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Interstitial but resilient: Nomadic shepherds in Piedmont (Northwest Italy) amidst spatial and social marginalization

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Abstract. Mobility, nomadic pastoralism's main adaptive strategy, has been compromised by agricultural expansion and rangeland fragmentation, among other factors, in many pastoral contexts. Among nomads' coping strategies, there is re-shaping mobility in shrinking grazing grounds. Through semi-structured interviews, in this study we address adaptation and resilience to the effects of increasingly intensive land use and pastoralists' marginalization employing Alpine nomadism (a form of mobility-based sheep husbandry that includes a vertical transhumance and a winter wandering in the lowlands) in Piedmont, Northwest Italy, as a case study. Our results show that Alpine nomads access a wide variety of grazing grounds through a web of social relations with multiple stakeholders, acting in the interstices of mainstream society and navigating marginal contexts: geographically, they use fallow, abandoned, and second-hand plots; economically and socially, they interact with other marginal groups of people (e.g. migrants) and are antagonized by diverse sectors of society. This interstitiality is in itself a form of adaptation that is taking place in diverse geographical contexts as nomads reconfigure their mobility and social relations to access the scattered pieces of land left unused by industrial, agricultural, and conservation land uses.

Keywords: Nomadic pastoralism; Transhumance; Europe; Resilience; Sheep husbandry

1. Introduction

For thousands of years, pastoral nomadism has allowed humans to occupy the most marginal areas of the world in terms of vegetal biomass production. The exploitation of patchy and seasonal grazing resources has subsumed the deployment of mobility as the main adaptive strategy (Niamir-Fuller 1998; López-i-Gelats *et al.* 2016). However, pastoral mobility has been compromised by agricultural expansion, rangeland fragmentation, intensification of livestock husbandry, and political and institutional marginalization in many pastoral contexts (Fernandez-Gimenez and Le Febre 2006; Galvin *et al.* 2008). As a consequence, the number of nomads, i.e. mobility-based pastoralists, has been declining worldwide, along with local breeds, products, and gastronomy, as well as forms of associated culture, knowledge, practices, and rituals. Pastoral nomads have adapted in a variety of ways, including diversification into other (non-livestock) productive strategies, diversification of their livestock portfolio, specialization on specific products, breeds, or production strategies, also maintaining mobility by re-shaping it into changing contexts, e.g. traveling further, motorizing livestock transport (Fernandez-Gimenez and Le Febre 2006; McCabe, Leslie, and De Luca 2010). Several studies have addressed pastoral systems' resilience in a changing world (Homann *et al.* 2008; Postigo *et al.* 2008; Thornton *et al.* 2009; Robinson and Berkes 2010; Dong *et al.* 2016). However, scholars have paid less attention to how pastoral systems adapt to changes (e.g. in land tenure and use, urbanization, agricultural intensification) that are squeezing them into the margins socially, economically, and geographically. To understand and discuss the ways and means through which nomadic shepherds adapt to the effects of increasingly urbanized contexts and intensive land use, we investigated nomadic shepherding in Piedmont, Northwest Italy, focusing on the system's resilience in a context of marginalization at multiple levels.

Alpine nomadism, as this pastoral system is sometimes called (in Italian *pastorizia vagante*, lit. 'wandering pastoralism'), is a form of mobility-based sheep husbandry widespread in several regions of North Italy (Verona 2006; De Marchi 2010; Nori and De Marchi 2015; Verona 2016). It can be conceptualized as a form of vertical transhumance, as these shepherds and their flocks seasonally exploit complementary resources in both highlands and lowlands (Ruiz and Ruiz 1986; Bunce *et al.* 2004; Mack, Walter, and Flury 2013; Juler 2014). But unlike contemporary forms of European transhumance, in which the animals are stabled during winter, in Alpine nomadism winter mobility is retained and focuses on forage resources available in the intensively used lowlands (Aime, Allovio, and Viazzo 2001; Fernandez-Gimenez and Le Febre 2006). In this study, we chose to use the terminology 'Alpine nomadism' to maintain the nuances of the Italian term and to stress the fully mobile aspect of the system.

Although mobile pastoralism (including transhumance and nomadism) is commonly associated with environments with low human population density and extensive rangelands (Blench 2001; Dong et al. 2016) and it is sometimes considered not compatible with agricultural industrialization policies and land use (Eriksson 2011), Alpine nomadism occurs in a highly industrialized agricultural and densely populated area, e.g. the Po Valley and the surrounding mountains. As such, it depends on the ability of shepherds to find interstitial grazing grounds not only geographically (e.g. between cornfields, cities, road infrastructures, private fields, protected areas) but also socially and politically, among others' economies and lands (Aime, Allovio, and Viazzo 2001).

Mobility-based forms of livestock husbandry have witnessed a steep decline during the last hundred years in favour of intensive forms of animal husbandry based on stabling and economies of scale rather than mobility (Lozny 2013). Of the wide network of pastoral movements that used

to connect European mountain pastures with lowlands and cultivated areas, only truncated forms survive (Kerven and Behnke 2011). The lowlands and valleys have been engulfed in housing, infrastructure, factories, and intensively cultivated fields, leaving little space for sheep, while economies of scale have favoured intensive husbandry in the lowlands and marginalized local mountain production. Several institutions and organizations (e.g. Slow Food, the European Union) have been calling for a revalorization of mountain productions and a reactivation of traditional forms of landscape management, thus recognizing the importance of supporting forms of livestock husbandry based on mobility and rooted in the territory (Rokos and Michailidou 2005; Kerven and Behnke 2011). Policies of the EU and other institutions influence shepherds' decision making and reverberate across the environmental, social, and political landscape (Eriksson 2011; Nori and De Marchi 2015).

