Mariana Mondini
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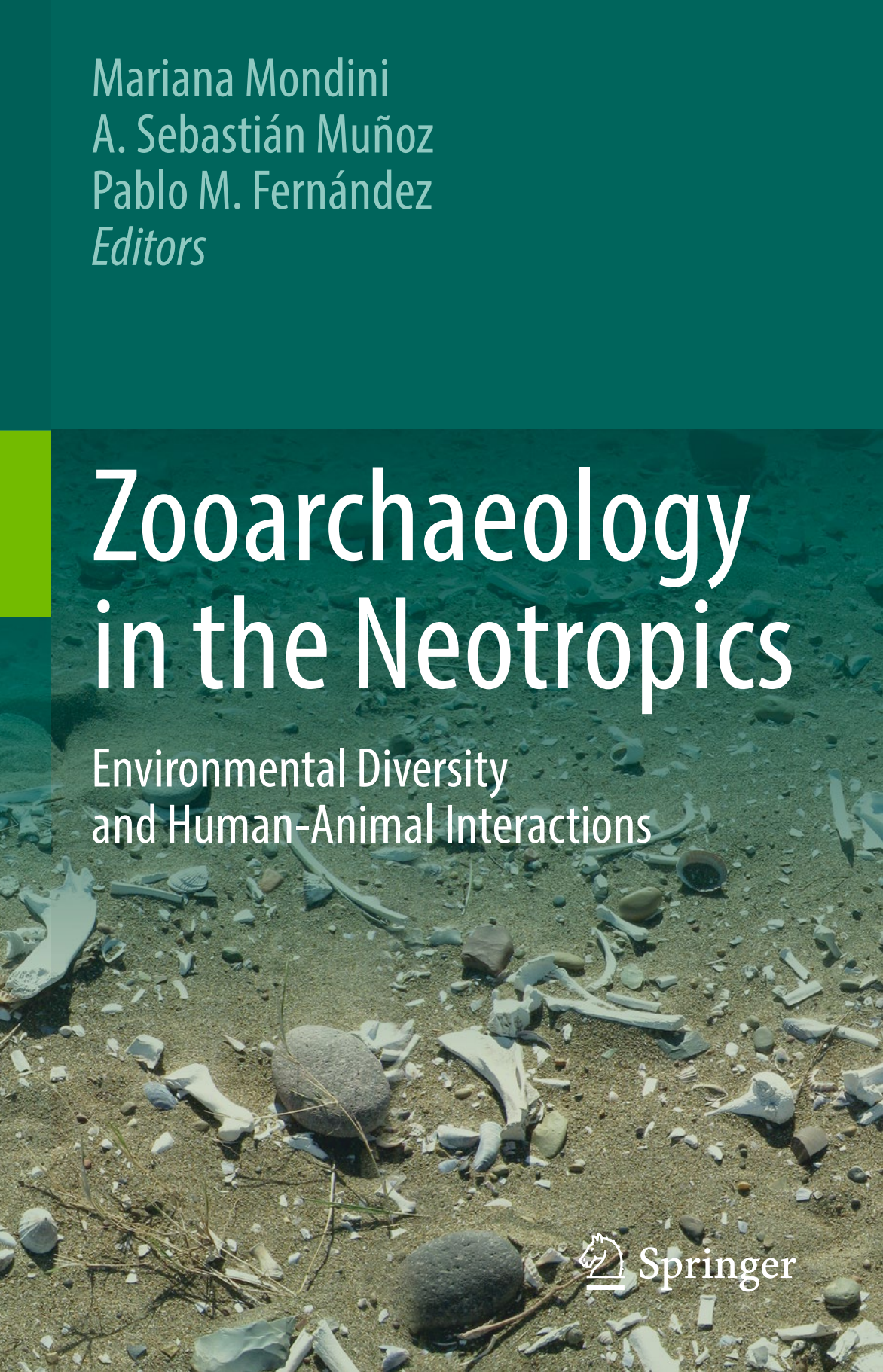
Zooarchaeology in the Neotropics

