트롬쇠 대학교

**엘레나 미클라쎬비치**

러시아 톰스카야 피자니사 박물관

**나제즈다 로바노바**

러시아 과학 아카데미 산하 카렐리아 연구센터

**벵상 샤르팡티에**

프랑스 국립예방고고학연구소

**강봉원**

경주대학교 문화재학과

---

## Contributors

**Claire Alix**

Archeology of the Americas, University of Paris 1, Panthéon Sorbonne, FRANCE

**Owen K. Mason**

Institute of Arctic and Alpine Research(INSTAAR), University of Colorado, USA

**Lauren E. Y. Norman**

Department of Anthropology, University of Kansas, USA

**Benjamín Ballester**

Prehistoric Ethnology, University of Paris 1, Panthéon Sorbonne, FRANCE

**Hwang Sang-ill**

Department of Geography, Kyungpook National University, S.KOREA

**Yoon Soon-ock**

Department of Geography, KyungHee University, S.KOREA

**Jan Magne Gjerde**

UiT - The Arctic University, NORWAY

**Elena Miklashevich**

Museum-reserve "Tomskaya Pisanitsa", RUSSIA

**Nadežda Lobanova**

Karelian Research Centre of the Russian Academy of Sciences, RUSSIA

**Vincent Charpentier**

French National Institute for Preventive Archaeological Research(Inrap), FRANCE

**Kang Bongwon**

Department of Cultural Resources Studies, Gyeongju University, S.KOREA

---

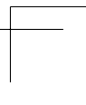
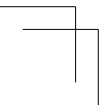
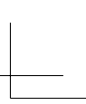
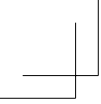
## 목 차

- 11 . 알래스카 북서부의 고래, 나무, 고래수염  
- 라이징 웨일 유적의 목재와 선박기술로 본 고래잡이 -  
클레어 알릭스 | 프랑스 파리 1 대학교  
오웬 메이슨 | 미국 콜로라도 대학교  
로렌 노르만 | 미국 캔자스 대학교
- 69 . 칠레 북부 아타카마 사막 연안의 바위그림, 해양 수렵 그리고 작살도구  
벤자민 발레스터 | 프랑스 파리 1 대학교
- 117 . 홀로세 울산지역의 해안환경 변화와 반구대 암각화  
황상일 | 경북대학교 지리학과  
윤순옥 | 경희대학교 지리학과
- 177 . 유럽 최북단 노르웨이 알타 지역 해양 포유류 암각화  
안 마그네 예르데 | 노르웨이 트롬쇠 대학교
- 209 . 라브도니카스의 카렐리아 암각화 탁본과 석고 모형,  
그리고 바위 예술 복제본에 관한 현대적 가능성  
엘레나 미클라셰비치 | 러시아 톰스키아 피자니사 박물관
- 269 . 오네가 호수 바위의 벨루가 고래  
나제즈다 로바노바 | 러시아 과학 아카데미 산하 카렐리아 연구센터
- 297 . 선사시대 후기 아라비아의 고래 사냥 (기원전 6500-2000년)  
뱅상 샤프팡티에 | 프랑스 국립예방고고학연구소
- 343 . 반구대 암각화와 한반도 동남부지역 고래사냥  
강봉원 | 경주대학교 문화재학과

---

## Contents

. Whales, Wood and Baleen in Northwestern Alaska - Reflection on Whaling through Wood and Boat Technology at the Rising Whale site -	41
Claire Alix   University of Paris 1 Panthéon Sorbonne, FRANCE Owen K. Mason   University of Colorado, USA Lauren E. Y. Norman   University of Kansas, USA	
. Rock art, marine hunting and harpoon devices from the Atacama Desert coast, northern Chile	93
Benjamín Ballester   University of Paris 1 Panthéon Sorbonne, FRANCE	
. Changes in the Coastal Environment of the Holocene Ulsan Region and Bangudae Petroglyphs	143
Hwang Sang-ill   Kyungpook National University, S.KOREA Yoon Soon-ock   KyungHee University, S.KOREA	
. Marine Mammals in the Rock Art of Alta, Norway, Northernmost Europe	193
Jan Magne Gjerde   UiT – The Arctic University, NORWAY	
Paper imprints and plaster casts of Karelian petroglyphs by V. Ravdonikas and modern possibilities for facsimile copying of rock art	239
Elena Miklashevich   Museum-reserve “Tomskaya Pisanitsa”, RUSSIA	
. Beluga Whale on the Onega Lake rocks	283
Nadežda Lobanova   Karelian Research Centre of the Russian Academy of Sciences, RUSSIA	
. Whaling in late Prehistoric Arabia (6500-2000 BCE)	321
Vincent Charpentier   French National Institute for Preventive Archaeological Research(Inrap), FRANCE	
. The Bangudae Petroglyphs and Whaling in the Southeastern Part of Korea	363
Kang Bongwon   Gyeongju University, S.KOREA	



# Rock art, marine hunting and harpoon devices from the Atacama Desert coast, northern Chile

Benjamín Ballester

University of Paris 1 Panthéon Sorbonne, FRANCE

## Introduction

Social representations could be transformed, inverted or distorted, but they are always linked to their producer's reality. This theoretical premise guide the following essay. A reflection about a particular rock art focused in a marine hunting thematic and the archaeological remains involved in the marine hunting activities, both produced by the same coastal society located in the Atacama Desert coast, at northern Chile. The main goal of the essay, is to make an attempt to create a correlation between prehispanic visual manifestations and their material conditions, non as a way to literally explain or read the images over the rock, but as a way to put them into a social context of production and consumption.

The Atacama Desert coast bond together one of the most arid and dry terrestrial environments with probably the richest littoral ecosystem of the world. Here, in this large and strait coastal plain, human collectives had inhabited from almost 11000 years before present following a coastal way of life, based in marine wild resources and their social interaction with inland people from the South Andean valleys and oasis. At the European arrival moment, in the XVI century, this people was described as a society specialized in marine and littoral fishing, hunting and gathering, an extremely different social panorama to the traditional Andean

Civilization. The image created by the outsiders reflects the idea of a simple hunter gatherer society organized in bands, in contrast of their inland neighbors, characterized as complex agropastoral villagers.

One of the main topics of this essay is try to demystify the Eurocentric conception behind the archaeological and historical perspective of this coastal society. The efforts would be centered in demonstrate that they were not as simple as the traditional perspective assume. We would start from the study of their principal pictorial manifestation, El Médano rock art style, especially its landscape location, geographical distribution, characteristics, compositions, sites, and from the motifs, the species identification, technical devices and marine hunting strategies. The following step would be the study of the archaeological evidence directly involved in marine hunting activities, particularly technical devices as harpoons, ropes and rafts recovered from different archaeological sites of the region. Finally, the essay would close in a discussion that mix both practical and ideological spheres into a single global reflection about this society, using at the same time archaeological and historical sources.

## **El Médano rock art style**

The most famous rock art expression of the Atacama Desert coast is El Médano style (Figure 1), a naturalistic and figurative set of visual manifestations whose thematic is almost exclusively restricted to the sea (Ballester 2018, Ballester & Gallardo 2016, Berenguer 2009, Contreras y Núñez 2008, Mostny & Niemeyer 1983, 1984, Niemeyer 2010, Núñez & Contreras 2008). This particular rock art is characterized by red paintings located in ravines, rockshelters and isolated blocks at different distances from the coast. Between the pictorial set of rupestrian images, marine motifs are the most popular, especially pisiform figures and marine hunting scenes composed by sea animals, rafts and harpoon lines. From the sea animal motifs different species can be distinguished, as whales, sharks, dauphins, swordfishes, squids, sea turtles and otarides, between others (see later). The hunting scenes are extremely detailed, carefully expressing the number of rafts and their human crew, but also the number of harpoon lines and the target in the sea animal's body.



Figure 1. Hunting scenes from El Médano rock art in the homonymous ravine (Photography by Francisco Gallardo).

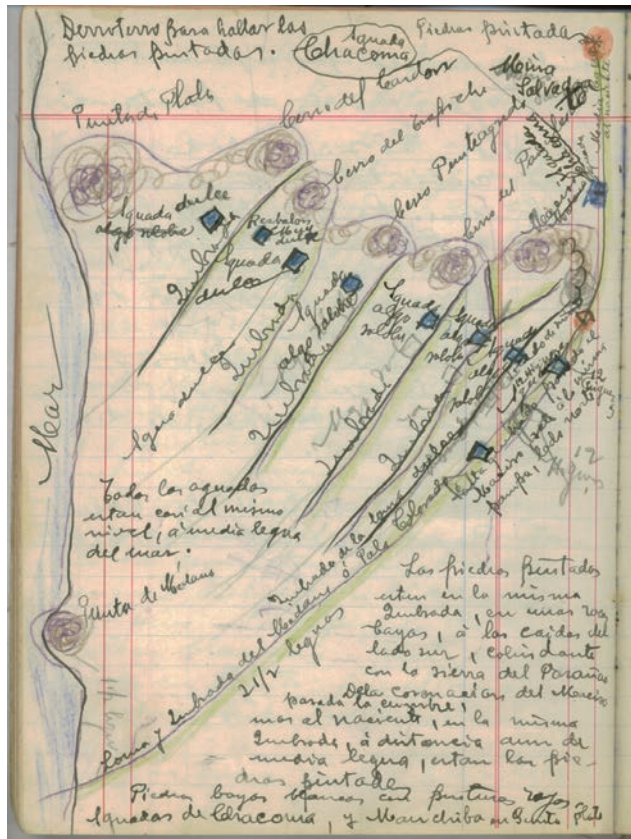


Figure 2. Freehand map drawing of El Médano paintings location made by Augusto Capdeville (1918) (courtesy by Rodolfo Contreras).