To address these issues, in this study we draw from the literature about *resilience*, defined as the ability to adapt and maintain livelihoods under changing conditions (Walker *et al.* 2004; Nelson *et al.* 2007), and *marginality*, defined as 'the position of people on the edges, preventing their access to resources and opportunities, freedom of choices, and the development of personal capabilities' (von Braun *et al.* 2009). Situations of marginality are defined by a specific position of the actor (a person or group) within the multiple dimensions (e.g. economic, geographical, social, cultural) of peoples' livelihoods (Gatzweiler and Baumüller 2014), and manifest themselves with conditions of exclusion from the mainstream society and economy, and from processes of decision-making that take place at a higher (national, regional) political level. We understand marginalization to be the social phenomenon by which an individual or group becomes marginal, i.e. the process whereby someone is pushed to the edge of a group, or a group to the margins of society (von Braun *et al.* 2009). The struggle of marginalized pastoralists to

maintain the resilience of their social-ecological system vis a vis rangeland fragmentation and land use intensification gives rise to a complex suite of adaptive practices that we call *interstitial pastoralism*, understanding *interstitiality* as the condition of being between spaces, of filling spaces, of being in the background, of going unnoticed. Alpine nomads and other pastoralists, in the process of marginalization of their livelihoods, have sought opportunities in these interstitial, marginal conditions.

This paper addresses Alpine nomadism in Piedmont with the aim of describing and discussing: 1) The nomadic shepherds, their flocks, and livelihood practices; 2) The landscapes used and navigated and how they are perceived by shepherds; 3) The social relations and networks established by shepherds; and 4) The adoption of interstitiality as a strategy to adapt to a changing socio-economic environment. We first describe Alpine nomadism (e.g. shepherds, flocks, economic purpose, itineraries) and shepherds' categorization of the landscapes they wander with their flocks. We then address the wider links that these shepherds have with the 'outside' world and the ways in which the outside world shapes Alpine nomadism. Finally, we discuss the results in terms of the degree of resilience that mobility provides to Alpine pastoralism, highlighting the similarities that interstitial forms of pastoralism hold in widely different geographical and social contexts.

2. Background

Piedmont is a region in North-western Italy with over 4 million inhabitants and a population density of 173 people/km^2. Mountains cover about 40% of the regional area, while hills and plains 30% each. Corn and winter wheat are the main crops in the plains, apart from northern Piedmont where rice fields predominate. Livestock husbandry and transhumance have historically been an

integral part of the Piedmont foodscapes, with a widespread use of mountain pastures during summer and a diversity of livestock breeds and livestock-derived products.

Sheep-based Alpine nomadism has a thousand-year-old history in Piedmont, where shepherds used to move seasonally from the summer mountain pastures to the winter plains and vice versa (Bini and Vicquèry 2013). The use of mountain pastures in the Western Italian Alps has been shown to go back more than 5,000 years ago (Pini *et al.* 2017). The prevalent use of sheep in this system has shifted through time, from a multi-purpose use (i.e. milk, meat, and wool) to an increasing degree of productive specialization in meat production. Sheep milk was widely used for cheese making in the Po plain until the 13th-14th centuries, when a tendency to be replaced by cow milk began (Montanari 2003). Nowadays, cattle husbandry is more important (e.g. in economic terms and cultural relevance) than sheep husbandry across most of the region's area. Furthermore, the decline in value and request for wool, which shepherds used to sell to local factories, in the last century further pushed shepherds towards a specialization in meat production and meat-oriented productive systems. The typical breed has always been the Biellese sheep, which is still one of the most important sheep breeds in northern Italy.

Over the centuries, shepherds continuously adapted their movements in accordance with the changes in land use occurring in the highlands (e.g. allocation of the best grazing grounds to cattle) as well as in the lowlands, where they had to negotiate their transit and access with different landowners and stakeholders (e.g. tolls paid to Benedictine monasteries for transit, negotiations with farmers for access to stubbles; Roletto 1920). In different areas of the region, shepherds and their flocks have seasonally used a combination of ecosystems. For example, shepherds of Valsesia used to spend the winter in the *baraggia*, a dry heather moorland with scattered forest trees. The

baraggia is still a crucial ecosystem for the survival of Valsesian pastoralism vis-à-vis the spread of intensive agriculture in the Piedmont plains (Bini and Vicquèry 2013).

Notwithstanding the historical importance of Alpine nomadism and transhumance in Piedmont and North Italy in general, the last thirty years have witnessed a drastic decline in livestock farms (-74%) and a concomitant livestock concentration in larger farms. The decline was particularly evident in the hills (-26%) and mountains (-36%), with repercussions on land maintenance and ecosystem management (Regione Piemonte 2017). In Roaschia (Southern Piedmont), where the local sheep breed (Frabosana or Roaschina) is an excellent milk producer and sheep husbandry has a long standing history, the number of sheep has declined since the Second World War to the point that Roaschian pastoralism has almost disappeared and the Frabosana is listed among the endangered ovine breeds (Aime, Allovio, and Viazzo 2001). Negative trends for mobility-based pastoralism in the North of Italy are the result of a number of concurring factors such as increasing intensification of livestock husbandry, abandonment of marginal areas and small-scale productive strategies, and increasing land use intensification especially in the lowlands. The research question in this context relates to the ways and extent to which Alpine nomads cope with a changing socio-economic environment and adapt their pastoral system to a fragmented landscape accessible through multi-level and diffuse social relations.

3. Methodology

Fieldwork was carried out between March and May 2017 in Piedmont, and included literature review, public data retrieving, and semi-structured interviews with nomadic shepherds and other stakeholders. Data collection consisted of two phases. The first phase included data collection from the four animal health authority offices in Piedmont where shepherds submit their request for

nomadic grazing, thereby listing species and number of animals and the itineraries followed municipality by municipality, day by day, within a one-year period in 2016. The second phase consisted of anthropological fieldwork methods (Bernard 2006) such as participant observation and in-depth semi-structured interviews with twenty nomadic shepherds (all men, from 20 to 80 years old, with a mean age of 49) selected randomly from the list in phase 1 (two restrictions were applied: only shepherds who graze in more than 4 municipalities and have sheep in their herd were considered). Shepherds were first contacted by phone and then, upon their acceptance, visited directly in the field. Questions included herd size, movements and itineraries, perceived environments, involvement in EU subsidy programmes, local and regional institutions, and owners of private lands, market involvement, constraints and opportunities. Interviews lasted for two to three hours, were conducted in the field in the Italian language, recorded, and later transcribed. The transcriptions and notes taken during fieldwork are the study's qualitative data, which were coded and analyzed narratively (description, explanation, interpretation, quotations) and through descriptive statistics. Participants were given an explanation of the methodology, aims, and outcomes of the study, and informed consent was obtained verbally before interviews were conducted. Throughout the field study, the ethical guidelines adopted by the American Anthropological Association (AAA 1998) were followed.

