

### Title

Adaptation, access to resources and mobility: From contemporary pastoral systems to ancient societies

### Authors

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### Abstract

Building on the literature on adaptation and on examples from contemporary pastoralists in Gujarat, we explore dynamics of pastoral systems and, more precisely, their adaptive strategies. We specifically focus on resources accessibility and mobility and how those two issues relate with the broader institutional settings in which pastoral production is embedded. We then apply this conceptual framework to an archaeological site, Bagasra, found in the same geographical area in order to explore probable dynamics of the ancient pastoral system in relation to resources accessibility and mobility. Although dealing with archaeological past is always a difficult task given the limited availability of data, this conceptual approach allow us to draw some hypotheses and appears as a relevant way to explore further the dynamics of ancient pastoral systems.

### Keywords

Access to resources; adaptation; institutional flexibility; mobility; nomadic pastoralists; Rabari

## Introduction

Researchers have suggested that, under certain circumstances, it is possible to infer the types of governance of agricultural resources implemented in ancient historical times (Oosthuizen 2013). However, such inferences are difficult to make for prehistorical settings, for which data are not typically available. Inferences are even more difficult in relation to mobility patterns (Barnard and Wendrich 2008). We therefore need to find other ways to approach the study of the dynamics of ancient pastoral systems, their relation with agricultural activities, and the possible institutional settings they were embedded in. Here we provide a potential alternative approach. Specifically, we use insights from research on adaptive strategies of a contemporary nomadic pastoralist society to interpret archaeological findings from a past nomadic pastoralist society in the same environment. Our work is based in the concept of adaptation and how the study of current adaptive strategies can elucidate past adaptive strategies. Adaptation is a key current research topic, especially in its relation to global environmental change processes and the need to find solutions to face the forecasted perturbations across global societies and economies (Nori and Davies 2007, IPCC 2007, Agrawal 2008). The interest in adaptation as a key driver of the evolution of past societies has also expanded to generate much research in archaeology, for a long time (Kirch 1980, O'Brien and Holland 1992). Interestingly, to date both strands of research –past and present- have typically been kept apart, and the conceptual advances made in research on adaptation of contemporary societies have seldom been integrated in research on past societies. In the first part of the paper, we discuss the issue of adaptation in relation with nomadic pastoralist societies in general. We then move to present a case study of a contemporary pastoralist society, the Rabari of Kutch, India, upon which we build to study examples of adaptation processes related to a set of socio-economic and environmental changes. Our analysis focus on two main aspects of the dynamics of pastoral systems: a) access to resources and how accessibility is framed by socio-political settings and b) mobility and specifically how its implementation affects pastoral livelihoods. In the last section, we use insights from those observations to draw hypotheses related to the mobility of pastoral societies in the archaeological site of Bagasra.

## I. Adaptation, access to resources and mobility in nomadic pastoral systems

Human societies are in constant need to adapt to externally- and internally-driven changes. To understand the adaptation process, authors have developed several theoretical frameworks (Smit

and Wandel 2006, IPCC 2007, Thornton and Manasfi 2010, Eisenack and Stecker 2012), from which we will only focus on the key aspects related to our research.

Some authors have stressed that rather than as single outcome of a given planned action or policy, adaptation is better characterised as an autonomous set of intersecting processes (Thornton and Manasfi 2010). Moreover, adaptation can take place at multiple scales (from the households to the global) and the outcomes and effects of adaptation processes happening at one scale are likely to also affect other scales (Adger 2001). Additionally, and despite the emphasis on local communities or national states in adaptation policies, the anthropological literature suggests that the basic unit likely to be the most resilient and adaptive is the household or the extended family, because of its high flexibility (Agrawal 2008, Thornton and Manasfi 2010). Another important aspect highlighted by the adaptation literature relates to the role that institutions play in adaptation processes. As emphasized by Agrawal (2008, see also Reyes-García et al. 2013), local institutions are critical to understand adaptation processes occurring at the local community level: they frame collective actions and as such partly shape the adaptation process and its outcomes.

