Zoboli D., Zedda M., Pillola G.L., Palombo M.R.

DOES A RELATIONSHIP EXIST BETWEEN PALAEOPATHOLOGIES AND INSULARITY ? A CASE STUDY OF SOME BONES OF PROLAGUS SARDUS (WAGNER, 1829) FROM SARDINIA (ITALY)

Alpine and Mediterranean Quaternary, 31 (1), 2018, 75 - 86 https://doi.org/10.26382/AMQ.2018.12

ISSN 2279-7335

Supplementary Appendices

Appendix A: The main Sardinian sites recording *Prolagus sardus* remains

Localities	Age	References
Cala d'Inferno (Alghero)	?Late Pleistocene	Zoboli, 2017
Cala di Ziu Santoru (Alghero)	?Late Pleistocene	Comaschi Caria, 1968
Cala Luna (Dorgali)	?Late Pleistocene	Comaschi Caria, 1968
Cannas di Sopra (Carbonia)	?Late Pleistocene	Zoboli, unpublished data
Cannisone (Sant'Antioco)	Late Pleistocene	Ulzega et al., 1980
Capo Figari unknown fissure (Golfo Aranci)	Middle - Late Pleistocene	Comaschi Caria, 1968
Capo Figari II (Golfo Aranci)	Middle Pleistocene (c. 370 ka)	Zammit Maempel & De Bruijn, 1982; van der Made, 1999
Capo Figari, Cala Greca (Golfo Aranci)	Middle Pleistocene -pre-Tyrrhenian	Palombo, unpublished data
Cava Alabastro (Fluminimaggiore)	Middle-?Late Pleistocene	Gliozzi et al., 1984; Minieri et al., 1995; Boldrini et al., 2010
Cava Grande (Fluminimaggiore)	Middle or Late Pleistocene	Gliozzi et al., 1984
Cava Santa Lucia (Fluminimaggiore)	Middle Pleistocene (c. 450 ka)	Gliozzi et al., 1984; van der Made, 1999
Cava Su Concali (Samatzai)	Late Pleistocene	Zoboli & Pillola, 2017
Colle S. Elia (Cagliari)	?Late Pleistocene	Zoboli, 2017
Conca 'e Crabas (Lula)	?Late Pleistocene	Comaschi Caria, 1968
Corongiu de Mari (Iglesias)	?Late Pleistocene	Comaschi Caria, 1968
Genna Maria (Villanovaforru)	Holocene	Fonzo, 1986
Grotta Campanaccio (Santadi)	Late Pleistocene or Holocene	Zoboli & Caddeo, 2016
Grotta Corbeddu Hall 1 and 2	Late Pleistocene (? 135,902+/- 140 yr BP) to Holocene (9,120 +/- 380- 6,262+/- 180 yr BP)	Sondaar et al. 1986, van der Geer, 2008; van der Geer et al., 2013
Grotta de Sos Omines Agrestes (Lula)	?Late Pleistocene	Comaschi Caria, 1968
Grotta de Su Entu (Oliena)	Late Pleistocene-Holocene	Comaschi Caria, 1968
Grotta dei Cervi (Alghero)	Late Pleistocene (12,060-11,610 ka cal BP)	Antonioli et al. 1998; Palombo et al., 2017
Grotta dei Fiori (Carbonia)	Middle Pleistocene (> 500 ka)	Boldrini, 2008; Melis et al., 2013
Grotta del Bue Marino (Dorgali)	?Late Pleistocene	Comaschi Caria, 1968
Grotta del Giglio (Alghero)	?Late Pleistocene	Comaschi Caria, 1968
Grotta del Papa (Tavolara)	Holocene (Neolithic to Nuragic and Phoenician)	Pani et al., 2013
Grotta dell'Arciprete (Dorgali)	?Late Pleistocene	Comaschi Caria, 1968
Grotta dell'Omo Morto (Alghero)	Late Pleistocene	Gliozzi, 1985
Grotta della Campana (Carbonia)	Late Pleistocene or Holocene	Zoboli, unpublished data
Grotta della Mandria (Tavolara)	?Late Pleistocene-Holocene	Comaschi Caria, 1968; Maxia , 1970
Grotta della Medusa/Dragonara	Late Pleistocene (22,390-21,910 ka cal BP)	van der Geer et al. , 2013; Palombo et al., 2017
Grotta di Filiestru (Mara)	Holocene (5,700-5,350 cal BC)	Levine, 1983
Grotta di Monte Corallinu	?Late Pleistocene	Comaschi Caria, 1968
Grotta di Monte Corongiu (Iglesias)	?Late Pleistocene	Comaschi Caria, 1968
Grotta di Monte Oro (Sassari)	?Holocene	Comaschi Caria, 1968
Grotta di Nurighe (Cheremule)	Late Pleistocene	Cordy et al., 1998
Grotta di Punta del Quadro (Alghero)	?Pleistocene-Holocene	Wilkens, 2000
Grotta di S. Bartolomeo (Cagliari)	Holocene	Comaschi Caria, 1959
Grotta di S. Giovanni (Domusnovas)	?Late Pleistocene	Comaschi Caria, 1968
Grotta di S. Michele (Ozieri)	Holocene	Zoboli. 2017
Grotta di Su Mamacone (Urzulei)	?Late Pleistocene	Comaschi Caria, 1968