4. Results and discussion

4.1 The shepherd and his herd

According to the data collected, there are 65 fully nomadic sheep flocks in Piedmont. They move all over the region, especially in mountainous and hilly areas and along river banks (e.g. Po, Sesia, Tanaro, Ticino). Herd size ranges between 400 and 3000 sheep. Shepherds claim that a herd with

less than 500 sheep is not economically viable, while the maximum viable herd seems to be about 1500 sheep (Table 1). The limited available data from other regions of North Italy show a comparable number of nomadic shepherds: in Lombardy, 60 shepherds have about 60000 sheep or about 1000 per flock (Regione Lombardia 2013).

Some 85% of the shepherds interviewed have only sheep of the Biella breed, the others having Bergamo sheep or a mix of the two. However, nomadic flocks never consist of sheep only, but rather they always include a variable number of goats (equal to one tenth or less than that of sheep, they provide milk and nurse lambs whose mothers refused them), some donkeys (from a few to fifteen, they provide transport of goods and lambs, especially during the seasonal movements up and down the mountains), as well as a variable number of dogs (both guardian dogs for animal predators and thieves and shepherd dogs to manage the flock). About one third of the shepherds also have few cows, used for milk production for home consumption, moving along with the flock. According to some informants, in the past chicken and rabbits were present, in a veritable nomadic farm. Within this livestock portfolio, the browsing habits of goats (e.g. bushes and brambles) are complementary with sheep's grazing habits, thus allowing the shepherd to use a field more efficiently as well as contrasting the growth of secondary forests on abandoned plots. However, goats' browsing habits can also damage valuable plants such as young poplars in reforestation areas or pulp-production plantations.

The daily routine of flocks includes grazing in the morning and in the afternoon, and spending nights in mobile fences. Shepherds move along and live in caravans; many have families in a settled house, where they go back once a week or more according to the distance. Herding units (i.e. labour force) mainly consist of one shepherd and one (or more) helpers (in 40% of the units). Other common herding units include the shepherd, his wife, and some helpers or the shepherd,

some relative(s) and/or helpers. Within the herding unit, the shepherd is the one who makes decisions, rarely leaves his flock, and possesses extensive nomadic experience. Because there is a frequent turnover of helpers, few of them have the knowledge to make decisions about flock management. In recent years, some authors have stressed the key role of migrants for the resilience of Euro-Mediterranean, including Italian, pastoral systems (Huband, McCracken, and Mertens 2010; Nori 2014; Nori and De Marchi 2015). In line with these findings, most of the helpers we met are Romanian, particularly from the area around Bacau, and have had experience with herding in their home country. Women, shepherds' wives, are usually in charge of bureaucratic tasks, keeping contacts with animal health and local authorities, take care of cattle, and act as caregivers for lambs and sick sheep. In addition, food provision (sometimes including cheese making for their own use) is a daily task of wives. If included in the herding unit, relatives such as sons, sons-in-law and grandchildren are primarily responsible for helping (and learning from) the shepherd.

About 80% of the shepherds do not have other income than the one obtained from sheep (meat only) and in some cases cows (milk and cheese production). About 20% of the shepherds have some other income (Figure 1), e.g. from trading sheep, as hired shepherds in Switzerland during summer time, as night guards, or from pensions. Some 95% of the shepherds obtain EU subsidies aimed at preserving mobility-based and marginally-located pastoral systems and livelihoods.

4.2 The shepherd and his landscapes

Year-round mobility, particularly winter mobility in the lowlands, is the distinguishing trait of Alpine nomadism versus contemporary forms of Alpine transhumance. Hence, we interviewed shepherds about their yearly movements and plotted these on a map (Figure 2, each shepherd with different colour), recording also the time and reasons for (not) choosing a particular grazing location. The twenty itineraries show the actual movement of each informant during the year

2016. The routes taken are variable, both among shepherds as well as from year to year for the same shepherd. All the itineraries have in common a transhumant movement between the lowlands and the mountains, as well as a somewhat fan shape, with on one side the uniformity of mountain grazing and on the other side the flexible itineraries in the plains, which open as a fan in the interstices of the lowlands. South-western Piedmont is devoid of Alpine nomadism because it is intensively cultivated with corn and wheat, with shepherds often crossing the cultivated plain by truck (hence the straight line on the map). Several shepherds spend the winter in Monferrato, a hilly area characterized by small allotments, a variety of crop fields, and substantial landscape and ecosystem diversity. The transhumant movement is similar in North Piedmont, though flocks there tend to spend the winter in rice fields and along river banks, before climbing the Pennine and Lepontine Alps in late spring.

Yearly movements can be grouped into four main periods (Table 2) defined by the continuous pendulum between highlands and lowlands and their transition phases. Alpine nomads and their flocks spend about four months per year in the highlands, exploiting the forage-rich pastures during the summer season. The movements up and down the mountains are mostly done on foot (particularly the return to lowlands), fewer times by truck, and can last one month or more with the flock moving daily. During the descent, flocks follow river banks and graze from fallow fields before moving at the beginning of October to cultivated fields and meadows, in accordance with agricultural cycles and navigating different anthropic and semi-natural environments.

When asked to free list and describe the environments they move across, shepherds provided a nuanced understanding of the landscape around them, listing forty perceived environments (Figure 3, we did not include the environments mentioned by just one informant). Every informant reported both a horizontal and a vertical transhumance, which included a variety of

landscapes such as mountain pastures, hilly areas, river banks, as well as city parks (two shepherds bring their flock to graze in the outskirts of Turin, one of them in the Parco del Valentino, at the very centre of the city), roadsides, and abandoned plots.

4.2.1 Alpine pastures

Alpine pastures (up to 3,000 m asl) were mentioned by all informants but one and are the most cited landscape used for grazing.[1] Sixty percent of the informants regard Alpine pastures as 'the best they can offer to their sheep', with abundant water and grass, claiming that the grass is very nutritious ('the grass never gets old', 'sheep eat little but they are always full'), though sometimes limited in quantity. Most shepherds further report that the quality of the grass increases with altitude, envisioning 'centuries-old grasses, born directly from the mountain itself.' Among these, *Ligusticum mutellina* ('as thin as parsley'), *Trifolium alpinum*, *Trifolium incarnatum*, and *Festuca alpina* were mentioned.