## El Médano Rock Art history

The first discovery of El Médano paintings was in a homonym ravine located near the fishermen town of Paposo, at northern Chile, in 1918, by the archaeologist Augusto Capdeville Rojas. According to its field notes (Capdeville 1918) the paintings were located five leagues north from this town, and two or three leagues to the interior desert by the coast (Figure 2). To arrive, two days of travel on foot was necessary starting from Paposo. The rock art was made with red ochre over white rocks, composed by motifs of “fishing nets”, “rafts”, “llamas or guanacos herds”, and “several Indians pointing the guanacos with arrows, some of them kneeling, and others throwing harpoons to big fishes (swordfishes), maybe whales, and other from their boats, picking fishes with lines” (Capdeville 1918:76-77). Even if his field notes had remain until now unknown, a brief mention of the paintings was published some years later in an Ecuadorian

bulletin (Capdeville 1923).

Fifty five years later another archaeologist, Hans Niemeyer, rediscover the El Médano site thanks to the information given by a Paposo local miner (Niemeyer 2010). Apparently Niemeyer never knew about Capdeville's previous discovery. In this opportunity the site and their paintings was published with more detail and in different academic circles, acquiring a relative mayor importance and becoming more protagonist into the Chilean archaeology (Mostny & Niemeyer 1983, 1984, Niemeyer 1977, 1980, 1989, 2010).

After him, different archaeologist had return to the site to restudy it. During the 2000 decade, a research group from the Museo Augusto Capdeville Rojas of Taltal perform new studies in the site, linking it with other rock art manifestations from Taltal and Paposo, including ravines and rock shelters, geographically expanding their visual expression out from the pristine site (Núñez & Contreras 2003, 2006, 2008). Their approach was also different, because they propose an anthropological and interpretative reflection about the paintings, related to ceremonial and ritual practices of the prehispanic coastal hunter gatherers (Contreras *et al.* 2008).

At the end of the same decade, José Berenguer (2009) publish a synthesis of the El Médano rock art style based principally in Hans Niemeyer field notes (Niemeyer 2010). His work mix the rock art with local and non-local ethnographic and archaeological information, constructing a more elaborate and rich understanding of this rock art into its historical, geographical and social context. Practically at the same time, another research team led by Francisco Gallardo arrive to El Médano. Their work could be described as an archaeology of art perspective, comparing the El Médano visual manifestations with other rock art expressions from the Atacama Desert, to understand from this particular materiality the interactions spheres and information flows along a vast region and between different human collectives (Gallardo 2018, Gallardo *et al.* 2012).

During the 2010 decade new discoveries and others research teams appears in scene. José Castelleti, after a long career as archaeologist in Taltal and Paposo (Castelleti 2007, Castelleti & Maltraín 2010, Castelleti *et al.* 2010), start to study the El Médano rock art. His work was focused into two different aspects. On the one hand, the analysis of the paintings material composition, an effort started first by Hans Niemeyer (1986) and then by Marcela Sepúlveda (Gallardo *et al.* 2012, Sepúlveda 2012), but with a special emphasis in the datation of the paintings (Castelleti *et al.* 2015, Goguitchaichvili *et al.* 2016); regrettably with several methodological and archaeological problems and inconsistencies (Ballester 2016, 2018a). On the other, a new perspective about

the relations between humans and whales in the prehistory based in the lecture of the rock art motifs.

Inside an extended archaeological project in Taltal (Salazar *et al.* 2015), the study of interior desert lithic workshops (Borie *et al.* 2017) had reveal the existence of a new rock art site from El Médano style distant 37 kilometers from the coast (Monroy *et al.* 2016). The association between lithic production activities and rock art manifestations open a new debate about their value and significance; but, even so, synchrony of both elements has not yet been proved and could be the result of different events separated in time. Nevertheless, this new site had extended the geographical distribution of El Médano paintings from the littoral rock shelters and coastal mountains ravines to the interior pampa.

In the same decade I begin working in El Médano rock art style. Associated with Francisco Gallardo, we start a project that comprehend this rock art manifestations into the social context, material culture and history of their marine hunter gatherers producers (Ballester 2018a, 2018b, Ballester & Gallardo 2015, 2016). In practical terms, the research has been focused in the stratigraphic excavation and datation of several rock shelters that present motifs ascribable to El Médano rock art (Ballester 2016), the discovery and study of new rock art sites nearly to El Médano classic site (Ballester 2018a, Ballester & Álvarez 2014/2015, Ballester & Gallardo 2016), and the finding of the first El Médano painting out of Paposo surroundings, located more than 250 kilometers north along the coast, near the Michilla port (Ballester *et al.* 2015).

## Rock art geographical distribution and site location

Even if the El Médano original site had define the rock art style geographical distribution for decades, today the panorama is completely different. After the new sites discoveries, there exist six ravines with paintings ascribable to this style in the coastal mountain range (El Médano, Izcuña, Botija, La Plata, Las Cañas, and San Ramón), in addition to four rock shelters adjacent to the coastline (Miguel Diaz, Punta de Plata, Loreto, and Guaque 01), and one site located in the pampa (Portezuelo 22) (Figure 3). Most part of them are restricted in 50 kilometers of coast, between Botija and Paposo, with another important concentration near the port of Taltal, almost 30 kilometers to the south, and finally one single painting located more than 250 kilometers to the north in Michilla. Overall, a distribution that reach 300 kilometers along the coast, including the shoreline, the mountain range and the desert pampa.

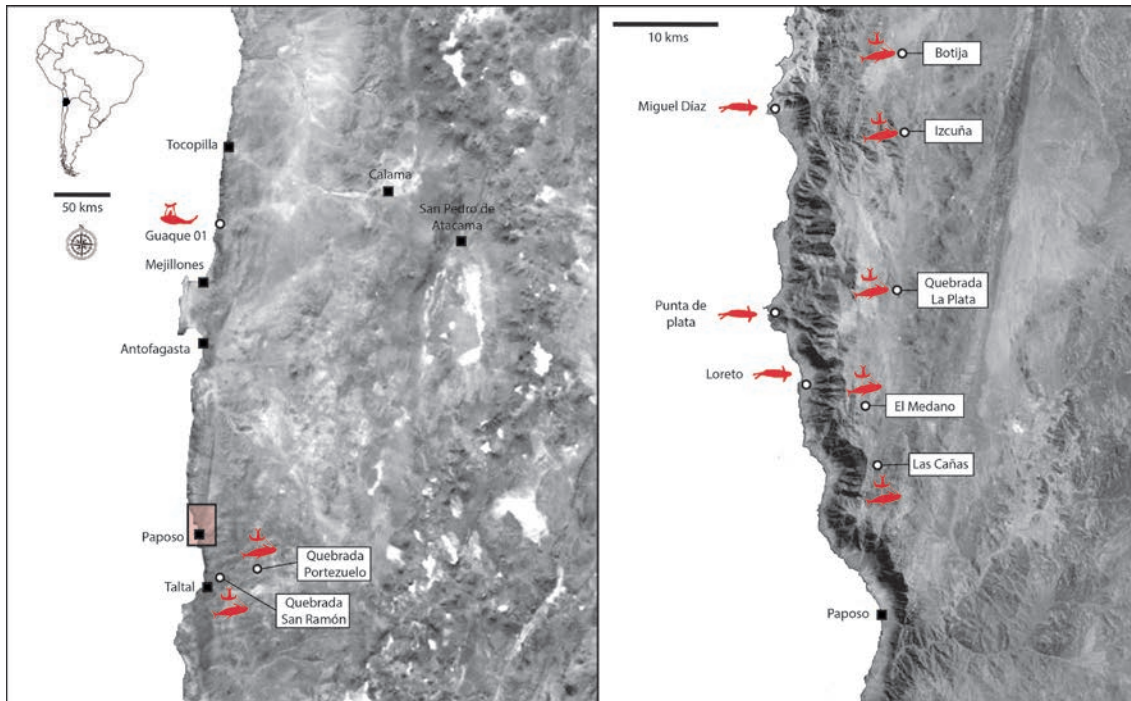


Figure 3. Location map of the archaeological sites with El Médano rock art paintings: (Left) General map; (right) zoom of the Paposo zone.

The major part of the paintings are located in steep ravines inside the coastal mountain range, between 600 and 1400 meters above the sea level, among 10 to 20 kilometers from the seashore to the interior desert (Figure 4). All ravines share similar geomorphological and environmental characteristics, with abrupt streams, high slope, and natural obstacles, converting them in complex trails for pedestrian displacement especially from the coast to the interior. In these sites the paintings are concentrated along the course of the ravine, oriented to the center of the stream, with high visibility due to the contrast between the red pigments over the light color rock supports. As an example, in less than 5 kilometers of the Izcua ravine, 300 motifs are painted over 74 panels, recoded in 24 blocks (Ballester 2018a). Similar paintings frequencies and concentration exist in El Médano ravine (Berenguer 2009, Niemeyer 2010).

Along the seashore four rock shelters present El Médano paintings, distant from the coast between 500 to 100 meters (Figure 3) (Ballester *et al.* 2015, Núñez & Contreras 2008). In general, they have reduce paintings concentrations (Miguel Díaz 8 panels, Punta de Plata 11 panels, Loreto 7 panels, and Guaque 01 only one panel). Paintings are placed in the interior shelter, especially in walls and roofs, but also in the exterior part of the rocky outcrop. The coastal



Figure 4. General view of the Paposos zone: (A) coastal mountain range; (B) coastal plain; (C) Izcuña ravine (Photographs by the author).

fog or camanchaca, the high humidity levels and the human reoccupation of the shelters, had altered most part of these paintings, leaving them in poor preservation conditions.

Until now only one site with these paintings has been documented in the pampa (Monroy *et al.* 2016). The site Portezuelo 22 is placed 37 kilometers from the coast at 1547 meters above the sea level. It include two sectors in an archaeological area of 2500 meters<sup>2</sup>, one of them composed by five rocky blocks with evident paintings done with red pigment. Pisiform representations, marine hunting scenes and abstract figures are expressed in eleven panels, regrettably there no exist a total motifs number for the site. Even if the paintings are placed inside a more extensive and complex archaeological site, there is no certainty about their contemporaneity or functional association, because they could be consequence of different occupations along the historical sequence or for diverse social purposes.