In the light of such insights, here we will specifically focus on the institutional dimension, to explore the linkages between adaptation and local institutional settings. Particularly, we will look at the multiple ways contemporary pastoralists manage to pursue their livelihoods in different institutional settings, and at the role that the flexibility of local institutions play in these adaptation processes.

#### **a. Adaptation in nomadic and semi-nomadic pastoral systems**

Nomadic pastoralism is a somehow blurred category referring to a wide variety of food production systems, which share a productive activity (raising animals) and a nomadic way of life (defined here as "the regular and frequent movement of the home base and household") (Salzman 2002, 246). The category is, however, unsatisfactory as it overemphasizes the pastoral component of nomadic pastoralists livelihoods and does not adequately reflect the variety and diversity of production systems involved in maintaining such a livelihood. A large body of research suggest that most nomadic pastoralist societies rely on diversified, multi-resources strategies with varying degrees of specialization (Dyson-Hudson and Dyson-Hudson 1980, Fratkin 1997, Casimir and Rao 2003), and the diversification of production activities is an important adaptive strategy (Chatty 2006).

Previous research has stressed the potential negative impact on pastoral systems of processes such as fragmentation of natural systems (Galvin 2009), changes in market or land tenure systems (Galaty and Salzman 1981, Salzman and Galaty 1990, Fratkin 1997), and vulnerability to a set of diverse

factors (Dong *et al.* 2011). Such processes likely affect the maintenance of pastoral livelihoods in two important ways. First, such processes transform the economic or the ecological (fodder and water availability) settings directly related to the pastoral activity. Second, as nomadic pastoralist livelihoods depend upon a wide range of strategies, in which animal husbandry is not necessarily the most important, at least in economic terms (Khazanov 1994, Pratt *et al.* 1997, FAO 2001), changes affecting these other (ancillary) activities are also likely to affect pastoral livelihoods as a whole.

The adaptation of current pastoral systems to the new socio-environmental settings seems related to a wide set of factors. As most pastoral systems rely on a diversified production setting, they are likely to be affected by variations in a diverse set of parameters that, in turn, can potentially act as drivers of change. In this regard, some authors noted that these systems are better characterized as being in a constant dynamic state (Galvin 2009) – and we should add, in a constant adaptive state. However, the adaptive strategies of such systems are specifically linked to two main dimensions: a) access to resources and b) the possibility to move over (sometimes wide) areas, in response to resources variability but also in response to socio-political and economic changes. Both dimensions depend on the various institutional settings implemented at the local and upper scales, with which nomadic pastoralists have to deal continuously.

#### **b. Access to resources**

Research on contemporary pastoral societies has shown that one of the core problems regarding their maintenance is resources accessibility, and not only their availability or variability (Nori *et al.* 2008). Resource accessibility is particularly relevant in times of uncertainty (be it political, economic, or ecological). Access to natural resources is mediated by the political and institutional settings, which determine aspects such as land tenure, management type, or access rights, and provide the framework that shapes the relations between pastoralist groups and other communities (from local to state level) (Ostrom 1990, Khazanov 1994, Galvin 2009).

Two main aspects should be discussed in relation to resource accessibility . First, pastoralist societies heavily rely on common pastures. Common pastures are grazing areas managed under Common Property Regimes and are found in relation to almost all pastoral systems around the world (Gibbs and Bromley 1986). These commons represent an important reserve of provisions for the animals in normal times and often constitute refuge areas in case of extreme climatic events such as drought. Second, the relations that pastoralists maintain with other social groups, particularly farmers, are

essential for the maintenance of the pastoral livelihood. The balance between herders and farmers, or the articulation of pastoral systems with settled agricultural activities, is also framed by the local institutional settings which determine the rights of access for pastoralists to privately owned land, to fallow fields, and to fodder produced in farms. The relation herders-farmers can be based on elaborated contractual systems (Toulmin 1992) or on more informal temporary agreements, but these institutional settings partially determine the adaptive options available to pastoralists. For example, Hussein (1998) has shown that in the Sahel region the weakening of local institutional agreements between farmers and nomadic herders resulted in a threatening of the pastoral livelihoods. Thus, the adaptive strategies implemented by pastoralists will be strongly related to the local institutional settings, which shape options of access to resources, being these privately owned or collectively managed, such as commons.