Grotta di Tanì (Iglesias)	Holocene	Zoboli, unpublished data
Grotta Domus de Janas (Seulo)	Late Pleistocene or Holocene	Zoboli, unpublished data
Grotta Nicolai (Iglesias)	?Late Pleistocene or Holocene	Comaschi Caria, 1968
Grotta Perca de Peppe Ninnu (Silanus)	?Late Pleistocene	Comaschi Caria, 1968
Grotta Rifugio (Oliena)	Late Pleistocene-Holocene	Agosti & Girod, 1980
Grotta Sa Cona (Teulada)	Late Pleistocene	Zoboli, unpublished data
Grotta Su Coloru (Laerru)	Holocene (7 ka BP)	Pitzalis et al., 2001
Grotta Su Guanu (Oliena)	Holocene (2,950-2,880 BC)	Comaschi Caria, 1968; Sanges & Alcover, 1980
Grotta Teulada	?Late Pleistocene	Boldrini, 2008; Palombo, unpublished data
Grotta Verde (Porto Conte Bay, Alghero)	Holocene (7,3 ka BP)	Lo Schiavo, 1987; Antonioli et al., 1996; Palombo et al., 2017
Grotte de Is Janas (Sadali)	Late Pleistocene or Holocene	Zoboli, unpublished data
Grotte Is Zuddas (Santadi)	Late Pleistocene	Todde & Barbata, 1972
Grotticella Besta Street (Sassari)	Holocene	Delussu, 2000
Grutta de Is Muscas (Sadali)	Late Pleistocene or Holocene	Zoboli, unpublished data
Grutta Sa Folla (Nuxis)	Late Pleistocene	Palombo & Zedda, 2016
Isola di S. Stefano (La Maddalena)	?Holocene	Comaschi Caria, 1968
Miniera di Begatrotta (Narcao)	?Late Pleistocene	Comaschi Caria, 1968
Monreale di Bonaria (Cagliari)	Middle or Late Pleistocene	Studiati, 1857
Monte Arbu (Silanus)	?Late Pleistocene	Comaschi Caria, 1968
Monte Coatza (Dorgali)	?Late Pleistocene	Comaschi Caria, 1968
Monte Murone (Alghero)	?Late Pleistocene	Comaschi Caria, 1968
Monte San Giovanni (Gonnesa-Iglesias)	Middle Pleistocene	Major, 1882, 1905; van der Meulen, 1973; Mezzabotta et al., 1995; Minieri et al., 1995
Monte Santa Giusta (Alghero)	?Late Pleistocene	Comaschi Caria, 1968
Monte Tuttavista XIr (Orosei)	?Late Pleistocene	Angelone et al.,2008; Palombo & Rozzi, 2014; Moncunill-Solé et al., 2016
Monte Tuttavista IXp (Orosei)	Middle or Late Pleistocene	Angelone et al.,2008; Palombo & Rozzi, 2014; Moncunill-Solé et al., 2016
Monte Tuttavista IV-5 (Orosei)	Middle or Late Pleistocene	Angelone et al.,2008; Palombo & Rozzi, 2014; Moncunill-Solé et al., 2016
Monte Tuttavista IV-20 (Orosei)	Middle or Late Pleistocene	Angelone et al.,2008; Palombo & Rozzi, 2014; Moncunill-Solé et al., 2016
Monte Tuttavista VI-b6 (Orosei)	Middle or Late Pleistocene	Angelone et al.,2008; Palombo & Rozzi, 2014; Moncunill-Solé et al., 2016
Nuraghe Aeddos (Orotelli)	Holocene	Wilkens, 2000
Nuraghe is Paras (Isili)	Holocene	Wilkens, 2000
Nuraghe Miuddu (Birori)	Holocene	Delussu, 1997
Nuraghe S. Imbenia (Alghero)	Holocene	Manconi, 2000
S'Omu e S'Orku (Arbus)	Holocene (8,7-8,5 ka BP)	Boldrini & Palombo, 2010; Floris et al., 2012
San Giovanni di Sinis	Late Pleistocene (MIS 5e)	Caloi et al., 1980; Chesi et al., 2007
Santuario di S. Antonio di Siligo (Siligo)	Holocene	Wilkens, 2000
Siniscola E and C (Siniscola)	Middle-Late Pleistocene	Mezzabotta et al., 1995
Su Carroppu (Carbonia)	Holocene (Mesolithic, c. 10 ka BP)	Modi et al., 2017
Su Coddu/Canelles (Selargius)	Holocene	Melis et al., 2017
Surconis (Bolotana)	Late Pleistocene or Holocene	Zoboli & Pillola, 2016
Ponte Carradas and Corongeddu (Iglesias)	?Late Pleistocene	Comaschi Caria, 1968
Punta del Quadro (Porto Conte Bay) breccias	Middle or Late Pleistocene	Palombo et al., 2017
Punta Quadro (Porto Conte bay, Alghero)	Holocene (Neolithic)	Turmes, 2003
Punta Norma (S. Giovanni Mine, Iglesias)	?Late Pleistocene	Comaschi Caria, 1968
Torre del Buru (Alghero)	?Late Pleistocene	Comaschi Caria, 1968
Tramariglio (Alghero)	?Late Pleistocene	Comaschi Caria, 1968