Environmental Diversity and Human-Animal Interactions



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Editors
Mariana Mondini
Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA)
IDACOR, CONICET/Universidad Nacional de Córdoba
Córdoba, Argentina

A. Sebastián Muñoz
Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA)
IDACOR, CONICET/Universidad Nacional de Córdoba
Córdoba, Argentina

Facultad de Filosofía y Letras
Universidad de Buenos Aires
Ciudad Autónoma de Buenos Aires, Argentina

Pablo M. Fernández
Instituto Nacional de Antropología y Pensamiento Latinoamericano—CONICET
Ciudad Autónoma de Buenos Aires, Argentina

Facultad de Filosofía y Letras
Universidad de Buenos Aires
Ciudad Autónoma de Buenos Aires, Argentina

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Contents

List of Contributors, Editors, and Peer-Reviewers

Contributors

Enrique Angulo Lima, Peru

Cristina Bayón Dpto. de Humanidades, Universidad Nacional del Sur, Bahía Blanca, Argentina

Laura Beovide Centro de Investigación Regional Arqueológica y Territorial-DICYT-MEC, Montevideo, Uruguay

Michael Buckley Manchester Institute of Biotechnology, Faculty of Life Sciences, The University of Manchester, Manchester, UK

Fernando Bustamante Universidad de Antioquia, Medellín, Colombia

Carmen Rosa Cardoza Lima, Peru

Richard G. Cooke Smithsonian Tropical Research Institute, Balboa, Ancón, Republic of Panama

Luciano De Santis Cátedra de Anatomía Comparada, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, CONICET, La Plata, Argentina

Luis Manuel del Papa Cátedra de Anatomía Comparada, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata, CONICET, La Plata, Argentina

Michelle Rezende Duarte Laboratório de Genética Marinha e Evolução, Depto. de Biologia Marinha, Instituto de Biologia, Universidade Federal Fluminense, Rio de Janeiro, Brazil

Paula D. Escosteguy Instituto de Arqueología, FFyL, Universidad de Buenos Aires-CONICET, Buenos Aires, Argentina

Romina Frontini CONICET—Dpto. de Humanidades, Universidad Nacional del Sur, Bahía Blanca, Argentina

Hermann Gorbahn University of Kiel, Kiel, Germany

Johny Isla Andes: Centro de Investigación para la Arqueología y el Desarrollo, Lima, Peru

Máximo Jiménez Smithsonian Tropical Research Institute, Balboa, Ancón, Republic of Panama

Alexandra Lara Smithsonian Tropical Research Institute, Balboa, Ancón, Republic of Panama

Juan Guillermo Martín Universidad del Norte, Barranquilla, Colombia

María Fernanda Martínez Smithsonian Tropical Research Institute, Balboa, Ancón, Republic of Panama

Sergio Martínez Depto. de Evolución de Cuencas, Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay

María Paz Martinoli Centro Austral de Investigaciones Científicas (CADIC), CONICET, Ushuaia, Argentina

Mariana Mondini Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA), IDACOR, CONICET/Universidad Nacional de Córdoba, Córdoba, Argentina

Facultad de Filosofía y Letras, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Buenos Aires, Argentina

A. Sebastián Muñoz Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA), IDACOR, CONICET/Universidad Nacional de Córdoba, Córdoba, Argentina

Walter Norbis Instituto de Biología, Depto. de Biología Animal, Facultad de Ciencias, Universidad de la República, Montevideo, Uruguay

Sara Christina Pádua Laboratório de Genética Marinha e Evolução, Depto. de Biologia Marinha, Instituto de Biologia, Universidade Federal Fluminense, Rio de Janeiro, Brazil

Markus Reindel Deutschalnd Archaeologist Institut, Bonn, Germany

Mónica C. Salemme Centro Austral de Investigaciones Científicas—CONICET and Universidad Nacional de Tierra del Fuego, Ushuaia, Argentina

