

## Phthiraptera found on Goats (*Capra hircus*) in breeding of central-eastern Sardinia

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**Abstract.** In the paper we report data on Phthiraptera collected from goats in breeding of central-eastern Sardinia (Ogliastra Province). A total of 154 specimens of Phthiraptera belonging to the species *Linognathus africanus* (102 specimens), *L. stenopsis* (23) and *Bovicola caprae* (29) were determined between 2005 and 2012 in 26 goats from 13 different farms from all the Province. Two species of ticks, *Rhipicephalus turanicus* and *Rhipicephalus bursa* were also found on some of the specimens of goats. Prevalence and associations among the species are discussed.

**Keywords:** Phthiraptera, goat, Sardinia, *Linognathus africanus*, *Linognathus stenopsis*, *Bovicola caprae*, ticks co-infestation.

### INTRODUCTION

Knowledge about arthropods ectoparasites of livestock in Sardinia are still incomplete. As emerged by recent studies, some taxa as Phthiraptera, are relatively poorly known, and the presence of some species in Italy and in Sardinia has just been recently highlighted (Calzolari et al., 2006; Fois et al., 2012a, 2012b; Veneziano et al., 2003, 2007). The Phthiraptera include the Anoplura (or Siphunculata) and the Mallophaga, respectively the so called sucking lice and chewing lice. They are obligatory permanent ectoparasities, characterized by a high specificity for the host. Phthiraptera can be vectors of pathogens and they can have an important impact on the productivity and welfare of livestock. In Sardinia louse infestation on goats [*Capra hircus* (Linnaeus, 1758)] appears to be common and widespread, but still little is known about the distribution and prevalence of parasitic species. Here we want to give a further contribution to the knowledge of which species more frequently parasitize the local bred of goats. Goats reared in the region, approximately 250.000 heads, are mainly of indigenous races with the introduction of some Maltese breeds and are commonly reared at wild or semi-wild condition.

## MATERIALS AND METHODS

154 specimens of Phthiraptera were collected on 26 goats from farms located in 13 different municipalities of the Ogliastra Province (central-eastern Sardinia) (Fig. 1) during the diagnostic activities of the Tortoli facilities of “Istituto Zooprofilattico Sperimentale della Sardegna”, between 2005 and 2012. The specimens collected using entomological tweezers directly from the goats, before necropsy, were fixed in 70% ethanol and identified at microscope at the Department “Scienze della Vita e dell’Ambiente” of Cagliari University. The ectoparasite were determined for comparisons based on Ferris (1951), Kellogg & Paine (1911), Martin Mateo (2009), Ségui (1944), Manilla (1988) and Iori et al. (2005).

## RESULTS

The most common species found among Phthiraptera Anoplura was *Linognathus africanus* (Kellogg & Paine, 1911) (Fig. 2) with 83 ♀♀, 11 ♂♂, 8 neanids on 18 goats of 9 breeding of the following localities: Arzana, Baunei, Cardedu, Loceri, Perdasdefogu, Seui, Talana, Tortoli and Urzulei.

*Linognathus stenopsis* (Burmeister, 1838) (Fig. 2) with 20 ♀♀, 2 ♂♂, 1 neanid was present in 11 goats from of 8 breeding of the following localities: Arzana, Baunei, Elini, Jerzu, Perdasdefogu, Seui, Ulassai and Urzulei.

*Bovicola caprae* (Gurtl, 1843) (Fig. 2) (Phthiraptera, Ischnocera), with 19 ♀♀, 5 ♂♂, 5