### **c. Mobility**

Mobility can be seen as the major adaptive strategy of nomadic pastoralists as it allows them to alleviate resource scarcity by using resources spread over large areas. Nomadic pastoralists move to deal with seasonal and spatial variability of natural resources for the animals, but mobility can also be driven by other factors. In research on nomadic pastoralists in Rajasthan, Kavoori (1996) and Robbins (1998) show that, besides worsening conditions in their area of origin, increasing mobility was also driven by attractiveness of the destination region, including favourable market conditions and labour opportunities. In other words, the authors explain mobility as an adaptive strategy driven by both "push" factors (such as diminishing carrying capacity in the area of origin) and "pull" factors (such as labour opportunities elsewhere) (Kavoori 1996).

The use of mobility as an adaptive strategy also implies a changing context around the mobile group, and as such it requires specific resource management. An important characteristic for resource management are flexible mechanisms to enable negotiation and conflict resolution between heterogeneous groups of resource users, whose rights often overlap (Nori et al. 2008). The question of mobility is thus strongly associated to the issue of access to resources, and to the institutional settings in which it is embedded.

## II. Introducing the case study: the Rabari of Kutch

### **a. Methods – data collection**

Data were collected between February 2012 and February 2013 in Gujarat state. Field research described here was dedicated to the collection of behavioural data on contemporary herders about their use of environmental resources and landscape management. Data collection included a qualitative and a systematic phase and was conducted in coordination with the Department of Archaeology and Ancient History of the M.S. University of Baroda (Vadodara, Gujarat).

We first collected background information about current pastoralist populations and their patterns of migration across Northern Gujarat, Saurashtra and Kutch regions. We then focused on the area where we found the highest diversity in migration patterns: the Anjar taluka, a subdivision of the Kutch district, where the Dhebar Rabari live. We contacted the Dhebar Rabari Community Council in Anjar and the Mindyala Sarpanch (village head) and asked for agreement to conduct fieldwork among the Dhebar Rabari and in the village of Mindyala. During seven months we conducted participant observation, semi-structured interviews, and focus groups at Mindyala and few other villages and with groups from the Anjar taluka migrating across Kutch. We used our initial contacts to select key informants through snowball sampling (Bernard 2006). Data used here mostly come from semi-structured interviews conducted with Rabari adults from villages in Kutch and other areas of Gujarat (northern Gujarat and Saurashtra) and from migrating groups (we visited 35 different groups once or repeatedly). Some complementary data come from a questionnaire survey (n=164) we conducted in Mindyala focusing on Traditional Ecological Knowledge related to small livestock keeping, general socio-economic characteristics of the population, and shepherd experience (see Salpeteur et al. 2015 for more details). We asked for Free and Prior Informed Consent before conducting interviews with every participant.

### **b. The Rabari semi-nomadic pastoralists of Gujarat**

The Raika/Rabari are considered the most important group of pastoralists in India (Agrawal 1999, Prévot 2007). The terms Raika and Rabari both describe the same community, mainly found in the states of Rajasthan and Gujarat, with minor groups in north-western states of India (Prévot 2007). Recently some Rabari groups engaged in longer and permanent migrations to central India (in

Maharashtra, Madhya-Pradesh, Chhattisgarh and Andhra Pradesh). Although these groups are now settled in these new southern territories, they still pursue a semi-nomadic livelihood. In 1999, the estimated population of the community was between five and six hundred thousand people for Gujarat and Rajasthan (Agrawal 1999, Prévot 2007). As more recent Indian censuses do not include caste or tribal divisions, it is difficult to obtain a more updated estimate.

