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Spatial diffusion of surnames by long transhumance routes between highland and lowland: A study in Sardinia

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ABSTRACT

We explored the relationships among Sardinian populations by means of a spatial analysis of surnames in five villages in the historical-geographical zone of Barbagia di Belvì, a mountainous area traditionally devoted to sheep-herding and the point of departure of transhumance toward lowland areas. We collected the surnames of 19th century Sardinian populations through the *Status Animarum* (parish censuses). The structures of past populations were compared with current structures based on surnames reported in telephone directories. The lowland villages studied have been the final destination of transhumance and have a different historical, cultural and economic background. The spread of surnames in Sardinia may have occurred also by means of transhumance which took place every year along precise routes from the pastoral mountain zones to the agricultural plains.

The standardized index of Chen and Cavalli-Sforza was used to calculate relationships among the five villages of Barbagia di Belvì (Aritzo, Belvì, Desulo, Gadoni and Tonara). An application of non-metric multidimensional scaling to the isonymy matrices showed that the villages of Barbagia di Belvì form a group that have changed very little over time. Transhumance routes were studied by spatial autocorrelation (Moran's *I*) applied to surnames. The results suggest that there has been an appreciable admixture between the Sardinian populations of the mountain villages of the central areas and the populations of southern lowland villages.

Riassunto:

Nel presente lavoro sono state esaminate le relazioni tra le popolazioni sarde attraverso l'analisi dei cognomi in cinque comuni della zona storico-geografica della Barbagia di Belvì (Aritzo, Belvì, Desulo, Gadoni e Tonara), area montuosa tradizionalmente dedicata all'allevamento delle pecore e punto di partenza della transumanza verso zone di pianura. I cognomi della popolazione sono stati rilevati dai registri parrocchiali (*Status Animarum*) del XIX secolo. La struttura cognominale di questo periodo è stata confrontata con quella attuale, ricavata dallo studio dei cognomi riportati negli elenchi telefonici, dei comuni di pianura, transito e destinazione finale della transumanza, che hanno un differente fondo storico, culturale ed economico. La diffusione dei cognomi in Sardegna, infatti, potrebbe essere avvenuta anche attraverso la transumanza, che si verifica ogni anno lungo percorsi precisi dalle zone montane pastorali alle pianure dedite all'agricoltura.

È stato utilizzato l'indice standardizzato di Chen e Cavalli-Sforza per calcolare le relazioni tra i cinque comuni della Barbagia di Belvì. L'applicazione del *non-metric multidimensional scaling* alle matrici di isonimia ha mostrato che questi comuni formano un gruppo che è cambiato molto poco nel tempo. Le direttrici di transumanza sono state studiate mediante la *spatial autocorrelation* (Moran's *I*) applicata ai cognomi. I risultati suggeriscono che vi è stata un'apprezzabile commistione tra le popolazioni sarde dei comuni di montagna delle aree centrali e quelle dei comuni della pianura meridionale.

Introduction

Surnames have a cultural origin and reflect the ethno-historical, socioeconomic and linguistic background of a given population,

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especially relevant in the context of population mobility (Colantonio et al., 2003; Cheshire, 2014). In “Western” countries, surnames are transmitted from father to children and are similar to a genetic marker, comparable to neutral and highly polymorphic alleles of a Y-chromosome locus (Boattini et al., 2012; Colantonio et al., 2003; Crow, 1983; Darlu et al., 2012; Graf et al., 2010; Jobling, 2001; Jobling and Tyler-Smith, 2003; King and Jobling, 2009a,b; King et al., 2006; Lacerenza et al., 2017; Lasker, 1985; Lucchetti et al., 1987; Martínez-Gonzalez et al., 2012; Robledo et al., 2015; Sykes and Irven, 2000; Winney et al., 2012). It is usual to select autochthonous DNA donors based on the original surnames of the place of residence (Manni et al., 2005; Winney et al., 2012). Using this specific surname-based approach, several genetic studies observed historical population genetic structure or past admixture events that were otherwise invisible (Bowden et al., 2008; Hill et al., 2000; Larmuseau et al., 2012; McEvoy and Bradley, 2006). Surname analysis can be also used to study migrations (Degioanni and Darlu, 2001; Bloothoof and Darlu, 2013).

The generalized origin of surnames in Italy was decreed by ecclesiastical regulations (*Rituale Romanum*) of the Council of Trent (1545–1563). These rules also prescribed that individuals should be indicated by their first name and surname in the census of the Catholic population (*Status Animarum*).