Edson Pereira Silva Laboratório de Genética Marinha e Evolução, Depto. de Biologia Marinha, Instituto de Biologia, Universidade Federal Fluminense, Rio de Janeiro, Brazil

Rosa Cristina Corrêa Luz Souza Laboratório de Genética Marinha e Evolução, Depto. de Biologia Marinha, Instituto de Biologia, Universidade Federal Fluminense, Rio de Janeiro, Brazil

José Togo Facultad de Humanidades, Ciencias Sociales y de la Salud, Universidad Nacional de Santiago del Estero, Santiago del Estero, Argentina

Martín Vázquez Centro Austral de Investigaciones Científicas (CADIC), CONICET, Ushuaia, Argentina

Lucía Watson Jiménez Universidad Nacional Autónoma de México, Mexico City, Mexico

Editors

Mariana Mondini Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA), IDACOR, CONICET/Universidad Nacional de Córdoba, Córdoba, Argentina

Facultad de Filosofía y Letras, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Argentina

A. Sebastián Muñoz Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA), IDACOR, CONICET/Universidad Nacional de Córdoba, Córdoba, Argentina

Pablo M. Fernández Instituto Nacional de Antropología y Pensamiento Latinoamericano—CONICET, Ciudad Autónoma de Buenos Aires, Argentina

Facultad de Filosofía y Letras, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Argentina

Peer-Reviewers

Analía Andrade Centro Nacional Patagónico (CENPAT), CONICET, Puerto Madryn, Argentina

Frank E. Bayham Department of Anthropology, California State University, Chico, CA, USA

Luis Borrero Instituto Multidisciplinario de Historia y Ciencias Humanas (IMHICIHU), CONICET, Buenos Aires, Argentina

Nicolas Goepfert Archéologies des Amériques (ARCHAM), CNRS, Paris, France

Sandra Gordillo Centro de Investigaciones en Ciencias de la Tierra (CICTERRA), CONICET/UNC, Córdoba, Argentina

Lisa Hodgetts Department of Anthropology, Social Science Centre, Western University, London, ON, Canada

Jean L. Hudson Department of Anthropology, University of Wisconsin-Milwaukee—Milwaukee Public Museum, Milwaukee, WI, USA

G. Lorena L'Heureux Instituto Multidisciplinario de Historia y Ciencias Humanas (IMHICIHU), CONICET, Buenos Aires, Argentina

Patricio López Mendoza ARQMAR—Depto. de Antropología, Facultad de Ciencias Sociales, Universidad de Chile, Santiago, Chile

Daniel Loponte CONICET—Instituto Nacional de Antropología y Pensamiento Latinoamericano (INAPL), Buenos Aires, Argentina

Lembi Lõugas Department of Archaeobiology and Ancient Technology, Institute of History, Archaeology and Art History, Tallinn University, Tallinn, Estonia

Agustina Massigoge Investigaciones Arqueológicas y Paleontológicas del Cuaternario Pampeano (INCUAPA), CONICET/UNICEN, Olavarría, Argentina

Matías E. Medina División Arqueología, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata—CONICET, La Plata, Argentina

Pablo Messineo Investigaciones Arqueológicas y Paleontológicas del Cuaternario Pampeano (INCUAPA), CONICET/UNICEN, Olavarría, Argentina

Katherine M. Moore Department of Anthropology, University of Pennsylvania, Philadelphia, PA, USA

Marta Moreno García Centro de Ciencias Humanas y Sociales (CCHS), CSIC, Madrid, Spain

David C. Orton BioArCh, Department of Archaeology, University of York, York, UK

Diego D. Rindel CONICET—Instituto Nacional de Antropología y Pensamiento Latinoamericano (INAPL), Buenos Aires, Argentina

Federico L. Scartascini Instituto Multidisciplinario de Historia y Ciencias Humanas (IMHICIHU), CONICET, Buenos Aires, Argentina