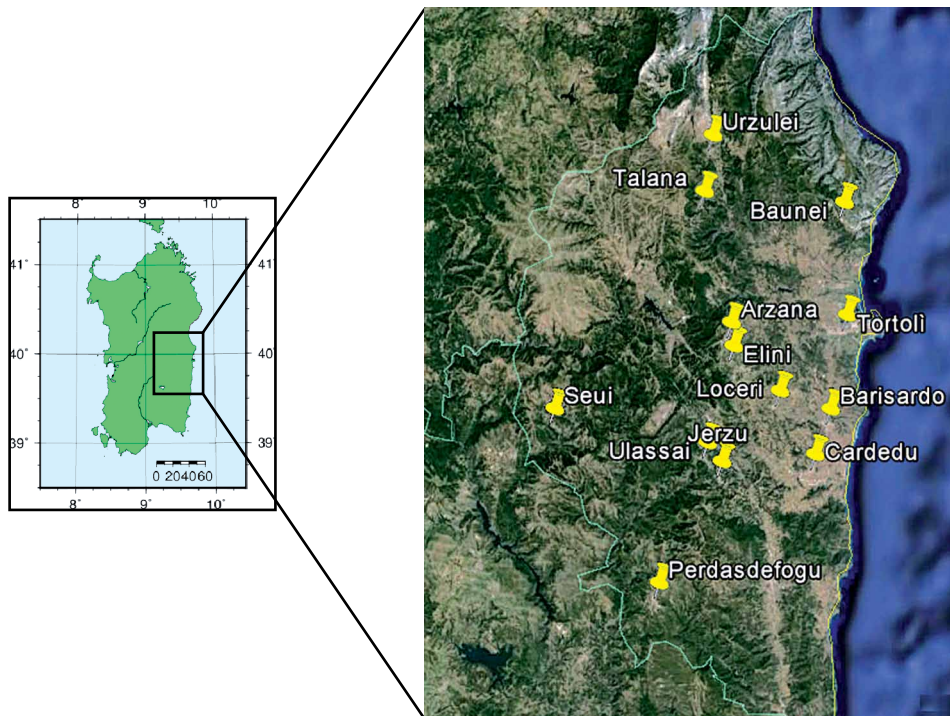


Fig. 1 – Localities of origin of the goats in Ogliastra (central-western Sardinia).