As in Northeast Italy (Nori and De Marchi 2015), Alpine pastures are mostly rented by shepherds for the summer season. They are allocated through a system of auctions, and this is an important cost and problematic for access to mountain pastures. Nomadic shepherds live in mountain cabins and usually visit more than one cabin per summer season, moving from the lower (at intermediate altitude grasslands and meadows) to the highest (permanent grasslands at 2,000 m and above) and back. Most of these cabins have no water or electricity guaranteed; some are better equipped and can be reached by motorized transport. A positive aspect of Alpine pastures according to informants is the lack of intensive agriculture and hence of residues from chemical weeding and pesticides on the vegetation, with overall better health of the animals. From the shepherd's point

[1] One shepherd distinguished Alpine pasture into two different areas: the *drua*, an area close to the cabin with higher fertility due to continuous presence of livestock, and the *giavina*, highland grasslands dotted with stones.

of view, it is also a positive time of the year, when 'days are beautiful and there is not a lot of bureaucracy [as the one needed to navigate the lowlands].' Problems include the presence of wolves, conflicts with tourists (e.g. regarding the relations between guardian dogs and tourists, the conversion of grazing grounds in touristic facilities), increasing prices of mountain pasture, and the somewhat precarious living conditions, often without a proper cabin, road access, or telephone network. In the mountains, sheep husbandry suffers from competition with cattle husbandry, which usually occupies the better pastures due to cattle herders' capacity to pay higher rents and their utilization of grazing grounds with cheese-making facilities, which are also those with better infrastructure. Instead, sheep husbandry is marginalized to higher elevations and to pastures with difficult access, i.e. those lacking cheese-making facilities and hence assigned to meat flocks and herds, and those with steeper grazing grounds and hence assigned to sheep.

Wolves have recolonized the Alps, including Piedmont's mountainous and hilly areas, during the last twenty years after almost a century of absence (Marucco 2014). The establishment of wolf packs in the highlands have generated alarm and tension among livestock owners who generations ago abandoned the measures necessary to reduce the likelihood of wolf attacks. A sometimes harsh debate is ongoing in Italy about the presence of wolves in the Alps and their impact on local livestock husbandry (Verona, Corti, and Battaglini 2010; Nori and De Marchi 2015). In spite of this, no informant reported wolf predation on their flocks nor considered wolves a main problem. The lack of reported wolf attacks by our informants is surprising given the several cases of wolf predation on domestic livestock that occurred in the Alps in the last twenty years and the fact that big nomadic sheep flocks are theoretically more difficult to guard and thus an easier target for wolves (Verona, Corti, and Battaglini 2010). Shepherds are aware of the risks connected with the presence of wolves, and never leave their flock unattended, but overall they consider, as one of

them stated, that ‘chemical products on the plains kill more than wolves in the mountains’ (cfr. Bini and Vicquèry 2013).

4.2.2 Lowland permanent grasslands and cultivated fields

Permanent grasslands and cultivated fields on the plains and in the hills were mentioned by 19 and 3 informants respectively (most shepherds refer to them simply as grasslands) and are the most important winter pastures. They are regarded as ‘fat’, as they have fertile soils and include abandoned and hay-making fields. Forty percent of the shepherds rent these fields from late autumn to winter as they are regarded the best pastures for their good grass and the relative ease in monitoring the flock. On the negative side, when it is rainy these fields quickly turn into muddy areas not suited for grazing.

Grasslands in the hills are highly regarded for the diversity and quality of their grasses (‘grasses have a different taste up on the hill’). However, increasingly fewer shepherds are using hilly grasslands due, according to informants, to two sets of motives. The first relates to the relative small size of grazing parcels there and to the increasing average flock size for economic viability: as economic returns per sheep head decline over time due to the marginal economic position of nomadic shepherds, economic viability is achieved by increasing flock size, in an attempt to increase gains by lowering production costs (Nori 2014). As a backdrop, shepherds select against smaller grazing plots because of the difficulties in managing the flock there, and by doing so select somewhat against grasslands in the hills. Indeed, in North Italy Alpine nomadism, average herd size increased from 100-150 sheep a century ago to about one thousand today (Regione Lombardia 2013). The second motive relates to the depopulation of hilly areas and their abandonment as productive areas, which according to informants means less fertilization and lower grass quantity and quality, as well as more abandoned areas unsuitable for grazing. The case of grasslands in the

hills shows how nomadic shepherds intersect and cope with wider changes that have occurred in North Italy during the last fifty years, including industrialization, urbanization, intensification of production in the lowlands, depopulation of marginal and mountainous areas, abandonment of agriculture and loss of landscape management, and growth of secondary thickets and forests over abandoned fields.

Cultivated fields are also important for the provision of stubbles. Corn, soy, wheat, and oat stubbles, in order of number of mentions, are an important source of proteins for nomadic flocks. Corn stubbles are the most popular but shepherds limit their access to sheep claiming that too many cause swelling and death by rumen blockage. Hence, some herders avoid corn stubbles, others continuously check for any sign of distress after consumption (e.g. 'at night you shouldn't see them full'). Soy stubbles are visited in the early spring, when soy fields' nitrogen fixation provides an early growth of nutritious grass.

4.2.3 Woodlands plantations

Black locust, poplar, acorn, and chestnut woodlands, in order of importance, provide diverse grasses as well as shade. Black locust woodlands were mentioned by half of the informants as palatable for their sheep but also dangerous because the trees' thorns may cause wounds and limps. Poplar woodlands and plantations used to be a key riparian environment for nomadic flocks; shepherds reported a sharp drop in the number of these plantations in recent years, which were often reconverted to corn, wheat, and Italian ryegrass cultivation. Poplars are essential for nomadic flocks because they provide shade, a place that can be easily enclosed, and a soil that does not suffer from trampling when rainy. However, grasses in the understory are not highly esteemed, except for *Stellaria media.* Acorn and chestnut tree woodlands are typically found in northern Piedmont. However, shepherds reported that chestnut woodland grazing has been

compromised during the last decade by the widespread effects of the chestnut gall wasp's invasion on chestnut production (sheep are fond of chestnuts) as well as by the effects of the abandonment of chestnut woodlands and management, which make them 'dirty' (i.e. with an abundance of dead biomass and colonized by brambles) and unsuitable for grazing.