Geoff Smith MONREPOS—Archaeological Research Centre and Museum for Human Behavioural Evolution, Schloss Monrepos, Neuwied, Germany

Peter Stahl Department of Anthropology, University of Victoria, Victoria, BC, Canada

Mikel Zubimendi División Arqueología, Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata—CONICET, La Plata, Argentina

Zooarchaeology in the Neotropics: An Introduction

1

Mariana Mondini, A. Sebastián Muñoz, and Pablo M. Fernández

This book brings together a collection of works on the archaeology of human-animal interactions through time in the Neotropical Biogeographic Region. This huge area, ranging from Central Mexico to Southern Patagonia, is characterized by an outstandingly rich biodiversity distributed across an amazing array of contrasting environments. Understanding the zooarchaeological imprint of human insertion in the rich and singular Americas is, thus, an opportunity for improving our knowledge of the many ways modern humans have dealt with the global colonization of our planet and of the diversity of subsequent organization forms within such diverse settings.

The Neotropical zoogeographic region was first recognized and defined by Sclater (1858) and Wallace (1876). Since then, it has been successively divided into distinct subregions, basically comprising the Caribbean islands, a highly diverse subregion(s) to the north and east, and an arid one(s) to the west and

M. Mondini (✉)
Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA), IDACOR, CONICET/Universidad Nacional de Córdoba, Av. H. Yrigoyen 174, 5000 Córdoba, Argentina

Facultad de Filosofía y Letras, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Argentina
e-mail: mmondini@conicet.gov.ar

A.S. Muñoz (✉)
Laboratorio de Zooarqueología y Tafonomía de Zonas Áridas (LaZTA), IDACOR, CONICET/Universidad Nacional de Córdoba, Av. H. Yrigoyen 174, 5000 Córdoba, Argentina
e-mail: smunoz@conicet.gov.ar

P.M. Fernández (✉)
Instituto Nacional de Antropología y Pensamiento Latinoamericano—CONICET, Ciudad Autónoma de Buenos Aires, Argentina

Facultad de Filosofía y Letras, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, Argentina
e-mail: pablomarcelofernand@gmail.com

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south, as well as different transition zones (Hershkovitz 1958; Rapoport 1968; Cabrera and Willink 1980; Simpson 1980; Patterson and Timm 1987; among others; for historical reviews and recent proposals, see Cox 2001; Morrone 2001, 2014; Solari et al. 2012; Holt et al. 2013).

The outstanding variety of Neotropical environments and landscapes—ranging from extreme deserts to savannas and grasslands, from alpine tundra to tropical rainforests—encompasses a great range of biomes and potential niches, greater than those in the northern regions (MacDonald 2003; Patterson and Costa 2012). The abiotic properties of the region—including its geometry, physical configuration, latitude and oceanity—also impinge upon the particular configuration of its biota (Morello 1984).

The wide array of Neotropical faunas and their high levels of endemism relate to this diversity and to the geological history of the South American subcontinent (Redford and Eisenberg 1989, 1992, 1999; MacDonald 2003; Patterson and Costa 2012; and references therein). It has been an island continent for most of the last 65 million years, although intermittent contact with other continents produced biotic exchanges at different times, contributing to its past and present diversity. More recently, some 3 million years ago, the Panama isthmus was formed and prompted the Great American Biotic Interchange. This not only allowed the introduction of species from the north, but also led to the extinction of many marsupial species in the Neotropical region. Today, while bats prevail among mammals to the north, rodents do to the south, and terrestrial carnivores and marine mammals become more important in the Southern Cone (Redford and Eisenberg 1992). More than 1500 mammalian species live in the Neotropics at present, which comprise about 30% of all extant species in the globe (Patterson and Costa 2012).