A century of discoveries among El Médano rock art show us that the actual geographical distribution would probably change if we increase the archaeological surveys and research programs in the region. The location of the rock art expression is one of the principal attributes

to comprehend the paintings values among their social and historical context, both at the production level, related to the agents and practices involved in the painting process, and at the consumption level, involving the link between images and their spectators.

## El Médano rock art sites

As an example of the archaeological characteristics of these sites, we present three recent study cases, two of them from ravine locations, and one from a coastal rock shelter.

### *Botija ravine*

The Botija ravine site was discovered in 2014, but remains almost unknown (Ballester & Álvarez 2014/2015). At 1380 meters above the sea level and 7 kilometers inland from the coast, in the middle section of the ravine stream, an isolated rectangular block of five meters long and two meters tall, shows red paintings in its four lateral faces (Figure 5). Over the panels is possible to distinguish cetaceans, sharks, and squids, some of them acting in hunting scenes with rafts (Figure 5A-B). Additionally, geometrical and abstract motifs are recognized, some of them rectangular and quadrangular figures with vertical internal subdivision and an upper vertical appendix (Figure 5B), singles and paired triangles, and horizontal rows of short vertical lines (Figure 5C).



Figure 5. Three different views of Botija principal rock art block.

Until now only this block has been registered in Botija, but the rest of the ravine continue unvisited. Archaeological surveys along the stream and its tributaries are still necessary to define the paintings number and density, especially if we consider that at the same latitude in the coast several residential and funerary archaeological sites has been identified (Mostny 1964).

### ***Punta Guaque 01 rock shelter***

More than 250 kilometers north from Paposo, near the Michilla mining port (Figure 3), an isolated painting attributable to El Médano rock art has been identified in 2011 (Ballester *et al.* 2015). The painting is placed inside an ephemeral rock shelter located in a small and width peninsula, at 100 meters from the seashore and 15 meters above the sea level (Figure 6A). Alongside the shelter, a middens of 1.5 meters tall and 375 meters<sup>2</sup> of surface demonstrate its occupation in the past. The painting contain only one hunting scene complex motif, composed by one raft without seafarer, drawn as an inverted semicircle, associated with a pisiform sea animal wish has one pectoral or dorsal fin and a heterocercal caudal fin<sup>1</sup> (Figure 6B). Two straight lines link both figures in a single scene, one starting from the raft stern and the other from the bow, trapping the animal from its head and medial part of the body, representing the harpoon lines.

But this is not the only archaeological site at Punta Guaque area. At least eight sites had been recognized in the peninsula, including domestic middens, cemeteries, lonely tombs, and others rock shelters from different period of the littoral sequence (Ballester *et al.* 2015). From one isolated tomb -called Punta Guaque 07- we had recover an archaeological oar made by a sophisticated technology that articulate two different parts, a paddle made of cactus wood and a pole made of hard wood probably from an arboreal specie. The oar was directly dated to 1405-1451 Cal a.D.<sup>2</sup>, placing it during the final period after the European arrival at the XVI century.

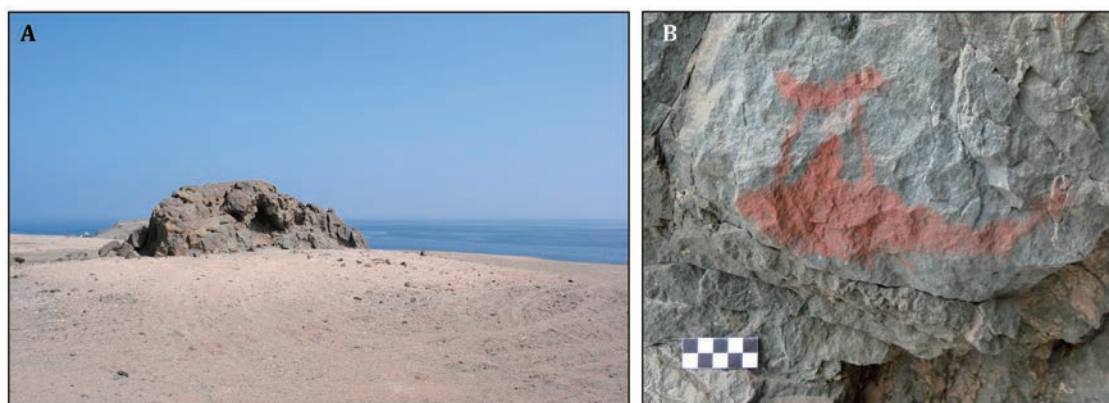


Figure 6. Punta Guaque 01 archaeological site: (A) general view of the rock shelter; (B) detail of the rock art painting.

1 The heterocercal caudal fin has the upper lobe larger than the lower (see Ballester *et al.* 2018).

2  $530 \pm 30$  a.p., Beta-334311, calibrated in two sigma ( $p=1$ ) using Calib 7.0.4 (Stuiver *et al.* 2005) and shcal13.14c curve (Hogg *et al.* 2013).

### ***Izcuña ravine***

During the same field work where Botija site was found, the Izcuña ravine was discovered almost 25 kilometers north from El Médano classical site (Figure 3). Thanks to the help of some SERNAGEOMIN<sup>3</sup> researchers, especially Javier Álvarez, we had registered twelve sector along the ravine stream with paintings concentration, all of them located between 1320 and 680 meters above the sea level (Ballester & Álvarez 2014/2015). As we mention above, 24 blocks, 74 panel and 328 motifs were identified in the field work (Ballester 2018a), a number that has increase after the image processing with computerize programs.

As is norm in El Médano rock art style, all images are painted in red colour, although with tonal variations from orange to deep red. Most part of the paintings are poorly preserved, heavily eroded by the camanchaca that rise the ravine from the coast. Inside the images set, pisiforms motifs dominates in frequency (36.59%), followed by marine hunting scenes (14.63%), terrestrial



Figure 7. Four different rock art panels from Izcuña ravine: (A) I-02, Block 08, Panel 01; (B) I-11, Block 01, Panel 01; (C) I-09, Block 09, Panel 01; (D) I-02, Block 09, Panel 08.

3 Servicio Nacional de Geología y Minería de Chile, National Service of Geology and Mining of Chile.

quadrupeds – probably camelids – (5.79%), and geometric or abstract figures; there is only one single anthropomorphic representation (0.3%) (Ballester 2018a). These frequencies demonstrate that both marine and hunting thematic leads the rock art style (Figure 7). A tendency also expressed in the treatment of the different kind of manifestations, because while human figures are drawn with simple linear and schematic canons, marine animals are painted following naturalistic and figurative canons.

## Species identification from the rock art

Taking advantage of the naturalistic representational canons from El Médano rock art we had create a methodological approach to identify and distinguish between different marine species based on their physiological and anatomical phenotypic characteristics (Ballester *et al.* 2018). The number, location, combination and singularities from each dorsal, pectoral, anal and caudal fins were considered to make the identification, including their position, particular movements and proportions. Special attributes in the head, body and tail were also pondered. The animal dimension in regard to the raft was not considered as a valid attribute for the identification, because in El Médano rock art sea animals are always oversized in relation to the others motifs as a way to reinforce its marine topic (Ballester 2018a).

Probably the most simple identification exercise occur out of pisiform motifs, particularly sea lions, turtles and squids (Figure 8). Sea lions (*Otaria flavescens*) representations are characterized by their big heads linked to the bodies without a neck, as a single figure, accompanied by two pairs or singles extremities depending if the figure is in plan or profile perspective (Figure 8A). This specie is represented as single motifs and in hunting scenes linked to rafts with harpoon lines. Sea turtles (*Chelonioidea*) are less frequent in the assemblage. Just four motifs have been recognized until now, all them in El Médano ravine and in all cases acting in hunting scenes. Turtles are easily distinguished by their bulky and rounded bodies, from where the four extremities radiates in addition to a prominent head and in some cases a linear tail between the rear extremities (Figure 8B-C). The body form, the extremities extensions, the tail presence or absence, and the closeness of the rear extremities, are the major physical attributes to discern between different marine turtles species, as *Dermochelys coriacea* and *Chelonia mydas* (Ballester *et al.* 2019). Finally the squid (*Cephalopoda*) motifs are very common in ravine sites, like El Médano, Izcuña and Botija. Their principal characteristic is an elongate and pointed body shape, with a linear rear tail (Figure 8D). Even if squids are never directly linked to rafts in

hunting scenes, they generally still participate from the action accompanying the hunting motifs, probably because squids are one of the major preys of some of the hunted sea animals (Figure 7B).

Inside the pisiform motifs set, also different marine species can be distinguished. Sharks (*Selachimorpha*) can be identified by the presence of its second dorsal and anal fins, a prominent first dorsal fin, and also by the particular form of the caudal fin, always heterocercal. Good examples of shark motifs can be seen in Botija (Figure 9A) and Punta Guaque 01 (Figure 6B). Another fish species easily distinguishable is swordfish (*Xiphias gladius*), particularly by its large and protuberant sword in the frontal part of the head, but also by its half-moon shape caudal fin, the anal fin, and the disposition and relation between pectoral and dorsal fins, always in the same line, opposed, and perpendicular to the body (Figure 9B-C-D). They are very common along the rupestrian assemblage of El Médano style, in rock shelter and in ravine sites, acting in hunting scenes with rafts and isolate as single motifs.