Like many other pastoral groups around the world (Scoones 1994, Nori and Davies 2007), the Rabari have recently faced important changes, both externally and internally-driven. A first important contemporary change relates to the partition of India and Pakistan (1947). The new political borders appearing after partition impeded access to rich pastures in the Sindh area (Pakistan) and forced some Rabari groups to look for alternatives areas within India. Not many years later, during the 1960s, the Green Revolution resulted in an exponential development of intensive and extensive agriculture in many areas, including Gujarat. The expansion of the area under cultivation strongly diminished the available pastures, thus creating a new unbalanced relation between herders and farmers which was further heightened by the new farmer's reliance from chemical fertilizers, which substituted sheep manure (Choksi and Dyer 1996). Soon after, the 1970 "Operation Flood," aimed at developing the dairy production and marketing system across India, accentuated this unbalanced relation by introducing further competition for agricultural resources between the ovicaprines and bovid herders (George 1985, cited by Choksi and Dyer 1996). More recently, the earthquake that hit Kutch in 2001 raised the concern of national and federal authorities about the "under-development" of this remote area. The event led to the implementation of strong industrial and energetic development policies which facilitated the establishment of industrial manufactures in the district, declared a "Special Economic Zone" (Sud 2007). The construction spree resulting from this program led to a significant increase in jobs offers, with the number of daily employees in factories in the Kutch district raising from 10.822 in 2001 to 41.249 in 2008 (GoG statistical abstract 2009). The establishment of industrial manufactures, however, also contributed to a further shrink of available pastures.. In sum, over the last 50 years, external drivers have progressively lead to occupational shifts and the sedentarization of an important section of the Rabari community.

Moreover, besides these external drivers, but in relation to them, there are also internal changes, i.e., changes happening in the Rabari community, that push them in the same direction. For example, Rabari self-perception has drifted towards the view of being a "backward group", off the path of modernity and unable to be part of the economic development taking place all over Kutch, Gujarat, and India. In such context, maintaining nomadic pastoralism is perceived as an obstacle to development, while schooling is seen as the best way to participate in it (Dyer and Choksi 1998, Dyer

2005). Consequently with this view and despite the difficult access to education, families strongly encourage the young generations to leave the shepherds livelihood, to get educated, and to turn towards other occupations (Dyer 2012). This trend is currently very strong in central Kutch and constitutes an important internal driver of change towards sedentarization among the Rabari community.

As a result of a varying degree of impact of such external and internal factors, the Rabari found in Gujarat nowadays show varying degrees of sedentarization and occupational diversification. Camel keeping, which used to be Rabari's primary occupation (Srivastava 1991, Choksi and Dyer 1996, Prévot 2007), is carried on only by small groups scattered on the coasts of Kutch and the Saurashtra peninsula (Bharwada and Mahajan 2010). Sheep and goat keeping is mainly carried out by Rabaris of Kutch and Saurashtra and most of the migrating shepherds are found in Eastern and Central Kutch. In northern and southern Gujarat, most of the community members are sedentary and they are involved in dairy-focused milk production, farming, trade and a wide range of other economic activities. Livelihood diversity can also be found, not only across the region, but also within a community. For example, in the Anjar taluka (central Kutch district), our case study, there is a wide variety of ways to keep sheep and goats. A small number of shepherds remain all year round in the village with their animals. They take the herd daily to the village's surrounding grazing areas and fallow fields, buying extra fodder when needed, or they circle further around the village, from farms to forest areas. Other families, however, are involved in semi-nomadic pastoralism. While this strategy implies seasonal moves, different shepherds follow different patterns, with heterogeneous spatial distribution. In the next part, we describe the three main patterns of migration identified and explore, through some examples, the adaptive strategies and coping mechanisms used to deal with the variable context in which the migration takes place.

### III. Adaptive strategies in motion

In this section we examine cases of adaptive strategies implemented by Rabari semi-nomadic pastoralists and how these strategies relate to the specific organization of migrating groups and to the institutional context. Furthermore, we illustrate how the chosen adaptive strategies affect the situation and further adaptation options of the migrating shepherds in relation to resources access and mobility.



#### a. Looking for the best fit to social and ecological environments

The Rabari shepherds cluster in migration groups called *dangs*, which have a common organization. Each *dang* groups a variable number of households (from two to more than sixty). *Dangs* are stable across the whole migration cycle (from a few months to a whole year) and from one year to the next. The *dang* is lead by one man, called *Nambardar* in Rajasthan (Agrawal 1994) and *Patel* in Gujarat (Swayam 2001, personal data), and sometimes by a council of households' heads. The leader is in charge of decision-making regarding issues that affect the whole group such as negotiating prices of inputs (e.g. veterinary drugs, fodder) and of outputs (the selling of wool or dung) related to animal husbandry. He also negotiates access to fields or village's pastures with individuals and local authorities and deals with government officials to gain access to state forests. The leader is also in charge of scouting the areas in which the *dang* travels to find suitable pastures and camp sites on a daily basis, and he also decides the direction in which the *dang* will move during the migration process.