Such environmental scenario and faunal diversity have been critical in shaping human insertion into the faunal community as they colonized the last landmass on Earth—besides Antarctica—and also in shaping the evolution of human-animal interactions ever since (Pineau et al. 2003; Muñoz and Mondini 2008a, b; Borrero 2008; Fernández et al. 2014). The particular configuration of these settings has prompted unique relationships with these diverse animals and has involved specific taphonomic processes. Different kinds of interaction, from competition to commensalism, developed between humans and animals. Some of the most intense relationships produced domesticated species, as is the case of some birds (the Muscovy duck, and the turkey in the Mexican transition zone), a rodent (the guinea pig) and two camelids (the llama and the alpaca) (Stahl 2008). In this volume, some instances of these varied human-animal interactions and of the processes forming the zooarchaeological record in the Neotropics are outlined, as are some ways to address their study.

The chapters in the following pages derive from some of the contributions presented at the Second Academic Meeting of the Neotropical Zooarchaeology Working Group of the International Council for Archaeozoology (NZWG-ICAZ), which took place at the 12th ICAZ International Conference held in San Rafael, Argentina, in September 2014. The meeting centered on exploring the particularities displayed by the Neotropical zooarchaeological record and on discussing the processes originating it and their consequences in the evolution

and diversity of human-animal interactions from a global perspective. The mission of the NZWG-ICAZ is precisely to offer a forum where these research problems can be discussed and shared (see http://alexandriaarchive.org/icaz/workneotropical).

The topics covered in this volume shed light on different and complementary aspects of state-of-the-art zooarchaeological research into the Neotropics. Several chapters focus on marine resources, and this partly relates to the fact that a large part of the region is a peninsula within an oceanic hemisphere (Morello 1984). These chapters cover a broad range of the variation found in the Neotropical coastal environments. Martinoli and Vázquez deal with pinniped exploitation by hunting and gathering populations in temperate insular settings (Tierra del Fuego island) in Middle and Late Holocene contexts. They found contrasting ways of using *Arctocephalus australis* and, hence, contribute to the current understanding of human attitudes towards these marine mammals by broadening the range of variation known. Frontini and Bayon discuss the use of marine and coastal resources in different locations of the nearby southern Pampas (Buenos Aires province) in a similar time period. After reviewing resource representation in samples from coastal and inland settings, they discuss the use of this kind of resources through time and propose a differential use of marine items during the Holocene. Further to the north, Silva and colleagues provide a thorough account of Mid- to Late Holocene shell mounds from the southeastern coast of Brazil. The emphasis is not just on human behaviour but rather on shell mounds as proxies for biodiversity. In bringing together a wealth of malacological information, biodiversity patterns are inferred and discussed for the region.

Inland Neotropical faunas also have unique characteristics given the variety of environments they inhabit and the long history of isolation of the South American subcontinent. Another set of chapters deals primarily with these faunas—both terrestrial and riverine/estuarine, including birds—and also with varying societal organizations. Such is the case of the chapter by Escosteguy and Salemme, who study faunal exploitation by hunter-gatherers in Cañada Honda, a riverine setting in the Pampas, contributing to our knowledge of the diversity of human-animal interactions in the region. Increasing dietary diversification and intensification of small vertebrate exploitation during the Late Holocene is inferred. Beovide and colleagues discuss resource exploitation as recorded in shell middens found in an estuarine environment over the Río de la Plata during Mid-Late Holocene. They analyze spatial and temporal resource catchment, as well as the consequences of the introduction of pottery by 3000 years BP. On the other hand, Cardoza and colleagues account for a case study in the Pacific basin of Peru during the Mid-Archaic and the Initial Period. Pernil Alto, in the Palpa Valleys, is one of the few settlements known so far that is informative of human-animal interactions in the area and of this age. In the latter period, when sedentism was being established, increased emphasis on camelids is inferred.

Natural formation processes in Neotropical environments are also dealt with in this collection of works. Muñoz makes a taphonomic analysis of Late Holocene surface bone assemblages from southern Patagonia. He discusses natural bone modifications which could be informative of the transition between burial and

exposure conditions in this kind of assemblages, which are abundant in the Atlantic face of coastal Patagonia. Also from a taphonomic perspective, the fossorial faunal record from the dry Chaco region in Santiago del Estero province, Argentina, is discussed by del Papa and colleagues. They differentiate individuals died of natural causes inside their burrows from those deposited by natural predators and in anthropic accumulations. Hence, a more precise interpretation of the role of burrowing rodents in human diets between 1200 AD and the Spanish conquest is offered.