Appendix A

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ISSN 2279-7335

Supplementary Appendices

Appendix B: Pathological bones of Prolagus sardus housed in MDLCA:

MDLCA 23769, right femur (Pl.1, fig. 6)
MDLCA 23770, right femur (Pl. 1, fig. 7)
MDLCA 23771, right femur (Pl. 1, fig. 8)
MDLCA 23772, right femur (Pl. 1, fig. 9)
MDLCA 23773, left humerus (Pl. 1, fig. 2)
MDLCA 23774, right ulna and radius (Pl. 1, fig. 3)
MDLCA 23775, right ulna and radius (Pl. 1, fig. 4)
MDLCA 23776, right tibia (Pl. 1, fig. 11)
MDLCA 23777, right calcaneus (Pl. 1, fig. 12)
MDLCA 23779/1-5, metapodials (Pl. 1, figs. 14-18)
MDLCA 23780, metapodial (Pl. 1, fig. 19)
MDLCA 23781, first phalanx (Pl. 1, fig. 20)
MDLCA 23782, second and third phalanges (Pl. 1, fig. 21)
MDLCA 23783/1-4, cervical vertebrae (Pl. 1, figs. 22-25)
MDLCA 23784/1-3, lumbar vertebrae (Pl. 1, figs. 26-28)
MDLCA 23786, rib (Pl. 1, fig. 30);
MDLCA 23787/1-2 (Pl. 1, figs. 31-32)
- Pathological bones of Prolagus sardus housed in NMB:

NMB Ty. 7177, right tibia (Pl. 1, fig. 10)
NMB Ty. 7308, left femur (Pl. 1, fig. 5)
NMB Ty. 8797, left humerus, ulna and radius (Pl. 1, fig. 1)

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Supplementary Appendices

Appendix C: Synopsis of the pathologies shown by the *Prolagus sardus* pathological bones detected in the samples from the Sardinian sites of Grotta dei Fiori, Surconis, Su Carroppu and Tavolara islet.

image	*site*	*dating*	*museum*	*bone*	*pathology*	*possible causes*	*consequences*
	Su Carroppu (Carbonia)	Holocene (Mesolithic, c. 10 ka)	MDLCA 23769-23771	3 femora	Not periarticular osteophytic formations, caused by periostitis of traumatic origin.	Lesions probably caused by not excessive trauma or by tendo-myositis due to muscular stresses repeated over time.	Pathologies fully compatible with life.
	Surconis (Bolotana)	Late Pleistocene or Holocene	MDLCA 23772	1 femur (juvenil individual)	Bone softeness (osteomalacia, rickets). Looking closely at the diaphysis, a longitudinal fracture line can be seen, partially resoldered with traces of bone reshaping.	The osteomalacia should be caused by metabolic imbalance of calcium, food deficiency, hypovitaminosis D or even deficiency in exposure to sunlight (which serves to activate vitamin D so that it can fix calcium on the bones). It mainly involves young individuals undergoing growth. Osteomalacia makes the bone softer and less resistant, ie more exposed to fractures. The orientation of the fracture indicates that the traumatic stress occurred by compression of the diaphysis (for example during the execution of a particularly challenging jump) and not by an impact from outside.	Pathologies compatible with life, even if the locomotor ability was limited.
	Su Carroppu (Carbonia)	Holocene (Mesolithic, c. 10 ka)	MDLCA 23773	1 humerus of a juvenile individual	Same considerations as for previous case.		

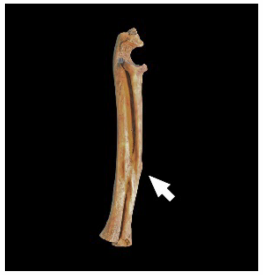
image	site	dating	museum	bone	pathology	possible causes	consequences
	Su Carroppu (Carbonia)	Holocene (Mesolithic c. 10 ka)	MDLCA 23774	ulna and radius	Fracture of the diaphysis of the radius. Complete, oblique and displaced fracture. The lesion was healed by the formation of a bone callus showing a longitudinal groove.	Traumatic lesion.	Pathology compatible with the life. The healing of bone fragments was facilitated by the ulna integrity.
	Surconis (Bolotana)	Late Pleistocene or Holocene	MDLCA 23775	ulna and radius	Extensive processes of hyperproduction of bone tissue involving the central part of the diaphyses of both bones. Most likely it is a tumor formation (osteosarcoma) that presents structural changes of the bone with new bone tissue and bone resorption frameworks.	This pathological lesion exposes the bones to spontaneous fractures after weak traumas.	
	Su Carroppu (Carbonia)	Holocene (Mesolithic c. 10 ka)	MDLCA 23776	1 tibia	Osteophytic processes at level of the distal epiphysis.	The periarticular position of this formations suggests a chronic inflammatory involvement of the crurotarsal joints).	Pathological lesions compatible with life even if the degree of limb mobility suffered serious limitations.
	Su Carroppu (Carbonia)	Holocene (Mesolithic c. 10 ka)	MDLCA 23781 (first) MDLCA 23782 (second and third)	first, second and third phalanx	The first phalanx shows osteophyte processes at level of the proximal epiphysis. A full ossification (ankylosis) occurs in the distal interphalangeal joint.	The periarticular position of these lesions suggests a chronic inflammatory.	Pathological lesions compatible with life but very limiting locomotion.