4.2.4 Fallow, abandoned plots and protected areas

Some 80% of the informants reported grazing their flocks on fallow land, abandoned and unused plots (e.g. abandoned vineyards and cherry-orchards), and brambles. As recognized by the herders themselves, grazing keeps these areas 'clean' by removing dry biomass and halting the colonization of shrubs and brambles, at the same time reducing the damaging impact of wildfires and maintaining the landscape. Sheep grazing is an integral part of landscape management in many European countries, as such providing a plethora of ecosystem and cultural services, such as articulating unused green spaces, maintaining and supporting biodiversity and landscape diversity, preventing the growth of secondary forest, and generating short food chains of culturally-meaningful products (Nori and De Marchi 2015; Ross et al. 2016; Triboi 2017). In the name of these services, shepherds also seek access for their flocks to protected areas and regional parks. However, in recent years, traditional winter feeding grounds along rivers have been declared protected areas by the regional legislation because of their high biodiversity. This has shortened and limited the time that shepherds can spend there, when they are not completely banned due to concerns over trampling, overgrazing, and disturbance of nesting birds (Regione Piemonte 2008). Shepherds argue that they should be allowed access for the ecological benefits of sheep grazing for that same biodiversity that park authorities aim to conserve, and further warn that without grazing the areas will 'turn dirty', with consequences to soil fertility and biodiversity ('no dung, no fertility').

From an ecological perspective, Alpine nomadism uses renewable resources in areas unfit for intensive land uses (e.g. mountain pastures), in unused and abandoned plots, and makes a secondary, seasonal, and complementary use of spaces with other land use priorities (e.g. conservation of river banks, crop production in cultivated fields, hay production in meadows visited after the second or third cut). Absent added grains and feeds, herd size is limited by the biomass produced in these environments and by their accessibility. Accessibility of grazing plots is vital to Alpine nomadism's resilience, in terms of geographical as well as socio-political accessibility. Shepherds need to be able to navigate their social as well as their geographical surroundings to grant their flocks access to grazing resources.

4.3 Shepherds' social and economic relations

We have described the different ecosystems where shepherds move their flocks, and we have hinted at how shepherds' ability to access these grazing fields is continuously shaped by the wider society of the region. During winter, Alpine nomads wander among municipalities that allow their transit and municipalities that do not, cross busy roads and railways, move their flocks at night to avoid blocking traffic, and struggle to keep flocks out of parks and other protected and forbidden areas. This navigation of the landscape is social as well as geographical. Shepherds need to not only know the geography of places and the characteristics of the grazing resources in each place in different seasons, but also establish and maintain a vast array of social relations to be able to access those resources (Figure 4). These diverse relationships are integral to the pastoral system as they make core ecological relations (e.g. the relations between the sheep and the grass, and between the shepherds and their flocks) possible. They take place with social (e.g. other shepherds, farmers, field owners, tourists), political (e.g. agricultural unions, road police, municipal and health authorities, the EU), and economic (e.g. shearers, tradesmen, slaughterhouses, customers) actors

and are each characterized by the transfer of cash, services (e.g. landscape conservation and management, manure, cultural services, safety, etc.), or products (e.g. lamb meat, cheese, wool) between the shepherd and each stakeholder.

These relations form an intricate social web that is paramount to nomadic shepherds, the more so as they move through interstitial spaces of a larger society with other priorities on land use than feeding sheep. Shepherds rely on a continuous renegotiation of access to fields as well as on flexibility about where and when to move. They need to balance safety (e.g. in relation to railway networks), feeding, and itineraries while moving from parcel to parcel, also having regard to the authorizations needed to cross private and public terrain. Shepherds interact with farmers to get access to their fields in accordance with the agricultural calendar. Some agreements between farmers and shepherds have been institutionalized over centuries and are still somewhat maintained or enforced based on customary practices. Traditionally, flocks were allowed to freely graze cultivated fields between Saint Martin's Day (November 11th) and Saint Joseph's Day (March 18th). When shepherds move to cultivated fields, they usually first contact the farmer for permission, then a scouting is organized to check how to reach the field (e.g. how and where to cross rivers and roads), and eventually a mobile fencing system is set up to avoid sheep damage to crops. The time spent in each field varies in accordance with the size of the plot and to the palatability and quantity of grazing resources, among other factors. Nowadays, permissions for transit and grazing must be requested from local animal health authorities (who submit the request to the municipality, which can accept or deny transit and grazing) and to the field's owner. The owner may require a payment in cash (an increasingly prevalent mode of transaction) or in livestock products (e.g. a lamb or cheese). The double permission needed makes the process

cumbersome and expensive, the more so in such a compulsorily flexible pastoral system in which movements can hardly be foreseen.

Among the most important relations there are those with the agricultural unions, which drive shepherds through the bureaucracy to access European Union subsidies. These have the aim of preserving mobility-based and marginally-located pastoral systems and livelihoods, as well as associated ecosystems and products (Eriksson 2011; Kerven and Behnke 2011). In Italy, they are managed and distributed by each region. For the period 2014-2020, the Piedmont Region provides funds and payments to nomadic shepherds through four main schemes (Regione Piemonte 2017): 1) Support to endangered autochthonous breeds; 2) Grazing extensification (e.g. to keep the grazing area clear of weeds and bushes, not to apply pesticides, chemical weeding, or mineral fertilizers); 3) Application of safety systems to prevent canine (e.g. wolves and stray dogs) attacks in the highlands (e.g. electric fences, guardian dogs); 4) Application of the pastoral farm plan in Alpine pasture areas. A majority of informants apply to the first two programmes each year, the first by introducing sheep of the *tacola* breed, an endangered Piedmont ovine breed, into the flock (10-15% of the total sheep heads). Regarding the second, most shepherds can only apply for highland subsidies since they do not have any written contract for the lowlands. The third and the fourth schemes are allegedly seldom applied for due to the difficulties (e.g. heaviness, difficult of transport due to isolation of grazing grounds, rocky pastures) of using electric fences in marginal mountain pastures. Although economic subsidies are a welcome integration to shepherds' livelihoods, they also attract speculations, with some actors entering the sector only to intercept the flow of these monies. In the words of one informants, 'they are not shepherds; they have never seen a sheep!' Most shepherds further regard the schemes as a distortion (albeit a necessary one at the moment) of what their livelihoods should ideally be, i.e. being paid the right price (relative to