Finally, Neotropical faunas also entail unique methodological challenges, and some chapters contribute new information from this perspective. Buckley and colleagues as well as Mondini and Muñoz deal with the taxonomic identification of Neotropical faunas; the former through collagen fingerprinting and the latter through osteometry. Buckley and colleagues explore the application of collagen fingerprinting analyses to remains of a dwarf deer of uncertain ancestry discovered in a ~6000 year-old shell-bearing midden in Pedro González Island (Panama), and discuss the taxonomic affinity of this and other deer in Central America and Amazonia. On the other hand, Mondini and Muñoz focus on the osteometrics of *Vicugna vicugna* and *Lama guanicoe* individuals from poorly known areas of their present range, and discuss variation recognition of Neotropical wild camelids.

Several other contributions were presented at the Second Academic Meeting of the NZWG-ICAZ apart from those included in this volume. The complete list of presentations can be found in the conference proceedings (see ICAZ 2014). At the meeting, we were honored with the discussion of the oral presentations by Dr. Susan deFrance (Department of Anthropology, University of Florida), who highlighted several aspects of these works, including interdisciplinarity and the application of sophisticated methods, as well as the need to link specific case studies to broader anthropological questions.

As a concluding remark, we would like to highlight that the chapters in this volume, along with the other presentations that contributed to the Second Academic Meeting of the NZWG-ICAZ, represent some instances of the variation in human-animal interactions through time in the Neotropics. They help grasp how unique they have been, and yet how much can be learnt from them even for other settings and other times. From a longer-term perspective, they reveal how much Neotropical zooarchaeology has been growing in the past few decades. It is our hope that it will continue to grow and become even stronger and, in so doing, it will most certainly reveal a varied array of interactions of all kinds with some of the most diverse faunas on Earth.

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Pinniped Capture and Processing: A Comparative Analysis from Beagle Channel (Tierra del Fuego, Argentina)

2

María Paz Martinoli and Martín Vázquez

2.1 Introduction

The Beagle Channel is located on the southern coast of the Isla Grande de Tierra del Fuego (Fig. 2.1). It was inhabited by maritime hunter-gatherer-fishers from 6400 radiocarbon years BP to the late nineteenth century AD, when the European permanent settlement in the island began. Archaeological data have shown that these human groups had a diversified subsistence focused on marine resources, where pinnipeds provided the greatest amount of calories to the diet (Schiavini 1990, 1993; Orquera and Piana 1999, 2009; Orquera 2005; Zangrando 2003, 2009a, b; Tivoli and Zangrando 2011). However, recent zooarchaeological studies have revealed variations in the exploitation of resources among these prehistoric people during the Late Holocene: marine and terrestrial mammals decreased in order of importance in later assemblages, fish and bird remains increased in general faunal representation during the last 1500 years (Zangrando 2009a, b; Tivoli 2010a, b; Tivoli and Zangrando 2011).

While pinnipeds sex/age profiles and anatomical representation have been studied for the Middle Holocene (Schiavini 1990, 1993; Orquera and Piana 1999), we did not have such data from other archaeological contexts. Most of capture, processing and butchery patterns were not comprehensively analyzed in regional and supra-regional scale (Muñoz 2011). Moreover, the link between the long term changes of diet and exploitation modes of pinnipeds in the Beagle Channel remained unknown.