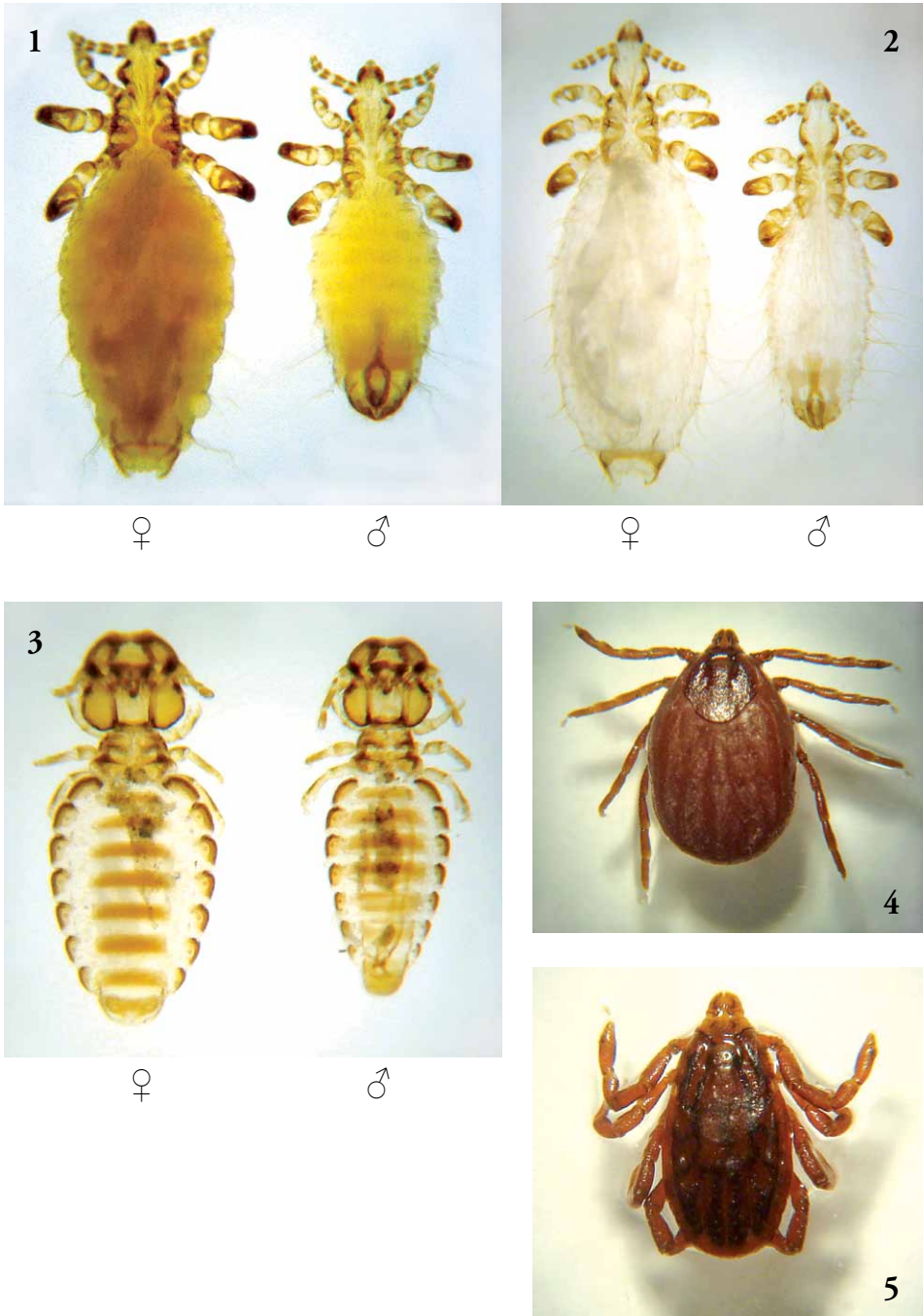


Fig. 2 – Ectoparasites found on goats in Ogliastro. 1) *L. africanus*; 2) *L. stenopsis*; 3) *B. caprae*; 4) *R. bursa* (♀); 5) *R. turanicus* (♀).

neanids, was present in 6 goats from of 5 breeding of the following localities: Barisardo, Perdasdefogu, Talana, Tortoli and Urzulei. All the ectoparasite and host relationship are reported in Table 1.

In five cases *L. africanus* shared infestation with *L. stenopsis* and in four cases with the chewing lice *B. caprae*, a situation already documented in previous papers (Colebrook et al., 2004; dos Santos et al., 2006; Himonas et al., 1989). In only one case, in a goat of a breeding from Perdasdefogu, were found all three species on the same host (Tab. 2).

In 4 goats of breeding of Talana, were also collected 12 specimens of tick (Ixodida, Amblyommidae) belonging to the species *Rhipicephalus turanicus* Pomerantsev, 1940 (Fig. 2) (6

Tab. 1 – Phthiraptera and ticks collected on 26 goats in Ogliastro area of Sardinia.

Goat N.	Locality	Date	<i>L. africanus</i>	<i>L. stenopsis</i>	<i>B. caprae</i>	<i>R. turanicus</i>	<i>R. bursa</i>
1	Arzana	23.V.2011	4♀♀, 4♂♂	1♀			
2	Barisardo	14.III.2008			1♀		
3	Baunei	12.X.2012		4♀♀			
4	Baunei	12.X.2012		3♀♀, 1♂			
5	Baunei	12.X.2012	1♂	3♀♀			
6	Baunei	12.X.2012		1♀, 1 neanid			
7	Cardedu	14.V.2005	3♀♀, 1♂, 1 neanid				
8	Cardedu	18.III.2008	2♀♀				
9	Elini	26.I.2012		3♀♀			
10	Jerzu	01.VI.2012		1♀, 1♂			6♀♀, 6♂♂
11	Loceri	25.V.2007	22♀♀				
12	Loceri	02.VIII.2007	3♀♀				
13	Perdasdefogu	31.V.2012	2♀♀, 1♂	1♀	1♀		
14	Seui	04.IV.2009	8♀♀, 1♂	1♀			
15	Talana	08.I.2008	7♀♀				
16	Talana	21.I.2012	1♀				
17	Talana	13.II.2012	6♀♀				
18	Talana	15.II.2012	5♀♀				
19	Talana	18.IV.2012	1♀		2♀♀	1♀, 3♂♂	
20	Talana	18.IV.2012	2♀♀			2♀♀, 1♂	
21	Talana	23.IV.2012	2♀♀			2♀♀, 1♂	
22	Talana	23.IV.2012	1♀			1♀, 1♂	
23	Tortoli	14.V.2012			3♀♀		
24	Tortoli	30.VI.2012	8♀♀, 3♂♂, 7 neanids		10♀♀, 5♂♂, 5 neanids		
25	Ulassai	20.I.2012		1♀			
26	Urzulei	04.IV.2011	6♀♀	1♀	2♀♀		
<b>Whole sample</b>			83♀♀, 11♂♂, 8 neanids	20♀♀, 2♂♂, 1 neanid	19♀♀, 5♂♂, 5 neanids	6♀♀, 6♂♂	6♀♀, 6♂♂

Tab. 2 – Phthiraptera and ticks community from Ogliastra' goats.

	<i>L. africanus</i>	<i>L. stenopsis</i>	<i>B. caprae</i>	<i>R. turanicus</i>	<i>R. bursa</i>
Number of cases	18	11	6	4	1
Mean prevalence	69,23	42,31	23,08	15,38	3,85
Shared infestation	<i>L. africanus</i> + <i>L. stenopsis</i>	<i>L. africanus</i> + <i>B. caprae</i>	all 3 lice species	<i>L. africanus</i> + <i>R. turanicus</i>	<i>L. stenopsis</i> + <i>R. bursa</i>
Number of cases	5	4	1	4	1

♀ ♀, 6 ♂ ♂) and in only one goat of breeding of Jerzu, the species *Rhipicephalus bursa* Canestrini & Fanzago, 1877 (Fig. 2) (6 ♀ ♀, 6 ♂ ♂) (Tab. 1).