production costs and margins of profit) for their sheep's meat. But on the one hand their price cannot compete with those of intensive livestock husbandry (for complex reasons that include economies of scale, lack of accountancy of intensive farms' externalities in the final price, etc.), and on the other hand lamb, ram, and sheep meat do not have a large market in Piedmont and in North Italy in general. Rams are usually sold alive directly to customers or butcheries, and shepherds eventually fetch low prices for their high-quality meat. In this context, Alpine nomads have found in recent years a market for their meat among Muslim migrants and families from the Maghreb countries, who are the main consumers of sheep meat in Italy. Such a market takes place with a reorganization of slaughtering, as Muslim customers demand Halal meat. A large number of rams are requested by the Islamic community for *Aid el-Adha*, an Islamic celebration that takes place each year about two months after the end of Ramadan. A marketing possibility for shepherds is to pursue economic stability by adapting to consumer demands and synchronizing flock reproduction and the availability of lambs and rams to the Islamic calendar and to establish networks with halal slaughterhouses (Nori and De Marchi 2015).

In spite of the marketing difficulties, specialization in meat production is at the moment the path taken by all informants, given the market marginality of cheese and wool, the two other main products traditionally obtained from sheep. Cheese production is hampered by the lack of cheese-making facilities, investment capacity, and labour force inherent to a form of pastoralism that exploits the margins geographically and socially. Wool had a huge economic importance in Piedmont until the second half of the 19th century (Mocarelli 2009): the income from the March shearing paid the shearers for the whole year, and the income from the September shearing went 'under the mattress' (as savings). Nowadays, wool is no longer a reliable source of income, but

rather regarded as a cost and ‘a special waste’: sheep are shorn once a year at Easter time and the wool, when sold, is purchased for around 0.30 €/kg, which is not even enough to pay the shearers.

4.4 Interstitial pastoralism

The partnership between humans and sheep, mediated by grass and accessed through mobility, is an old and resilient one. This resilience is greatly exemplified by this case study, in which nomadic shepherds move through the interstices of an industrialized and intensively cultivated territory, in a condition that is economically, socially, and geographically marginal at the same time. Even in harsh conditions for its perpetuation, nomadism finds ways of squeezing itself into a hostile society (e.g. pushed to the fringes of legality in relations with migrants, both as a labour force and as customers; deprived of grazing grounds in the lowlands due to development and conservation; blamed by tourists and locals for the filth and smell, and obstructing roads; reproached by animalists for slaughtering lambs). Today the old partnership turns to migrants and abandoned and fallow fields for survival and this is, in itself, a great display of adaptation and resilience.

This form of adaptation is not unique to Alpine nomadism; rather, it is present in several contexts in which pastoralism loses access to grazing areas via competition with other land uses. In all these contexts, the pastoral systems display shared adaptive traits, giving rise to the idea of an interstitial nomadic pastoralism with its own features. These core features are: 1) The widespread use of interstitial spaces for grazing, squeezing into the remnants of other land uses; 2) Adaptation to moving within a territory with low ecological connectivity, in which grazing grounds are islands in a sea of other exclusive land uses (e.g. adaptations include motorized transport, moving by night to avoid creating traffic jams, unauthorized grazing and field invasion); 3) Establishment of a wide array of social relations, some imbued with tension and conflict (e.g. with other

shepherds, with authorities and conservation institutions and parks, with the average road user, etc.); 4) Interaction of shepherds with other marginal stakeholders and sectors of the 'host' society (e.g. migrants); and 5) A politicization of nomadic livelihoods toward an increasing dependence on wider and complex economic, social and institutional networks (e.g. EU subsidies).

These features apply to Alpine nomads as well as to other pastoralists of Europe and beyond. Indeed, interstitiality historically occurs in a wide variety of contexts under a set of drivers (e.g. loss of control over grazing ground, economic marginality, cultural belittlement) that push nomadic pastoralism to the margins. The idea of an interstitial pastoralism is not new, though underdeveloped. Ahmed (1982) has written of the Gomal nomads living 'in the administrative and social interstices of the larger states of Pakistan and Afghanistan' (1101), pointing to nomadism as an adaptation to the political as well as to the natural environment. In Romania, extensive sheep husbandry has expanded following the decollectivization and fragmentation of land tenure since the early 1990s, occupying the interstices of urban areas (e.g. roadsides, abandoned plots), though governmental laws and policies have often ignored or devalued this practice (Triboi 2017). Forms of interstitial and urban pastoralism take place in France, where sheep can be seen grazing on the outskirts of Paris, and increasingly local authorities and public and private actors use herds in urban areas for their ecological services of maintaining lawns, abandoned lands, river beds, and urban areas (Garric 2013; Triboi 2017).

In the Laikipia region of Kenya, Maasai and Samburu pastoralists have seen their customary territory greatly reduced since colonization and, more recently, by the expansion of natural parks and private conservancies as well as by land grabbing for agriculture and development schemes. They are being squeezed into the interstices of a territory that they no longer control and of a society with different land use priorities (Letai and Lind 2013). In the process, tension and

conflicts are increasing between Laikipia pastoralists and conservation authorities and the wider society (e.g. in recent years the Kenyan Army intervened repeatedly to defend private properties from pastoralists seeking grazing grounds for their cattle; German, Unks, and King 2017), as pastoralists lead their herds to abandoned and unused plots in peri-urban areas to graze. Similarly, during the dry season, the Maasai of the Kenyan Great Rift Valley move their herds along grassy roadsides and into conservation areas (e.g. lakes' shores) and agricultural fields, and establish adaptive relations with new stakeholders in their customary land (e.g. the Maasai around Lake Naivasha may seek access for their herds to the green residues from the large-scale export-oriented flower and vegetables farms surrounding the lake; Volpato, pers. obs. 2018).