The aim of this study is therefore to evaluate exploitation strategies of pinnipeds excavated from shell middens at two different archaeological localities of the Beagle Channel with different ages: *Imiwaia I* (Middle Holocene) (Orquera and Piana 1999, 2000; Zangrando 2009a; Tivoli 2010a) and *Ajej I* (Late Holocene)

M.P. Martinoli (✉) • M. Vázquez
CADIC-CONICET, Bernardo Houssay 200, 9410 Ushuaia, Tierra del Fuego, Argentina
e-mail: mpmartinoli@yahoo.com.ar; vazquezmartin68@gmail.com

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Fig. 2.1 Isla Grande de Tierra del Fuego, Beagle Channel. *Ajej*, *Túnel* and *Imiwaia* archaeological localities

(Piana et al. 2008). Pinniped capture and processing strategies were previously analyzed at site level in both locations, but a temporal evaluation of these activities is still needed.

Prey exploitation involves a set of interconnected activities between the time of carcass procurement and final disposal, and there are several variables that influence butchering decisions (Lyman 1992). When dealing with questions on pinnipeds hunting strategies, two factors are recognized as particularly important (Binford 1978; Lyman 1992, 2008; Hildebrandt and Jones 1992; Gifford-Gonzalez and Sunseri 2009) and they interact with each other: (a) foraging areas: pinnipeds occupy both the marine and terrestrial environments; and (b) prey sizes: pinnipeds have a distinct sexual dimorphism, which affect mainly animal size. In the case of the capture of large-sized prey on land, seals underwent primary disarticulation on kill sites and those parts considered of marginal value were probably abandoned at the hunting location (Binford 1978; Gifford-Gonzalez and Sunseri 2009). But when the capture took place in the water, combined with transport technology (canoes) and a residential area located nearby the foraging places, it would imply the complete carcass transportation back to the residential site regardless of prey size (Lyman 1992; Orquera and Piana 1999; Ames 2002). On the contrary, small prey tends to be transported complete to the final consumption place, in spite of its distance from the foraging areas (Binford 1978). Based on the previous assumptions we can generate a particular set of archaeological expectations regarding three interrelated aspects: sex and age profiles, anatomical representations and butchery marks on bones.

2.1.1 Pinnipeds as Resource for Hunter-Gatherer-Fishers in the Beagle Channel

The main pinniped species in Tierra del Fuego are the South American fur seal (*Arctocephalus australis*) and the Southern sea lion (*Otaria flavescens*) (Bastida and Rodríguez 2003). The former is the most abundant in the archaeological record of the north coast of the Beagle Channel. The weight recorded for South American fur seals ranges between 150 and 200 kg for males and 60 kg for females (King 1983), but the weight recorded in Uruguay's population spans between 80 and

60 kg for males and with an average of 40.6 kg for females (Schiavini 1990, 1993). These otariids have a polygamous behaviour and their annual cycle is divided between a short reproductive stage and a period of regular visits to coastal areas (Crespo et al. 2008).

The age of sexual maturity is about 3 years for female seals and 7 or 8 years for male seals. The mating season of *A. australis* is during summer (Sielfeld 1983, 1999), and they are available in breeding colonies. Throughout the rest of the year, adult and young male seals spend more time foraging in the sea whereas adult female seals must return regularly to the colonies to nurse their pups (King 1983; Campagna 1985). South American fur seal colonies are located on rocky shores (Sielfeld 1983), and most of the breeding colonies are located in outer coasts and islands of the archipelago (Schiavini 1990; Crespo et al. 2008, p. 2), such as *Isla de los Estados*, *Isla Observatorio*, or in the surroundings of *Cape Horn* (Schiavini and Raya Rey 2001). However, it has been documented haul-outs in the Beagle Channel (Schiavini and Raya Rey 2001; Crespo et al. 2008, p. 3).