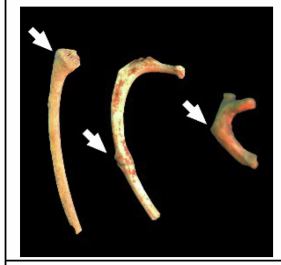
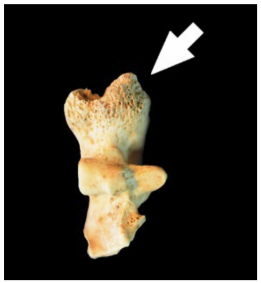
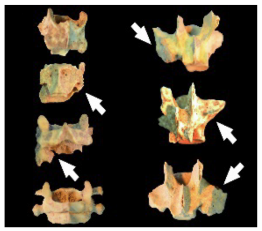
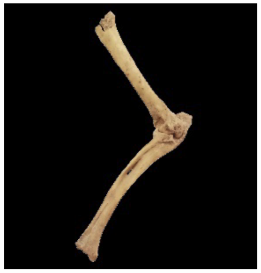
image	site	dating	museum	bone	pathology	possible causes	consequences
	Su Carroppu (dx and sx) and Grotta dei Fiori (middle) - Carbonia	Middle Pleistocene (Grotta dei Fiori) and Holocene (Su Carroppu)	MDLCA 23787/1 MDLCA 23786 MDLCA 23787/2	3 ribs	One rib shows a complete transversal and not displaced fracture (middle). In the other two ribs signs of periostitis are present.	All these lesions are of traumatic origin. The bone callus of the fracture is grew for continuous respiratory movements.	Pathological lesions compatible with life.
	Su Carroppu (Carbonia)	Holocene (Mesolithic c. 10 ka)	MDLCA 23779/1-5 MDLCA 23780 (in the rectangle)	metapodial bones	Osteophytic processes are present. One metapodial bone shows signs of osteomalacia (in the rectangle).	Periostitis and arthroses could be causes of the osteophytic processes. Malnutrition could be the cause of the osteomalacia (see above).	Pathological lesions compatible with life.
	Su Carroppu (Carbonia)	Holocene (Mesolithic c. 10 ka)	MDLCA 23777	1 calcaneus	Osteophytic processes.	The periarticular position suggests a chronic inflammation process (arthrosis) at level of crurotarsal joint.	Pathological lesions compatible with life but very limiting locomotion.
	Su Carroppu (Carbonia)	Holocene (Mesolithic c. 10 ka)	MDLCA 23783/1-4 (left) MDLCA 23784/1-3	cervical and lumbar vertebrae	Osteophytic processes in many vertebrae. An ankylosis lesion between two cervical vertebrae.	The periarticular position suggests a chronic inflammation process (arthrosis) at level of intervertbral joints (spondylarthrosis).	Pathological lesions compatible with life but limiting in locomotion.

image	*site*	*dating*	*museum*	*bone*	*pathology*	*possible causes*	*consequences*
	Tavolara islet (Major's Colletion Basel)	Holocene	NMB Ty. 7177	1 tibia and fibula	Tibia and fibula showing a complete, angulated and displaced fracture of the diaphysis healed with an extensive bone remodelling process.	Fracture of traumatic origin.	Pathological lesion compatible with life but limiting in locomotion.
	Tavolara islet (Major's Collection Basel)	Holocene	NMB Ty. 7308	1 femur	The proximal epiphysis shows a serious pathology with bone erosion and impressive bone remodelling. It could be about a case of osteonecrosis of the femoral head, where large areas of bone less are surrounded by exuberant osteophytes, or a case of osteosarcoma.	The necrosis of the femoral head is favoured by a high rate of estrogens in the blood probably caused by the ingestion of plants with high concentrations of phytoestrogens.	Pathological lesion compatible with life but very limiting in locomotion.
	Tavolara islet (Major's Collection Basel)	Holocene	NMB Ty. 8797	humerus, radius and ulna	Process of ankylosis in the elbow and radioulnar joints. The proximal epiphysis of the humerus is absent perhaps separated from an unhealed fracture.	These lesions are probably due to a serious arthrosis and an extensive process of periostitis. The cause was mainly of traumatic origin.	Pathological lesion compatible with life but very limiting in locomotion.