The way this political organization structures group migration is adaptive for at least two reasons. First, it increases the economic efficiency of the migration process as organizes the division of labour and enables group members to gain better prices through collective negotiations and to dedicate more time to their own production activity (Agrawal 1998). In other words, the *dang* constitutes a basis for pooling resources and labour between households. Second, this political organization provides high flexibility, as *dangs* can adjust their size according to the migration context. In this regard, the three main patterns of migration identified are associated with varying *dang* size. The *dangs* which migrate within a short-range around their village of origin, remaining in the area of Kutch throughout the year, are in general of small size. They cluster between one and four families and rarely go beyond this number. The migration in their home area is known to be safe, and there is no need to create a big *dang* to move across this territory. The second pattern, mid-range migration within a delimited area, follows a two-season rhythm. During the rainy season, which is the sowing season in farms, the Rabari keep the herds far from the fields, in forests and pasture areas; then in September/October, after the first harvest, they start migrating across the agricultural landscape, until the next monsoon. Among the groups following this migration pattern, two types of organization are observed. The groups migrating within Kutch, and to a limited extent towards northern and central Gujarat, usually cluster between two and eight households which remain together during the two stages of the cycle. Among the *dangs* which move to the central India states (Madhya Pradesh, Maharashtra and Chhattisgarh), the organization fluctuates widely between the

monsoon and the dry season. During the rainy season, the Rabari from Gujarat cluster in very large groups – beyond 60 households in some cases - to get access to these forests and to protect themselves against harassment by outsiders. Once the monsoon ends, these big clusters split into smaller groups, clustering three to eight households, which spread across the landscape, each of them following its own migration route, with its own leader, until the next monsoon. Last, a third migration pattern relates to groups which migrate across Gujarat during the dry season and within Kutch during the monsoon. In this latter case, the *dangs* are middle-sized reaching up to ten households, as by migrating out of Kutch the *dangs* need to protect themselves against potential threats.

The flexibility of the *dangs* in terms of size variability and their ability to adjust to specific social and ecological migratory environments increase the adaptive potential of this political structure. The size of the group is the result of a balance between a) the need to cluster enough individuals to fulfil the daily labour requirements of animal husbandry and camp life, b) the need of protection against outside threats, and c) the need to maintain a low pressure on the farms where they pasture. The political structure is also flexible in terms of its composition. Thus, while small *dangs* carrying out small and middle-range migration in Gujarat usually cluster households of closely kin-related men (Salpeteur et al. 2015), the same small *dang* outside the state cluster individuals from different kin groups and villages (cf Prévot 2007, Agrawal 1993, 1994, 1998). In the following examples we will describe some of the adaptive strategies implemented by Rabari shepherds to deal with the fast-changing context of their migration, highlighting in particular issues related to accessibility of resources and mobility.

#### **b. Securing access to resources in a fluctuating institutional setting**

Most Rabari neither own pasture lands nor have political control over the territory they are migrating through. Therefore, during most of the migration cycle, the Rabari shepherds depend on three main sources of fodder: fallows from agricultural land, pastures owned by individuals or communities, and state forests. To secure access to these pastures, the Rabari depend on the institutional settings shaping land tenure regimes and framing relations with resource owners, be it individual farmers, village councils or the state.

In Gujarat, land tenure regimes are organized around three main settings:

- 1) State lands which include lands under different categories (protected areas, forest reserves, revenue lands) administered by different authorities (e.g. Ministry of Environment, Forests

and Climate Change). Some of these lands are also administered by local authorities (village councils – *Panchayat*) with power to convert the land to different purposes.