The resilience of nomadic pastoralism in contexts such as North Italy, post-socialist Romania, and the Kenyan Highlands is a testimony to the importance of mobility for livestock husbandry, because only mobility maintains intact the bonds between livestock, grass, and humans, shaping social-ecological systems that are built on these elements. While witnessing the marginalization of their livelihoods, these pastoralists adapt by exploiting the same condition of interstitiality to which they are pushed, by seeking access to a variety of scattered plots while establishing an array of relationships with other stakeholders to maintain the resilience of the pastoral system (Galvin 2008; Easdale, Aguiar, and Paz 2016).

5. Conclusions

This study has addressed the adaptation and resilience of Alpine nomadism, a pastoral system based on full-time mobility between highlands and lowlands and across lowlands during winter, in response to the loss of grazing grounds following urbanization and intensification of land use in Northwest Italy during the last half a century. We have shown that this form of pastoral nomadism

has adapted by using a variety of landscapes to find grazing resources (e.g. lowland grasslands, stubble, fallow and abandoned plots) and establishing social networks and relations at multiple levels and with multiple stakeholders (e.g. the EU, local authorities, farmers, migrant communities). Piedmont nomadic shepherds act in the interstices of the mainstream society, navigating marginal contexts: geographically, they use fallow, abandoned, and second-hand plots; economically and socially, they interact with other marginal groups of people; politically, they are at the fringes of society and of legality; culturally, they face hostile attitudes from part of the general public and local authorities and are tolerated at best.

Other studies about the resilience of interstitial pastoral systems would prove interesting and give further insights into how nomadic pastoralism adapts and survives in conditions of marginalization, and how mobility is reconfigured into the scattered pieces of land left unused by industrial, agricultural, and conservation land uses. Also, such studies would provide a background and contextual analysis to be used to build and implement strategies at multiple institutional levels that aim to support nomadic herders by improving access to unused and abandoned plots, by including them into the planning and management of regional parks and conservation areas, by recognizing (also economically) their contributions in terms of ecosystem and cultural services, as well as by finding ways to support their products.

Squeezed into interstitial places by land use policies, economically and socially at the margins, living on the verge of destocking from desperation, antagonized by diverse sectors of society, the nomadic shepherds of Piedmont falter but do not fall and hope for better times. They are a testimony to the strength and resilience of a ten-thousand-year-old bond between humans and sheep.

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Conflict of Interest

The authors declare that they have no conflict of interest.

Authors' contribution

GM conducted fieldwork and analysed the data, GV drafted the paper, all authors designed the study, composed the literature review, and worked on, read and approved the final manuscript.

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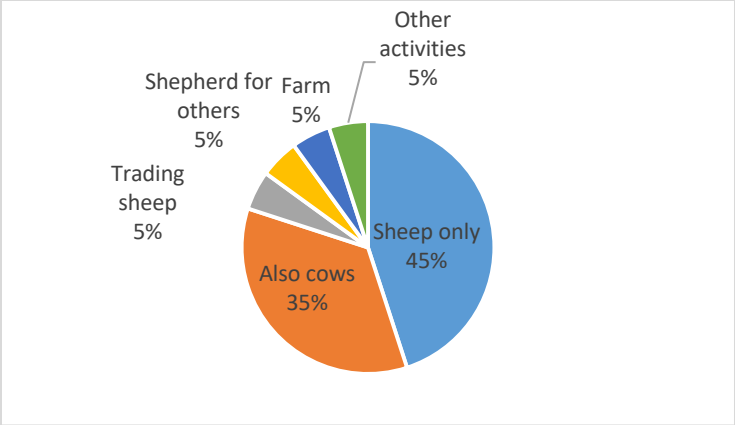

Figure 1. Shepherds' income sources

	Torino	**Cuneo**	**Alessandria**	**Novara**
Small (<500 sheep)	7	4	2	10
Medium (500≤ *x* <1500)	10	2	4	10
Big (≥1500 sheep)	2	/	/	3
TOTAL	**19**	**6**	**6**	**23**

Table 1. Number of sheep per herd per zone (data collected from the Health authority office)

Season	**Activity**
Oct-Nov to May-Jun	Lowlands grazing
May-Jun	Transition (transhumance to highlands)
Jun to Sep-Oct	Highlands grazing
Sep-Oct	Transition (transhumance to lowlands)