In many populations, civil sources can also be used: lists of surnames for the entire population (family heads, telephone subscribers, users of other utilities, etc.) are readily available. The relatively easy sampling, similarity with genetically inherited traits and high polymorphism make surnames particularly suitable for the study of microevolutionary processes in populations from the 17th century onward (Lucchetti et al., 2008). Evolutionary processes in populations, isolation, and migrations based on the surname analysis can be considered complementary to other methods (Boattini and Pettener, 2013; Henneberg, 1979; Zei et al., 1993).

In this paper we analyze the spread of the typical surnames from the central area of Sardinia.

Earlier studies on the distribution of surnames in Sardinia have demonstrated that: they act like neutral alleles (Zei et al., 1983a, b, 1986); the migration matrices determined from the temporal differences in surname distributions agree with what is known about the history of the population and its mobility (Wijsman et al., 1984); the temporal variation of the frequency of surnames is 10 times lower than the spatial variation (Zei et al., 1986); the similarities among village populations based on the relative distribution of erythrocyte markers agree with the similarities among villages based on surname distributions (Lucchetti et al., 1987); isonymic relationships among various Sardinian villages follow the isolation by distance model and the isonymy among nearby villages increases in time (Sanna et al., 2001, 2006). Moreover, the genetic homogeneity of Sardinians, shown by the distribution of some Y-chromosome genetic markers, is not confirmed when samples are formed based on the zone of origin of the surnames of sampled individuals rather than their zone of residence (Zei et al., 2003).

It is also noteworthy that the isonymic difference/similarity among various municipalities of Sardinia is conditioned by their geographical location and historical background (Sanna et al., 2006; Orrù et al., 2008). The Sardinian municipalities form a particular and well defined cluster when compared with other Mediterranean communities (Lucchetti et al., 2008).

The island has presented two different but complementary socioeconomic and cultural realities through the centuries. One, typical of mountainous areas, is characterized by mainly pastoral activities, while the other, typical of lowland areas, is characterized mainly by agricultural activities (Sanna and Danubio, 2008). This economic system remained the same until the second half of the 20th century (Sanna, 2006).

There were two basic types of transhumance in Sardinia: short-range, involving movements within the same municipal territory or toward nearby villages, and long-distance, from the western slopes of the Gennargentu Massif in central Sardinia to the south-western plains (Le Lannou, 1941; Ortu, 1988; Sanna and Danubio, 2008).

Sardinian shepherds who practiced long-distance transhumance remained for about six months in the plains, where the flocks wintered: transhumance began in December and was finished at the end of April (Meloni, 1982; Sanna and Danubio, 2008). The transhumance covering the longest distances started in the villages forming Barbagia di Belvì and Barbagia di Ollolai, with migrations to the wintering areas of up to 150 km. To reach the wintering areas, the flocks of Barbagia had to cover many kilometers of highlands and plains densely populated by farmers. Sometimes, en route, this created conflicts with the owners of the lands bordering the winter pastures (Le Lannou, 1941).

The spread of surnames in Sardinia may also have occurred by means of long-distance transhumance, occurring every year along precise routes from the pastoral mountain zones to the agricultural plains.

Historically, the territory of the island is divided into 34 zones (Ghiani Moi, 1964). This categorization provides important information about the territorial distribution of people in Sardinia: people living in the same zone have likely shared the same habits, living conditions, food, meteorological features, etc. We considered a subset of these zones, i.e. only the ones involved in transhumance (Fig. 1). The point of departure of transhumance toward lowland areas was the zone of Barbagia di Belvì, a mountainous area traditionally devoted to sheep rearing. From the genetic point of view, the population of this zone is considered one of the most conservative of the island (Calò et al., 1998; Cappello et al., 1996; Vona and Calò, 2006).

We obtained the frequencies of surnames of these mountain populations in the 19th century and in recent times and compared them with the current distribution of surnames in the lowland villages. These lowland populations live in a cultural and economic environment very different from that of the populations of Barbagia di Belvì.

The aims of this paper are: 1) to highlight the relationships among the Sardinian populations in relation to transhumance, and 2) to determine if transhumance resulted in appreciable admixture between the pastoral populations of the mountains and the agricultural populations of the plains.

Methods

The populations considered were those of the villages of Aritzo, Belvì, Desulo, Gadoni and Tonara, which form the historical-

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