The tick *R. turanicus*, a common species in Sardinia often associated with livestock and wild animals, has been found in association with *L. africanus*, while *R. bursa*, more common in drier habitats and also associated with livestock and wild animals, was found in only one case in co-infestation with *L. stenopsis* (Tab. 2).

## DISCUSSION

The data show that the species detected more frequently and in greater number of specimens is *Linognathus africanus*. This is a species widely distributed and it has been reported in Africa, Asia, Australia, USA, Central and South America. In Europe has been reported in Spain (Portus et al., 1977), in Greece (Himonas et al., 1989) and in Turkey (Tasci et al., 1989a, 1989b). *Linognathus africanus* was reported for the first time in Italy in 2006, in Emilia Romagna (Calzolari et al., 2006) and in Sardinia in 2012 (Fois et al, 2012a, 2012c), but the knowledge about the real distribution of the species are still incomplete. (Fois et al., 2012a). In Sardinia has been documented for at least four provinces (Ogliastra, Cagliari, Medio Campidano and Oristano Provinces) (Fois et al., 2012a, 2012c) but it supposed to be spread throughout the island.

*Linognathus stenopsis* is worldwide recognized as one of the more common among sucking lice of goats. In Italy is well known from the past (Conci, 1946) but still considered present only in the north of Peninsula (Manilla, 1993; Cringoli, 2011).

*Bovicola caprae* is one of the most common species of biting lice on goats. This louse live on the skin surface and feed on hair, skin, and detritus with a entire life cycle completed in one month. It is distributed worldwide and known for north mainland in Italy (Manilla, 1993; Cringoli, 2011). Actually seem that *L.africanus* represent the dominant species on goats in the area despite his recent recognition for Italy. This situation suppose or its previous non-recognition or a recent massive invasion, rather difficult because of the scarce mobility of host towards the island, historically present in farms with local breeds.

The collection of ectoparasite confirmed anyway the presence also of *L. stenopsis* and *B. caprae* as two species associated with goat in Sardinia (Fois et al., 2012a) and stimulate to study in future the relationship among the different species of ectoparasites related to the same host and also to verify their potential role as vectors of pathogens, some of which are still not fully known (Mura et al., 2008).

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## RIASSUNTO

### **Phthiraptera associati a *Capra hircus* in allevamenti della Sardegna centro-orientale**

In Sardegna le conoscenze sugli artropodi ectoparassiti degli animali d'allevamento sono ancora incomplete nonostante recenti contributi almeno per gli Phthiraptera. (Fois et al., 2012a, 2012b, 2012c). Il lavoro fornisce un ulteriore contributo alla conoscenza di questo gruppo di ectoparassiti rinvenuti su capre (*Capra hircus*) allevate nella Provincia dell'Ogliastra (Sardegna centro-orientale). Il patrimonio caprino della Sardegna è stimato complessivamente intorno ai 250.000 capi, ad allevamento brado o semibrado. Gli artropodi sono stati raccolti su 26 capre provenienti da diversi allevamenti situati in tredici comuni dell'Ogliastra, nel Centro Territoriale di Tortolì dell'Istituto Zooprofilattico Sperimentale della Sardegna tra il 2005 e il 2012. Sono stati fissati in etanolo al 70% e successivamente identificati al microscopio presso il Dipartimento di Scienze della Vita e dell'Ambiente dell'Università di Cagliari. Su un totale di 154 esemplari di Phthiraptera, in 18 capre è stato reperito *Linognathus africanus* (Kellogg & Paine, 1911) (83 ♀♀, 11 ♂♂, 8 neanidi), in 11 ospiti *L. stenopsis* (Burmeister, 1838) (20 ♀♀, 2 ♂♂, 1 neanide), e in altre 6 capre *Bovicola caprae* (Gurtl, 1843) (19 ♀♀, 5 ♂♂, 5 neanidi). In 5 casi *L. africanus* condivideva l'infestazione con *L. stenopsis*, in 4 casi con *B. caprae* ed in un solo caso, sullo stesso ospite sono state reperite tutte e tre le specie. Sono state rinvenute anche 4 coinfezioni tra *L. africanus* e la zecca *Rhipicephalus turanicus*, oltre che un caso di coinfezione tra *L. stenopsis* e *Rhipicephalus bursa*. *Linognathus africanus* appare in definitiva essere la specie maggiormente frequente e diffusa a dispetto della sua recente identificazione stimolando a ulteriori approfondimenti sulla sua reale presenza nell'isola e nell'Italia continentale.

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