Regarding pinniped exploitation during the Holocene, the analysis of the layer D of the *Túnel I* (6400–4500 BP) site provided most of the archaeological data to build a general model of pinnipeds capture and processing (Schiavini 1990, 1993; Orquera and Piana 1999). The NISP (Number of Identified Specimens) value for pinniped remains from this layer is 59,300 (65% of the D layer total NISP) (Orquera 2015, pers. comm.). Schiavini (1990, Table 29) has determined MNI (Minimum Number of Individuals) values of 273 for *A. australis* and 9 for *O. flavescens* considering maxillae and mandibles. This author has also identified sex and age, based on the canines, for 223 individuals of *A. australis*: 86.5% of them were males and 69% of these males were under 8 years of age (non-reproductive males), whereas in females 37% of the bones came from animals of less than 4 years of age (Schiavini 1990). All anatomical units of these individuals are represented, although the frequencies have not been published (Orquera and Piana 1999). According to the study of maxillary canines it was determined that most of *A. australis* represented in the layer D (90%) died between March and September (Schiavini 1990, Fig. 42).

These zooarchaeological studies based on determination of sex, age, season of death and anatomical profiles, led to two main interpretations. First, the zooarchaeological assemblages of layer D of *Túnel I* are composed mainly by males (83%) of *A. australis* killed between autumn and spring (Schiavini 1990, 1993). Considering that the rockeries are mainly located in outer parts of the archipelago, it was proposed that pinniped captures should have occurred predominantly in the water, foraging in the sea with canoes and harpoons. Second, it was proposed that entire carcasses were transported and butchered in consumption places (Orquera and Piana 1999).

The Second Component of *Túnel I* has a Middle Holocene archaeological context. As said above, in the excavated sites younger than 1500 years BP the relative importance of pinnipeds in the diet has decreased (although they continued to provide the largest amount of calories to the human diet), while the importance of offshore preys (fish and birds) has increased (Zangrando 2009a, b; Tivoli and Zangrando 2011). So, one may ask if such a change in subsistence strategy

correlated also with changes in the modes of exploitation of pinnipeds. The two proposed possible changes are: differences in foraging areas (foraging in the water/foraging near the colonies) and consequently differences in prey choice (males/females). These possible differences generate in turn these specific expectations:

(a) Changes in the foraging areas imply differences in prey selection: pinnipeds can be considered as highly predictable preys, both spatially and temporally (Lanata and Borrero 1994) and they have ruled behaviours according to season, sex and age. Thus, sex and age profiles represented in the bone assemblages can be informative about the possible hunter-gatherer foraging areas (Lyman 1989, 2003): the capture of isolated individuals in the water should result in a profile where adult and subadult males dominate, while the predominance of females sexually matured and pups would indicate the exploitation of colonies.
(b) Changes in prey selection probably imply different decisions regarding transport and carcass butchering: pinnipeds have a distinct sexual dimorphism; males double the size of females. According to traditional understanding one of the main reasons of differential transportation is prey size (Binford 1978; Hawkes and O'Connell 1985). Therefore we assume a transport of adult females and subadults/juveniles in complete carcasses while adult males would have been transported in incomplete carcasses at *Imiwaia I* and *Ajej I*. But another two aspects in transport decisions are: transport distance (Binford 1978) and transport technology (Ames 2002). Both sites were located in coastal areas, so if some of the preys were actually captured in the water using canoes we would assume a low transportation cost (Ames 2002), and therefore complete anatomical profiles. But if the animals were captured within the colonies we would expect different transport strategies depending on prey size (Gifford-Gonzalez and Sunseri 2009). We would also expect differences in the nature and amount of butchery marks depending on the implied distance in carcasses transport (Binford 1978).

2.2 Materials

2.2.1 Imiwaia I

The *Imiwaia I* site (layers M, L and K; 6000–4500 years BP) is located in the *Cambaceres* Bay (54°52′26″S, 67°17′59″W). It is a multicomponent site with a central depression (house pit) surrounded by shell midden deposits (Orquera and Piana 2000). This site was interpreted as a residential locus, where multiple activities took place (Orquera and Piana 1999, 2000).

Nearly 36,000 bone specimens were recovered from layers M, L and K; most of which were identified taxonomically (NISP = 32,424). Figure 2.2 shows a clear predominance of fish (NISP = 20,367; 63%), followed by birds (NISP = 5343;