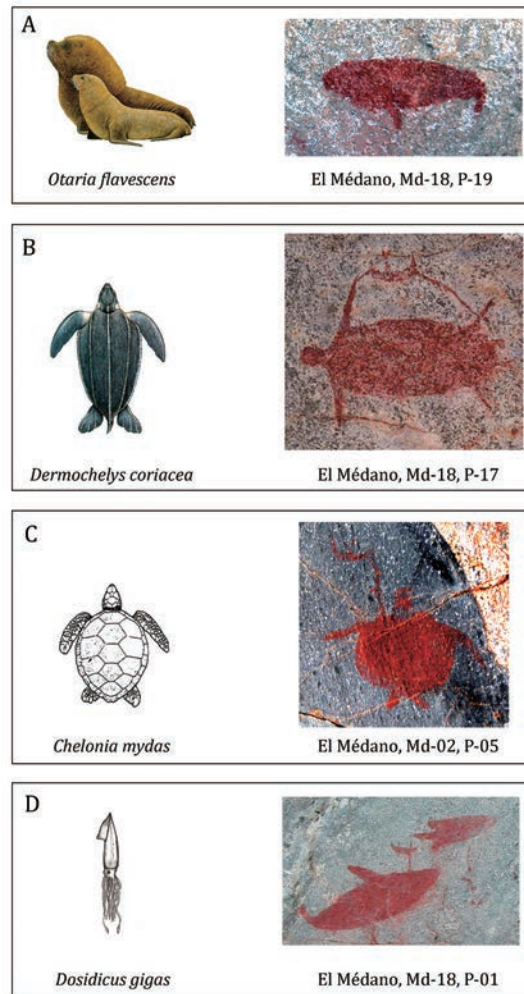


Figure 8. Sea lions, turtles and squids paintings in El Médano rock art.

Finally, cetaceans are also present, including individuals from both subgroups, mysticetes (*Mysticeti*) and odontocetes (*Odontoceti*). One motif located in El Médano ravine (Md-2, Panel 4) represent a fin whale or finback (*Balaenoptera physalus*) (Figure 10A), the second biggest species in the planet. The recognition of the specimen was possible thanks to some of their particular morphological attributes, as the large, thin and flattened body, a fluted head, a small and less pronounced dorsal fin displaced towards to the animal's tail, large pectoral fins, and an homocercal caudal fin. This is the only reliable motif attributable to this species, inserted in a hunting scene composed by one raft manned by a single seafarer, and linked to the animal

by only one harpoon line. The southern right whale (*Eubalaena australis*) is another mysticetes exponent in the rock art. One of their principal morphological characteristics is the absence of dorsal fins – unlike others local cetaceans-, accompanied by a thick body wider towards the head and narrowing towards the tail, with a homocercal tail and two important pectoral fins. This figure is relative common in El Médano and izcuña ravines, in all cases in hunting scenes with rafts and harpoon lines (Figure 10B). One of the more important ethological traits of this species is the habit of exhibit the tail out of the sea surface, practice that had become the principal identification tool employed today by cetacean’s researchers to recognize and individualize each animal. This habit is not exclusive from southern right whale, and humpback whale (*Megaptera novaeangliae*) also do it regularly, nevertheless this last whale has a clear dorsal fin that distinguish both species. This difference had become a valuable comparative technique to identify some motifs attributable to whale’s tails exhibitions in the Izcuña ravine. Here, in the same panel where the animal of a hunting motifs has been classify as a southern

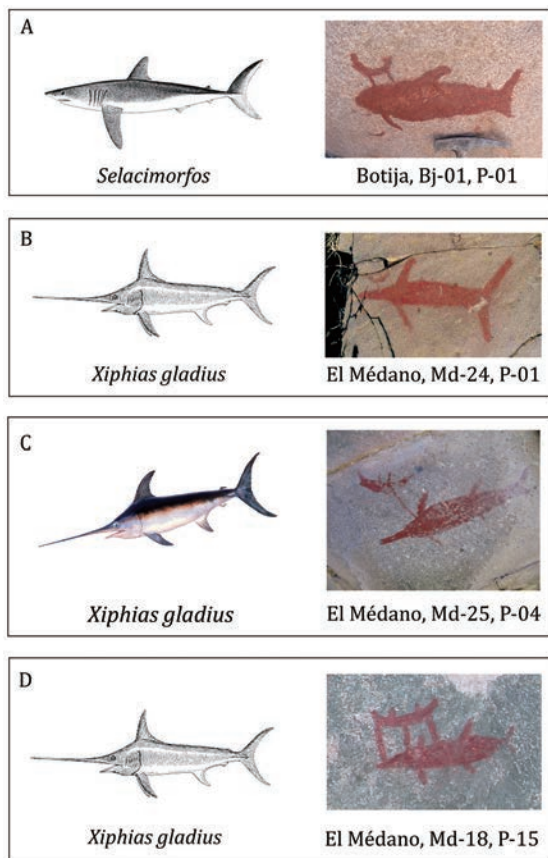


Figure 9. Shark and swordfish paintings in El Médano rock art.

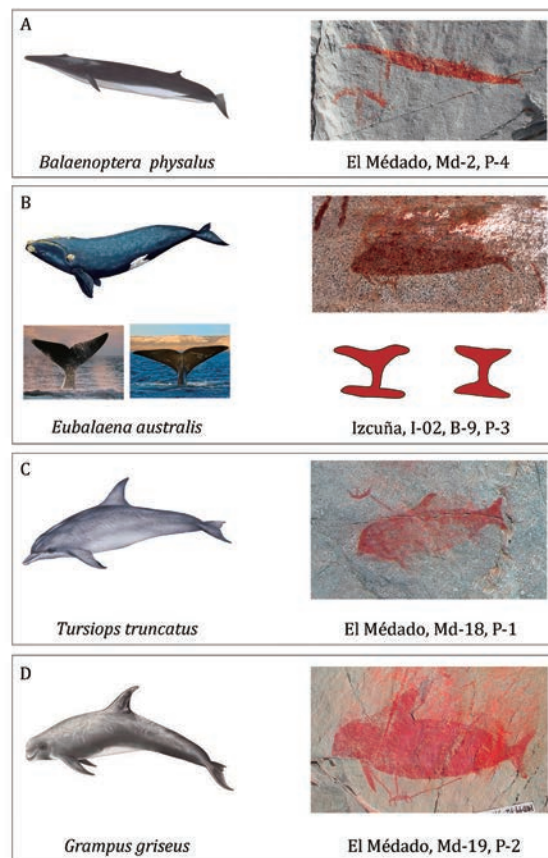


Figure 10. Cetacean paintings in El Médano rock art.

right whale, there are two whale's tails motifs, probably a reference to the same species (Figure 10B).

At least two odontocetes species was identified in the rock art. One of them is the bottle-nosed dolphin (*Tursiops truncatus*), characterized by protuberant nose, a globular forehead, a big dorsal fin in the middle part of the body, pectoral fins that come off near the head, and a homocercal tail (Figure 10C). The other is the grey or Risso's dolphin (*Grampus griseus*), who, at difference from the last one, has not a prominent nose and has a more globular forehead, with a robust body and a bigger dorsal fin in the middle section of the body (Figure 10D). These two odontocetes species are present in El Médano ravine, in both cases acting in hunting scenes in association to manned rafts and linked by harpoon lines.

As we can see, different species can be distinguished in El Médano rock art. The original painters had create a naturalistic and figurative art where animals representations followed the principal physiological and anatomical attributes from the real referents, especially the distinctive characteristics from each species. In that sense, there exist an explicit intention to discriminate among different kinds of sea animals, a visual classification constructed by the producers that was necessarily comprehensive for the spectators. This imply a shared knowledge corpus between paintings producers and consumers about the sea animal's world and their relations to humans -physiology, anatomy, environment, and ethology.

## Deciphering hunting strategies based in the rock art motifs

From this rock art we can learn a lot more about their producer's life. Besides from the animal's representations, the hunting scenes allow us to have an idea about the strategies, organizations, methods, techniques and material devices involved in the real hunting practices over the sea - or at least, their representations of those practices. As we said at the beginning of the essay, even if representation don't express directly the reality, as a mirror, they are necessarily linked to their producers and consumers real conditions of life. In that sense, rock art allow us to create interpretative models about ancient practices and customs, nevertheless they inevitably need to be additionally contrasted with others material supports and information sources.

If we consider just the image assemblage of Izcuña ravine, where we have a well-documented and controlled universe of motifs (Ballester 2018a, Ballester & Álvarez 2014/2015), some

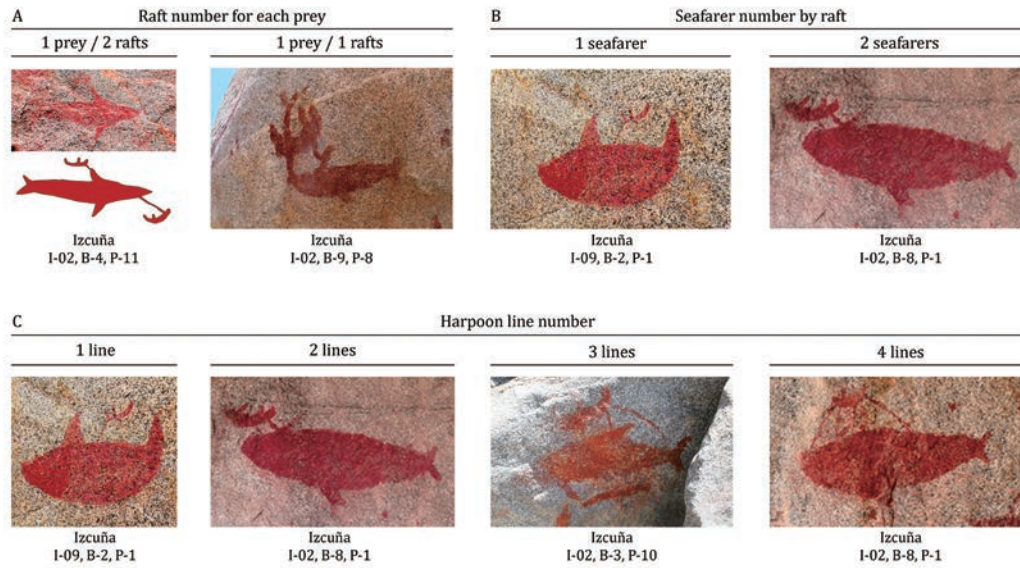


Figure 11. Quantification of rafts, seafarers and harpoon lines in hunting scenes of El Médano rock art.