- 2) Common lands, or lands that are under some Common Property Regimes, such as common pastures (*oran*) and sacred groves (*gauchar*). Access to such areas is limited to members of the community owning the land.
- 3) Private lands, or lands under individual property regimes, such as most of the farms (Sud 2007).

The Dhebar Rabari have developed specific strategies to secure access to both private lands and common pastures even in the current situation of change. We discuss two of such strategies.

#### *Strategy 1: Maintaining access through informal relations*

As access to fields depends on the informal agreement that can be reached with the landowner, a first way for Rabari shepherds to secure access to pastures is to maintain good relations with farmers. In this regard, in most of the *dangs* we observed, we found that both the leader and group members paid special attention to their relations with farmers. Individual contacts are maintained from one year to the next and handed down from one generation to the next. Interestingly, the strategy is observed both among shepherds as well as among farmers. A new practice illustrates well this specific management of relations with farmers and local authorities: as cell phones are now largely spread among Rabari individuals, phone numbers of farmers and contacts across all migration areas are kept by each individual, written down in small notebooks, and the phone numbers can be transmitted from one shepherd to another, and from father to son. This specific management of relations allows the shepherds to secure access to private fields, by maintaining trust with farmers and local authorities along their migration routes. Thus the *dangs* tend to migrate to areas where they have secured relations, which, in absence of extreme events, results in regular migration routes from one year to the other. The maintenance of informal relations with farmers is one of the most common adaptive strategies among Rabari shepherds, and is the one that has been implemented for a long time within the community. However, today these long-lasting relations with the farmers are changing and sometimes break down, in part because the farmers are less dependent on the manure brought by the herds to their fields, and because the fallow browse is increasingly kept by farmers for their own animals, mostly dedicated to milk production. As a result of this, the groups need to be more mobile for finding accessible grazing areas, and they tend to migrate over longer distances and in more diverse areas.

*Strategy 2: Securing access to pastures through formal institutional structures*

Regular access to pastures in common lands (such as *orans*, cf. Srivastava 1991, Prévot 2007) is restricted to the village inhabitants. Under such circumstances, a strategy used by Rabari shepherds is to buy land in what they consider a privileged grazing area. Buying individual plots allows them to become members of the local village and thus get access rights to the village's common pastures. This strategy was already noticed by Westphal-Hellbusch (1975), who mentioned Rabari herders settling down in the Nakathrana area (Kutch) to have permanent access to the large forest areas of the vicinity, known to be good grazing areas. The Rabari shepherds originating from eastern Kutch, who usually migrate in northern Gujarat, in the Patan and Mehsana areas, reportedly use a similar strategy (Choksi and Dyer 1996, Bharwada and Mahajan 2010). As explained by some *dang* leaders interviewed for this research, land acquisition is a way to maintain rights of access to a specific area. Becoming an official inhabitant of a (new) village also eases the relations with local farmers thus facilitating access to their fields. In sum, Rabari shepherds make use of the existing institutional settings and land tenure regimes to secure access to resources that, otherwise, would not be accessible.

A similar strategy consists in gaining ownership rights on state-owned land, so to gain access to local common lands. We describe here the case of the Ratotalao settlement, where we conducted part of our survey. Situated in western Kutch, within the territory of the Baranda village, this settlement clusters thirteen Rabari households from central Kutch and four households from Rajasthan. The settlement, composed by a dozen of small concrete houses nearby a small lake within a large state forest, has been a regular campsite for the Rabari for two generations. Due to the quality of the grazing area, the mentioned households steadily increased the amount of time spent in the area and created stronger relations with the *Panchayat* (village council) of Baranda village and with the forest officers in charge of the area. Such relations finally lead the village council to offer the Rabari to settle permanently in this area, supporting their demand for an official recognition of ownership rights on this parcel of land under a specific land distribution scheme. The Rabari initiated the administrative process, but were forced to leave the area for five years after the 1984-85 droughts. Upon return, during the 90s, the Rabari re-started the administrative process, finally deciding to construct permanent houses to speed government's recognition. Through this strategy, the Rabari herders gained recognition from the villagers and grazing rights on the land. Such rights have allowed them to limit their migrations to one or two walking days around the settlement complemented with a longer, one-month travel at the end of the dry season, when the vegetation cover is insufficient to sustain the herds and they need to take the sheep to graze on agricultural land.