Table 2. Yearly movements of nomadic shepherds in Piedmont

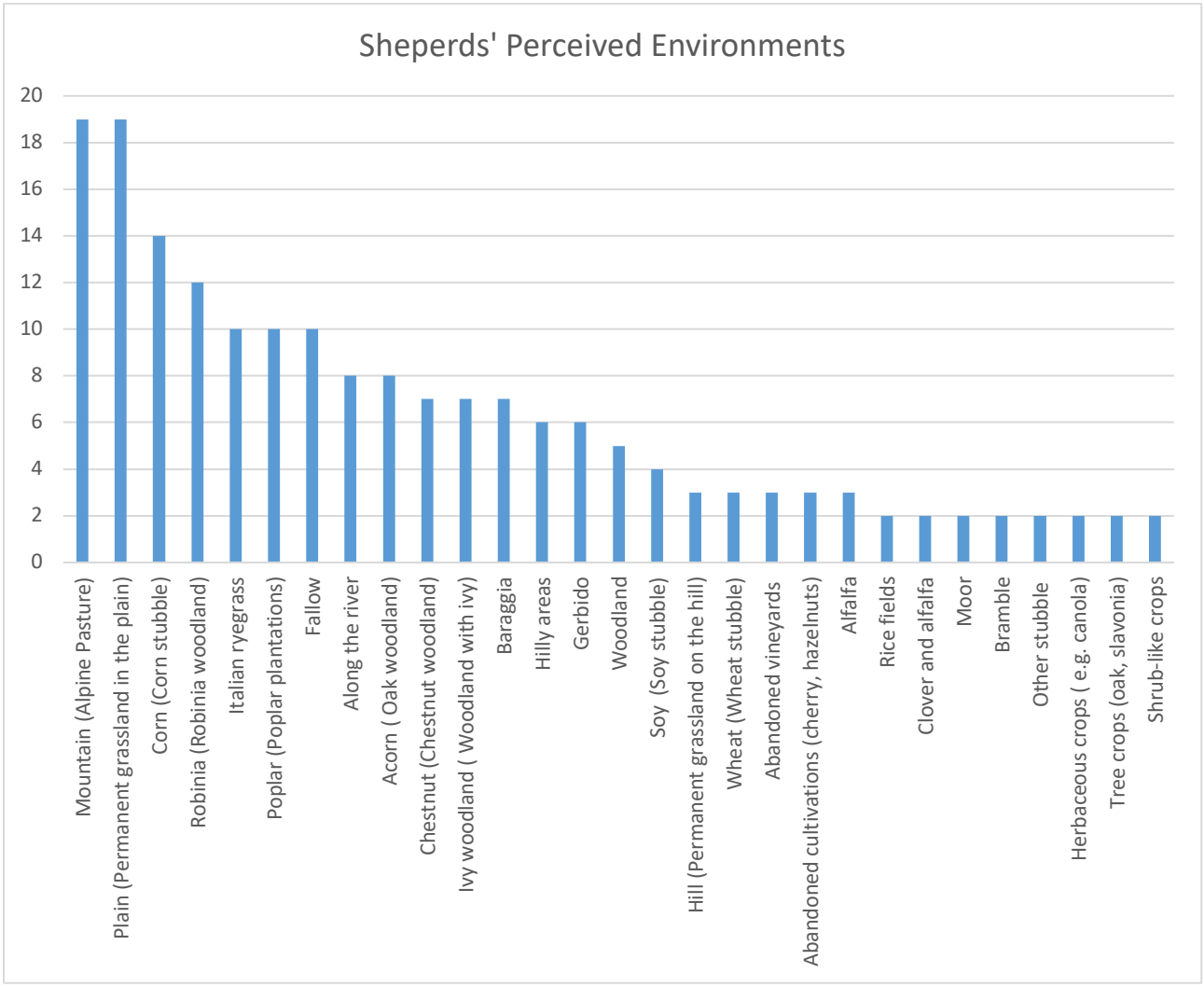

Figure 3. Number of citations per perceived environment

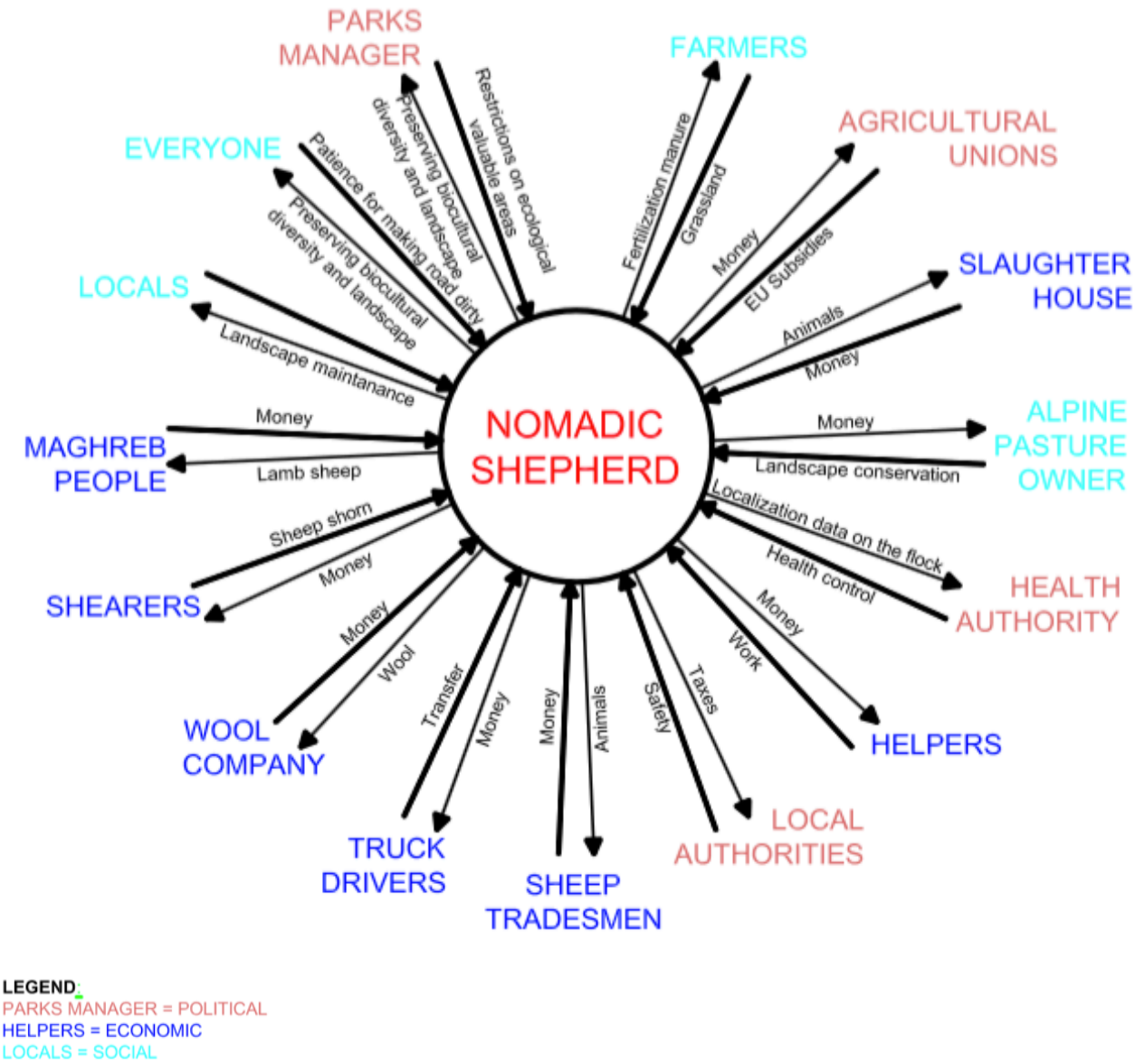

Figure 4. Relationships of the nomadic shepherds in Piedmont: type of exchange (mostly political, social, economic or ecological) and object of the exchange

Figure 2. Itinerary of 20 interviewed shepherds taken in 2016 (the places named on the map are also mentioned in the text)