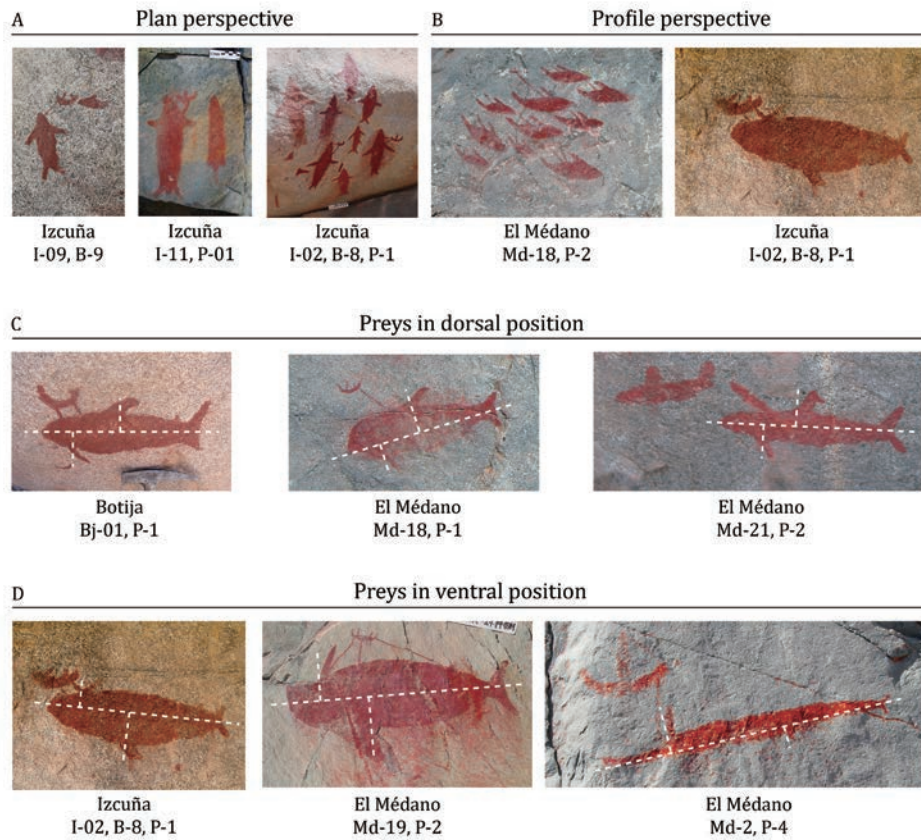


Figure 12. Perspective and animal position in El Médano rock art.

aspect can be discern. Over 328 total motifs along the ravine, 48 are marine hunting scenes, corresponding to the 14.63% of the site. From them, practically all scenes are composed just by one raft linked to a single sea animal (97.92%), except one complex motifs composed by two rafts and a single animal (Figure 11A). This creates an image compositional relation based in a 1:1 proportion (one raft:one prey). Most part of the raft motifs are manned by one seafarer (47.92%), then by two (35.42%), and finally without a crew (14.58%)<sup>4</sup>; there is no motifs with more seafarers (Figure 11B).

Linking the rafts to the preys are the harpoon lines. They go in number from one to four, being the hunting scenes motifs composed by one harpoon line the most frequent (41.62%), followed by two lines (30.95%), then three (19.05%), and at last four (2.32%)<sup>5</sup> (Figure 11C). The harpoon target over the animal also change, being the most frequent in the head (49.33%), then the pectoral or dorsal fin (24%), the medial part of the body (20%), and the tail (6.67%). The fact that they had made explicit in the image a different number of harpoon lines and linked into diverse parts of the animal, express the idea of a sequential and complex hunting process.

In the hunting scenes of El Médano and Izcuña ravines preys appear in plan and profile perspective<sup>6</sup>. Inside the last group we had identified an important difference in the disposition of the animal in relation to the raft. If we consider that the natural position of a pisiform animal is with the dorsal fin upwards and the pectoral fin downwards, looked in profile perspective from the head toward the tail, always the first fin in the line is the pectoral and the second the dorsal (see i.e. Figure 9A & Figure10). In singles pisiform motifs the disposition of the animal is at all times the natural, with the dorsal fin upwards, but in hunting scenes the situation varies. Even when some animals are painted in natural position (Figure 12C), there exist a significant proportion of animals painted overturned, with their ventral side upwards and their dorsal fin downwards (Figure 12D). Probably the representation of inverted animals express cases of defeated, exhausted or dying individuals after the hunting process. This is most plausible if we consider that some animals, especially cetaceans, turnover leaving their ventral side up to the sea surface when they are dying. If this interpretation is true, those scenes of inverted animals could be the final stage of a more complex and large process, expressing a sequential idea. Nevertheless, another option is that they could also be the representations of dragging moribund animals through the coast.

<sup>4</sup> The difference (2.08%) correspond to undetermined motifs.

<sup>5</sup> The difference (6.06%) correspond to undetermined motifs.

<sup>6</sup> As an example, in Izcuña ravine the proportion between both is 27.08% to 68.75%. The difference (4.17%) correspond to undetermined motifs.

## Beyond the rock art: harpoon device, navigation and marine hunting archaeology

In the archaeological sites of the Atacama Desert coast harpoon devices remains are significant, and in funerary context they are very common, as death offerings, generally complete and still articulated. In domestic middens, on the other way, they appear only fragmented sections, as their lateral barbs, central shafts, or lithic bifacial points. The prehispanic harpoon device was composed by three basic sections, a principal foreshaft made of wood (Figure 13a), a composite detachable head (Figure 13b), and a harpoon line (Figure 13c) (Ballester 2017b, 2017c, 2018b, Llagostera 1989, Núñez 1999, Silva & Bahamondes 1968). No floats or buoys has been recognized until now, neither in archaeological record or historical sources. The archaeology situate the first evidences of harpoon devices through 7000 years before present, and continue to be in use still after the European arrival at the XVI century (Ballester 2018b). Today some inhabitants of the Atacama Desert coast continue to practice marine hunting with harpoons, but now made of new raw material and with different technologies, by the demand of the national fishery commerce system (Contreras 2010).

The principal foreshaft could rise three meters long, made of arboreal wood, and generally composed by three articulated sections. This kind of objects is very scarce in archaeological contexts, especially for the bad preservation conditions and the intense grave looting or grave robbing. The detachable heads are more frequent, mainly in funerary contexts, in some cases reaching more than 20 pieces offered just to one diseased (Ballester *et al.* 2014, Spahn 1967). Until now four basic types of harpoon heads has been classified, differentiated by their constitutive elements, raw materials and technical solutions (Figure 14) (Ballester 2018b). They are composite and articulated artifacts, made by a huge raw materials diversity, including marine and terrestrial mammal bones, arboreal wood, cotton fibers, resins, mineral pigment, spine cactus, copper, leather, tendons, and lithic; practically the whole raw material diversity known by these coastal hunter gatherers. It is probable that the harpoon head variability respond to their utilization over multiples marine preys in hunting activities, just like is explicitly expressed in El Médano rock art style.

Lines are the last section of the harpoon device. Probably they are the less frequent in archaeological context, and only a few artifacts are well conserved today. Unlike the other harpoon sections, the line is made in only one piece, from a thin leather strip of sea lion skin of five millimeters on average diameter, which could arrive to 70 meter long without intermediates

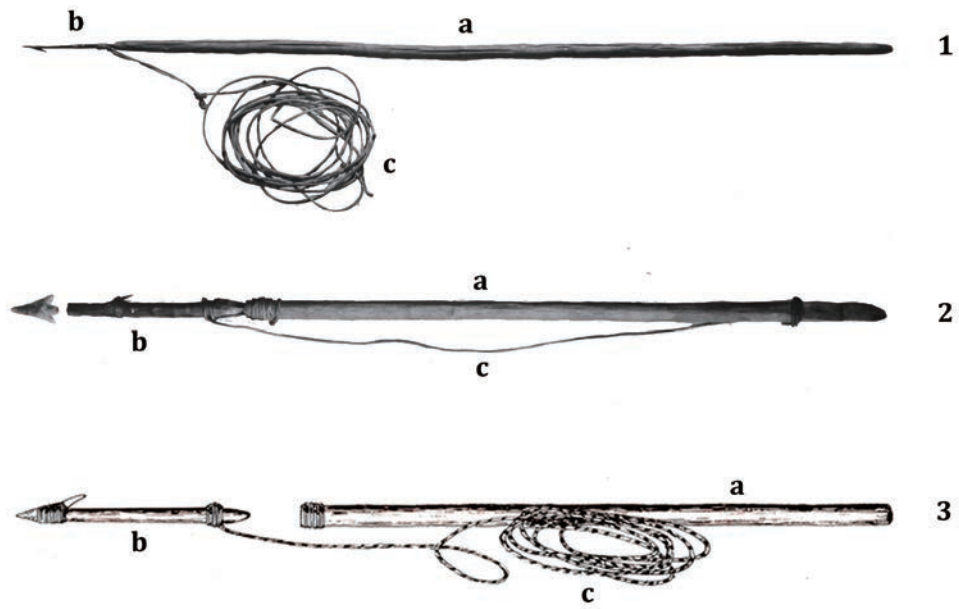


Figure 13. Harpoon device of the Atacama Desert coast: (a) principal foreshaft, (b) detachable head; (c) line. (1-2) Complete harpoon (Bird 1946:pl. 123a-j); (3) complete harpoon (Llagostera 1989:Fig.2.b).

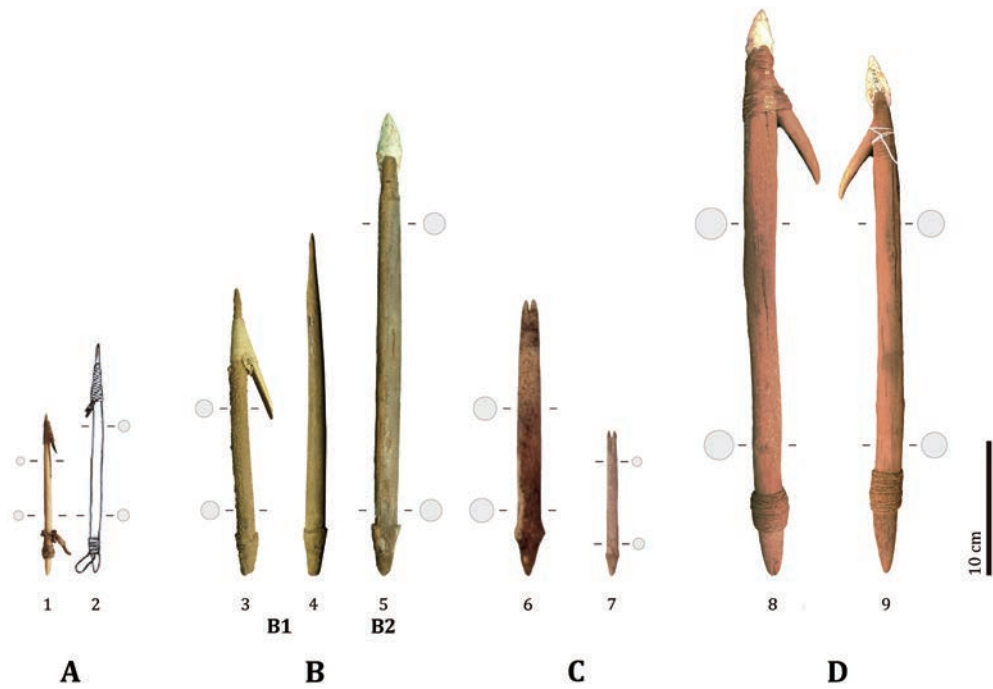


Figure 14. Harpoon head typology of the Atacama Desert coast (Ballester 2018a:fig.8)

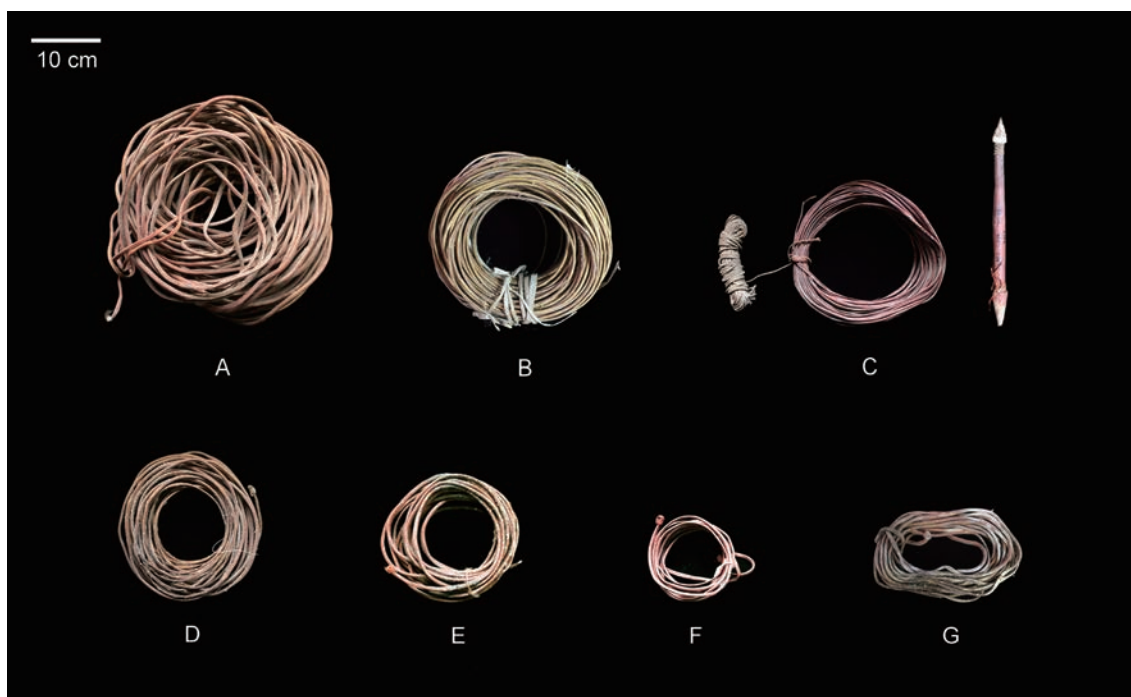


Figure 15. Harpoon lines from the Atacama Desert coast (Ballester 2017a:Fig.3).

knots or ties (Ballester 2017a). Hunting ropes had been recovered from funerary context always rolled in packages of many laps, maybe the same way to store it after its use (Figure 15).

Meanwhile, indirect information about the use of navigation devices also dates back to 7000 years before present. Consequently synchronous to the appearance of the harpoon technology along the Atacama Desert coast, the presence of faunal remains from big marine preys, like swordfishes, marlins, sharks, and some cetaceans, had been related to the development of navigation (Ballester *et al.* 2017, Béarez *et al.* 2016, Castro *et al.* 2016, Contreras *et al.* 2011, Olgúin *et al.* 2014, 2015, Rebolledo *et al.* 2016, Salazar *et al.* 2015). Species that continue to be hunted with navigation and harpoon technologies in later times, even after the European contact at XVI century (Bird 1943, Bittmann 1978, Castro *et al.* 2012, Llagostera 1990, Mostny 1942, Núñez *et al.* 1974, Núñez 1974, Schiappacasse y Niemeyer 1984). At the same time, a new settlement pattern and mobility system had been established along the coast, based in residential and logistic camps, transformation that was possible thanks to the navigation technology and a new social organization (Ballester & Gallardo 2011).

Whale remains, especially bones as domestic waste and raw material of artifacts, are present in

archaeological sites from the first peopling of the coast at 11000 years before present until the European contact (Ballester *et al.* 2017, Castelleti 2007, Castro *et al.* 2016, Contreras *et al.* 2011, Llagostera 1977, 1979, Núñez *et al.* 1974, Olguín *et al.* 2015, Zlatar 1987). Scarce evidence exist of its consumption in domestic sites, but this is probably consequence of its consumption out of residential settlement, near the beach in butchering areas. More abundant are in funerary context, where for the construction of tumulus during the Formative Period (2500 to 1200 years before present) they had use bone whales as part of the mortuary infrastructure (Ballester & Clarot 2014, Gallardo *et al.* 2017). During the Late Intermediate Period (100-500 years before present) some individual was buried with cetacean skulls painted in red color. Also they had manufactured different kind of artifacts employing whale bone supports, like harpoon heads, fishing weights, among others (Ballester 2018a, Llagostera 1989).

Direct information about the navigation device is much later. Oars fragments and archaeological remains of a raft has been directly dated in Auto Club cemetery of Antofagasta in 819-724 years before present<sup>7</sup> (Ballester *et al.* 2014, 2015). Other similar rafts remains are commons in Late Intermediate Period (1000-500 years before present) cemeteries along the coast (Bittmann 1978, Núñez 1986). In all cases, the ritual and symbolic expression of the important role of navigation, seafarers and marine hunters for the pre-européen coastal society.

## The hunting activities according to the first Europeans

Several voyagers, explorers, merchants, colonial officers and clericals from Occident had encounters with the inhabitants of the Atacama Desert coast from the XVI until the XIX centuries. Some of them had left us as legacy invaluable reports and illustrations of their direct contacts, with magnificent and detailed information about diverse aspects of their customs, traditions and practices, especially those related to the sea (Figure 16).

One of the more famous narrations comes from Antonio Vásquez de Espinoza (1948[1630]:618-619), who in the beginning of the XVII century describe al incredible scene of a whale hunting:

“There is abundance of copper in that province, and with it they make prongs or spears... then they go out hunting whales... when the Indian has spied one asleep... he goes out to it on his sea-lion skin

<sup>7</sup> 920 ± 30 a.p., Beta-335821, calibrated in two sigma (p=0.84) using Calib 7.0.4 (Stuiver *et al.* 2005) and shcal13.14c curve (Hogg *et al.* 2013).



Figure 16. The inflated sea lion skin raft, its seafarers and the harpoon devices according to European illustrations: (left) Alcides d'Orbigny (1945[1847]); (right) Riou (Marcoy 1875:6).

raft... [and] gives it a harpoon thrust under the fin, where its heart is, and immediately drops into the water to escape the whale's reaction; for when it feels the wound it is furious and bellows loudly and dashes the water high in the air in the wild and angry struggles which the pain causes; then it starts off bellowing toward deep water, until it yields to mortal fatigue. Meanwhile the Indian has recovered his raft and returned to shore to watch and locate the point off the coast where it is dying, and they remain on guard till they see it stop. Then all that clan and family group who have been carefully watching, go there at once together with all their friends and neighbors for the feast; they open it up on one side, and some stay inside gorging and others outside for six or eight days until they cannot stand it any longer for the stench" (author's translation and selection).

This particular scene is remarkable, not just by the incredible feat, but for the similarity with some aspects that we had detached from the study of the El Médano Rock Art. First, the real possibility of whale hunting with their traditional technologies, including the inflated sea lion skin raft and the harpoon device. Second, the hunting activity was essentially a specialized task, developed by only one raft and manned just by a single seafarer. But, also the report give us additional information impossible to obtain from rock art. Even if the hunting was an individual practice, their results were collective, because after drag the animal to the coast, all family members, kindred and neighbors participated from the animal butchering and consumption. It was a moment to reproduce social ties and create obligations. The consumption was truly a ceremonial and festivity occasion with fundamental social consequences (Ballester 2018a).

But Antonio Vásquez de Espinoza's narration is not the only report available. Practically in

the same years, another Spaniard clerical, fray Reginaldo de Lizárraga (1999:378; author's translation) describe that Indians goes hunting tuna

“not in crews like in Spain, but as a lone Indian fisherman going out in a sea lion skin raft, two or three leagues from the coast; carrying his harpoon, attacking, giving rope until the prey bleeds to death, then dragging it to the coast”.

Again the remark of an individual and specialized practice, and also the harpoon device employed to make it possible. Louis Feuillée (1714:590-591; author's translation), a French explorer and priest, emphasize about this last aspects almost a century later, in 1710, mentioning that over the raft

“they put all their provisions, consisting of a large pumpkin full of water, and their weapons, which are a bow, arrows and a kind of dart to attack big fishes”, and that it was to “to take away or to defend against these fishes that the Indians embark always with them a large dart provided with a point at its extremity”.

## Rock art and their material conditions

It will never be the same to study the rock in an isolated way than to do it considering the historical context of their producers and consumers. In this brief essay we have study El Médano Rock Art considering their principal characteristics, history, geographical distribution, site location, marine species represented, and aspects relatives to the hunting strategies and task organization from the hunting scenes motifs. The reflection about the rock art becomes more significant and acquires an additional value when we cross it with the archaeological evidence from residential middens and funerary contexts, but also with the written documents and illustrations leaved by the first Europeans that had travel and settled in the region.

To the coastal society of the Atacama Desert big marine preys had an enormous social value that exceeded the economic and nutritional sphere, into symbolic, ideological, political and representational domains. Bone remains of the same species were offered to diseased in funerary contexts, exemplifying the symbolic and ritual value of these animals. They perfectly knew the differences between each marine species, a knowledge corpus necessarily formed by the regular contact and tight relation with those animals. Some of them were the cetaceans,

even mysticetes and odontocetes, differentiated by their anatomical, physiological and ethological features. Undoubtedly this knowledge was specialized and not available to all society members by the same way, concentrated among those who performed the practice in the sea.

The hunting of these big sea animals was fundamental to the coastal social order. It allowed the existence of a restricted group specialized in hunting activities and navigation, but at the same time, a communal and collective consumption of the preys during long feasts and ceremonies. This particular situation creates a form of debt and social obligation from the collectivity to the sea hunters, disequilibrium probably solved by different political status and decisions responsibilities among the society. The knowledge concentration must had contributed in this social phenomenon.

El Médano rock art is one of the most spectacular premodern and not occidental visual expression about the sea hunting over the entire world. Whales were part of this image universe, and evidently express an intimate relation between humans and cetaceans along this desert coast. Nevertheless, as we mentioned several times along the essay, rock art by itself cannot solve all questions and uncertainties, it is imperative to cross and mix different and multiples information sources and material supports to get more reliable archaeological interpretations.

## Acknowledges

1160045, 1140056 & 1070083 FONDECYT Grants. Specially thanks to Francisco Gallardo, Marcela Sepúlveda, Javier Álvarez, Daniel Quiroz and Rodolfo Contreras. This research was possible thanks to the following institutions: Université Paris 1 Panthéon Sorbonne, Servicio Nacional de Geología y Minería de Chile (SERNAGEOMIN), Museo de Antofagasta (MA), Museo Augusto Capdeville Rojas de Taltal (MACRT), Museo Arqueológico de San Miguel de Azapa of the Universidad de Tarapacá (MASMA), and Universidad de Antofagasta (UA).

## 참고문헌 | References

- Ballester, B. 2016. El Tiempo de El Médano. *Taltalia* 9:49-62.
- Ballester, B. 2017a. La Delgada Línea Roja: sogas de arpón de los últimos cazadores marinos del norte de Chile (1000-1500 DC). *Revista Chilena de Antropología* 35:47-71.
- Ballester, B. 2017b. A la caza del arponaje de la Gente de los Túmulos de Tierra (500 cal. A.C.-700 cal. D.C.). In *Monumentos funerarios de la costa del desierto de Atacama. Los cazadores-recolectores marinos y sus intercambios (500 a.C.-700 d.C.)*, edited by F. Gallardo, B. Ballester & N. Fuenzalida, pp. 67-78. CIIR & SCHA, Santiago.
- Ballester, B. 2017c. Technologie du Harponnage sur la côte Pacifique du Désert d'Atacama (Nord du Chili). Unpublished Master 2 thesis, Université Paris 1 Panthéon-Sorbonne, Francia.
- Ballester, B. 2018a. El Médano rock art style: Izcuña paintings and the marine hunter-gatherers of the Atacama Desert. *Antiquity* 92(361):132-148.
- Ballester, B. 2018b. Tecnología de arponaje en la costa del desierto de Atacama, norte de Chile. *Estudios Atacameños* 57: 65-95.
- Ballester, B. & J. Álvarez 2014-2015. Nadando entre alegorías tribales o la crónica del descubrimiento de las pinturas de Izcuña. *Taltalia* 7-8:9-17.
- Ballester, B. & A. Clarot 2014. *La Gente de los Túmulos de Tierra*. Marmot Impresores, Santiago.
- Ballester, B. & F. Gallardo 2011. Prehistoric and historic networks on the Atacama Desert coast (northern Chile). *Antiquity* 85:875-889.
- Ballester, B. & F. Gallardo 2015. El Médano Rock Art: Large marine prey hunting paintings in the Atacama Desert coast (northern Chile). *The Current* 3(1): 6-7.
- Ballester, B. & F. Gallardo 2016. Painting a lost world. The red rock art of El Médano. *Current World Archaeology* 77:36-38.
- Ballester, B., A. Clarot & A. Llagostera 2014. El Cementerio de Auto Club de Antofagasta y la sociedad litoral entre los 1000 y 1450 d.C. *Hombre y Desierto* 18:187-212.
- Ballester, B., F. Gallardo & P. Aguilera 2015. Representaciones que navegan más allá de sus aguas: una pintura estilo El Médano a más de 250 km de su sitio homónimo. *Boletín de la Sociedad Chilena de Arqueología* 45:81-94.
- Ballester, B., E. Calás, C. Peregrino, E. Vidal & P. Aguilera 2017. La vida en comunidad de los cazadores pescadores marinos del desierto de Atacama (4000-2000 cal. a.C.). In *Monumentos funerarios de la costa del desierto de Atacama. Los cazadores-recolectores marinos y sus intercambios (500 a.C.-700 d.C.)*, edited by F. Gallardo, B. Ballester & N. Fuenzalida, pp. 183-197. CIIR & SCHA, Santiago.
- Ballester, B., J. Gibbons, D. Quiroz & J. Álvarez 2018. Aletas, colas, arpones, líneas, balsas y cazadores: Nuevas pinturas para nuevas miradas sobre el estilo de arte rupestre de El Médano (norte de Chile). In *Actas del XX Congreso Nacional de Arqueología Chilena*. Concepción, In Press.
- Ballester, B., R. Labarca & E. Calás 2019. Relaciones entre tortugas marinas y seres humanos en la costa del Desierto de Atacama: una primera aproximación desde dos contextos arqueológicos. *Boletín del Museo Chileno de Arte Precolombino*, In press.
- Béarez, P., F. Fuentes-Muchen, S. Rebolledo D. Salazar & L. Olguín 2016. Billfish foraging along the northern coast of Chile during the Middle Holocene (7400-5900cal BP). *Journal of Anthropological Archaeology* 41:185-195.
- Berenguer, J. 2009. Las pinturas de El Médano, norte de Chile: 25 años después de Mostny y Niemeyer. *Boletín del Museo Chileno de Arte Precolombino* 14(2):57-95.
- Bird, J. 1943. Excavations in northern Chile. *Anthropological Papers of the American Museum of Natural History* 38(4):173-318.

- Bird, J. 1946. The cultural sequence of the north Chilean coast. *Bulletin of the Bureau of American Ethnology* 143:587-594.
- Bittmann, B. 1978. Fishermen, mummies and balsa raftson the coast of northern Chile. *El Dorado* III(3):60-103.
- Borie, C., X. Power, S. Parra, H. Salinas, P. Rostan, P. Galarce, I. Peña & F. Traverso 2017. Tras la huella del sílice pampino: nuevas metodologías para el rastreo de las áreas fuente de aprovisionamiento lítico en Taltal. *Estudios Atacameños* 56:103-131.
- Capdeville, A. 1918. Arqueología. Llanura del Hueso Parado. Cementerio de los túmulos de tierra. Unpublished Field Note.
- Capdeville, A. 1923. Un centenario Chinchu Atacameños en Punta Grande, Taltal. *Boletín de la Academia Nacional de Historia* 7(18):34-49.
- Castelleti, J. 2007. Patrón de asentamiento y uso de recursos a través de la secuencia ocupacional prehispánica en la costa de Taltal. Unpublished MA dissertation, Universidad Católica del Norte.
- Castelleti, J. & G. Maltraín 2010. El formativo de Taltal y el patrón de asentamiento local. In *Actas del XVII Congreso Nacional de Arqueología Chilena*, Tomo 1, pp. 165-176. Ediciones Kultrún, Valdivia.
- Castelleti, J., O. Reyes, G. Maltraín, I. Martínez, P. Galarce, H. Velásquez & J. Ogalde. 2010. Ocupaciones en abrigos rocosos en la costa de Taltal: patrón de uso del espacio desde momentos Holocénico Tempranos. In *Actas del XVII Congreso Nacional de Arqueología Chilena*, Tomo 2, pp. 685-695. Kultrún, Valdivia.
- Castelleti, J., A. Goguitchaichvili, C. Solís, M. Rodríguez & J. Morales. 2015. Evidencia de tempranas manifestaciones rupestres en la costa del desierto de Atacama (25° S). *Arqueología Iberoamericana* 28:16-21.
- Castro, V., C. Aldunate & V. Varela 2012. Paisajes culturales de Cobija, costa de Antofagasta, Chile. *Revista Chilena de Antropología* 26(2):97-128.
- Castro, V., C. Aldunate, V. Varela, L. Olgún, P. Andrade, F. García-Albarido, F. Rubio, P. Castro, A. Maldonado & J. Ruz 2016. Ocupaciones Arcaicas y probables evidencias de navegación temprana en la costa arreica de Antofagasta, Chile. *Chungara, Revista de Antropología Chilena* 48(4):503-530.
- Contreras, R. 2010. Recolección y pesca: Pasado y presente en la costa de Taltal. *Taltalia* 3:57-86.
- Contreras, R., P. Núñez & O. Rodríguez. 2008. El Médano: reflexiones antropológicas en torno a la cosmovisión de los habitantes prehispánicos de la costa sur del Norte Grande. *Taltalia* 1: 87-122.
- Contreras, R., P. Núñez, A. Llagostera, J. Cruz, A. San Francisco, B. Ballester, O. Rodríguez & G. Becerra 2011. Un conglomerado del período Arcaico costero Medio del área Taltal Paposo, norte de Chile. *Taltalia* 4:7-31.
- Feuillée, L. 1714. *Journal des observations physiques, mathématiques, et botaniques faites par l'ordre du Roy sur les côtes orientales de l'Amérique Méridionale, et Dans les indes occidentales, depuis l'année 1707, jusques en 1712.* Chez Pierre Giffart, libraire, Graveur du Roy & de l'Académie Royale de Peinture & de Sculpture, Paris.
- Gallardo, F. 2018. Estilos de arte rupestre e interacción social en el desierto de Atacama (norte de Chile). *Mundo de Antes* 12(1):13-78.
- Gallardo, F., G. Cabello, G. Pimentel, M. Sepúlveda & L. Cornejo. 2012. Flujos de información visual, interacción social y pinturas rupestres en el desierto de Atacama (norte de Chile). *Estudios Atacameños* 43: 35-52.
- Gallardo, F. B. Ballester & N. Fuenzalida 2017. Monumentos funerarios de la costa del desierto de Atacama. Los cazadores-recolectores marinos y sus intercambios (500 a.C.-700 d.C.). CIIR & SCHA, Santiago.
- Goguitchaichvili, A., J. Morales, J. Urrutia-Fucugauchi, A. Soler, G. Acosta & J. Castelleti. 2016. The use of pictorial remanent magnetization as a dating tool: State of the art and perspectives. *Journal of Archaeological Science: Reports* 8:15-21.
- Hogg, A., Q. Hua, P. Blackwell, M. Niu, C. Buck, T. Guilderson, T. Heaton, J. Palmer, P. Reimer, R. Reimer, C. Turney y S. Zimmerman. 2013. SHCal13 Southern Hemisphere Calibration, 0-50,000 Years cal BP. *Radiocarbon* 55(4):1889-1903.

- Lizárraga, R. 1999. Descripción del Perú, Tucumán, Río de la Plata y Chile. Union Académique Internationale, Academia Nacional de Historia, Buenos Aires.
- Llagostera, A. 1977. Ocupación humana en la costa Norte de Chile asociada a peces locales-extintos y a litos geométricos: 9680+/-160 a.P. In *Actas del VII Congreso de Arqueología Chilena*, pp. 93-113. Ediciones Kultrún, Altos de Vilches.
- Llagostera, A. 1979. 9700 years of maritime subsistence on the Pacific: an analysis by means of bioindicators in the North of Chile. *American Antiquity* 44(2):309-324.
- Llagostera, A. 1989. Caza y pesca marítima. In *Prehistoria. Desde sus orígenes hasta los albores de la conquista*, edited by J. Hidalgo, V. Schiappacasse, H. Niemeyer, C. Aldunate & I. Solimano, pp. 57-81. Andrés Bello, Santiago.
- Llagostera, A. 1990. La navegación prehispánica en el norte de Chile: bioindicadores e inferencias teóricas. *Chungara, Revista de Antropología Chilena* 24/25:37-51.
- Marcy, P. 1875. *Travels in South America, from the Pacific Ocean to the Atlantic Ocean*. Scribner Armstrong Co., New York.
- Monroy, I., C. Borie, A. Troncoso, X. Power, S. Parra, P. Galarce & M. Pino 2016. Navegantes del desierto. Un nuevo sitio con arte rupestre estilo El Médano en la depresión intermedia de Taltal. *Taltalia* 9:27-47.
- Mostny, G. 1942. Informe preliminar sobre las excavaciones efectuadas en la costa chilena entre Pisagua y Coquimbo del 8 de Octubre de 1941 al 15 de Marzo de 1942. *Boletín del Museo Nacional de Historia Natural* 20:97-102.
- Mostny, G. y H. Niemeyer 1983. *Arte rupestre chileno*. Ministerio de Educación, Departamento de Extensión Cultural, Santiago de Chile.
- Mostny, G. y H. Niemeyer 1984. *Arte rupestre en El Médano, II Región*. *Creces* 9(5):2-5.
- Niemeyer, H. 1977. Variación de los estilos de arte rupestre en Chile. In *Actas del VII Congreso de Arqueología de Chile*, Altos de Vilches, volume II, pp. 649-660. Editorial Kultrún, Santiago.
- Niemeyer, H. 1980. *Arte rupestre en la República de Chile*. In *Actas de las Primeras Jornadas de Arte Rupestre de la Provincia de San Luis*, pp. 67-77. Dirección Provincial de Cultura, San Luis.
- Niemeyer, H. 1986. Proyecto de arte rupestre de la Qda. El Médano. *Boletín de la Sociedad Chilena de Arqueología* 4:1.
- Niemeyer, H. 1989. Los canastos para pescar en Quebrada El Médano. *Museos* 5:2.
- Niemeyer, H. 2010. *Crónica de un descubrimiento. Las pinturas rupestres de El Médano, Taltal*. Museo Chileno de Arte Precolombino, Santiago.
- Núñez, L. 1986. Balsas prehistóricas del litoral chileno: grupos, funciones y secuencia. *Boletín del Museo Chileno de Arte Precolombino* 1:11-35.
- Núñez, L. 1999. Archaic adaptation on the South-Central Andean Coast. In *Pacific Latin American in prehistory. The evolution of Archaic and Formative cultures*, edited by M. Blake, pp. 199-211. Washington State University Press, Washington D.C..
- Núñez, L., V. Zlatar & P. Núñez 1974. Caleta Huelén 42: una aldea temprana en el norte de Chile (nota preliminar). *Hombre y Cultura* 2(5):67-103.
- Núñez, P. 1974. Notas sobre la aldea preagrícola Caleta Huelén 42, desembocadura del río Loa. Norte de Chile. *Serie Documentos de Trabajo* 5:27-43.
- Núñez, P. & R. Contreras 2003. *Pinturas prehispánicas de Taltal*. Impresión Ercilla S.R.L., Antofagasta.
- Núñez, P. & R. Contreras 2006. El arte rupestre de Taltal, norte de Chile. In *Actas del V Congreso Chileno de Antropología*, pp. 348-357. Colegio de Antropólogos de Chile, San Felipe.
- Núñez, P. & R. Contreras 2008. El arte rupestre de Taltal, Norte de Chile. *Taltalia* 1:77-85.

Olguín, L., D. Salazar & D. Jackson 2014. Tempranas evidencias de navegación y caza de especies oceánicas en la costa pacífica de Sudamérica (Taltal, ~7.000 años cal. AP). *Chungara. Revista de Antropología Chilena* 46(2):177-192.

Olguín, L., V. Castro, P. Castro, I. Peña-Villalobos, J. Ruz & B. Santander 2015. Exploitation of faunal resources by marine hunter-gatherer groups during the Middle Holocene at the Copaca 1 site, Atacama Desert coast. *Quaternary International* 373:4-16.

D'Orbigny, A. 1945[1847]. *Viaje a la América Meridional, Brasil, República de Uruguay, República Argentina, La Patagonia, República de Chile, República de Bolivia, república de Perú, realizado de 1826 a 1833*. Editorial Futuro, Buenos Aires.

Rebolledo, S., P. Béarez D. Salazar & F. Fuentes 2016. Maritime fishing during the Middle Holocene in the hyperarid coast of the Atacama Desert. *Quaternary International* 391:3-11.

Salazar, D., V. Figueroa, P. Andrade, H. Salinas, X. Power, S. Rebolledo, S. Parra, H. Orellana & J. Urrea. 2015. Cronología y organización económica de las poblaciones arcaicas de la costa de Taltal. *Estudios Atacameños* 50:7-46.

Schiappacasse, V. & H. Niemeyer 1984. Descripción y análisis interpretativo de un sitio Arcaico Temprano en la Quebrada de Camarones. *Publicación Ocasional del Museo Nacional de Historia Natural* 41:1-187.

Sepúlveda, M. 2012. Pinturas rupestres, tecnología y flujos de información en el desierto de Atacama, norte de Chile. Manuscript in possession of the author.

Silva, J. & R. Bahamondes 1968. La potera, anzuelo para cefalópodos. *Anales del Museo de Historia Natural de Valparaíso* 1:217-237.

Spahni, J. 1967. Recherches archaéologiques à l'embouchure du rio Loa (Côte du Pacifique-Chili). *Journal de la Société des Américanistes* 56(1):181-239.

Stuiver, M., P. Reimer y R. Reimer. 2005. CALIB 5.0. [WWW program and documentation]. <http://intcal.qub.ac.uk/calib/manual/index>.

Vázquez de Espinoza, A. 1948[1630]. *Compendio y descripción de las indias occidentales*. Smithsonian Institution, Washington D.C.

Zlatar, V. 1987. Un yacimiento precerámico y su problemática desde la perspectiva de sus recintos habitacionales. *Hombre y Desierto* 1:1-36.