The examples presented illustrate the relation between access to resources (in this case grazing land) and adaptive strategies. Due to important changes in the land tenure system in the area, with increasing difficult access to privately owned land, simple inter-individual agreements are often insufficient to get access to enough food for the herds. In such context, some Rabari shepherds have switched to a different option offered by the institutional setting: by becoming landowners and acquiring village residential status, they gain supplementary access rights to common lands in different areas. It is difficult, however, that this strategy becomes generalized as it requires high levels of cash investments from the shepherds, which are out of reach for an important part of the community.

### **c. The ins and outs of migration: mobility in a wider perspective**

As we have seen, mobility is a major aspect of the Rabari pastoralist livelihood. Even if some of the adaptive strategies set in place result in diminished mobility, the possibility to move is still at the core of adaptation processes at stake within the Rabari. The following example focuses on the consequences of mobility, and how the move to new areas affects the organization of migratory groups. Before the partition between India and Pakistan (1947), the Dhebar Rabari used to take their herds to the Sindh area, along the Indus River, in contemporary Pakistan. The partition and the two following wars (1965 and 1971) led to a total closure of the border, thus blocking access to these rich pastures (Choksi and Dyer 1996, Bharwada and Mahajan 2010). The shepherds were forced to find new grazing areas, and progressively switched their routes towards the south-east, first going across eastern and southern Gujarat and then crossing the border into the Indian states of Maharashtra, Andhra Pradesh and Madhya Pradesh where they found new pastures. Progressively shepherds switched their migration routes to these new areas, spending more and more time away from Gujarat and going as far as the current Chhattisgarh state. The use of these new grazing lands required changes, both at the physical and at the social levels. Herders had to help their herds to adapt to the new ecological conditions, for example by providing salt supplements into their food. Moreover, as access to state forests was officially restricted to local pastoralists, and therefore prohibited for Rabari from Gujarat, Rabari had to engage in harsh and constant negotiations with government officers and local inhabitants to secure it, and use the state forests as refuge areas. This process often concluded by the payment of expensive bribes. As a result of those new constraints and difficulties, during the monsoon the Rabari migrating to this area cluster in very large groups.

Access to these new areas and the development of new strategies also relate to changes in the economic relation with the other communities. A much faster growth of lambs coupled with a market interest for meat has resulted in higher economic returns for shepherds. This, in turn, has acted as a "pull" factor, attracting other groups of shepherds (Choksi and Dyer 1996). This example illustrates how an exogenous political event led to a succession of changes and required a series of adaptations pertaining to different domains. In this case, the specific organization of migration groups provided the flexibility needed to adapt to the new socio-ecological context they were embedded in.

#### IV. Discussion

In this section, we first draw some general remarks from the contemporary examples presented and then discuss the case of Bagasra archaeological site, in Gujarat, to hypothesize about prehistoric pastoral activities and herds' management in a semi-arid area.

##### **a. Adaptation among contemporary Rabari pastoralists – a synthesis**

The synergies between pastoral activities and agricultural systems emerge as particularly important in the examples described. Previous research has suggested that the relations between pastoralists and farmers may be shaped by formal institutional settings, but our field data suggest that such relations can also rely on informal inter-personal agreements which are maintained through time. Furthermore, our examples illustrate that when this relation is disrupted, or when there is no formal institutional frame to manage the exchanges between the two groups, pastoralists resort to implement other adaptive strategies that grant them access to resources managed under different property regimes. Under such circumstances, some pastoralists become sedentary; others switch towards a more transhumance-like migration process, with reduced mobility, and still others increase their mobility. Thus weaker institutions granting access to resources seem to increase the diversity of adaptive strategies and consequently pastoral production modes. Diversification might occur within the same community.

Mobility requires specific institutions and flexibility so that mobile individuals and groups can adapt to a fluctuating environment. But mobility options also depend on the wider socio-political framework in which migrating groups are embedded. These external institutional settings determine

the possibility to move and the type of relations the pastoralists can build with farmers, and therefore their accessibility to resources. Our examples also show how mobility of pastoralists is shaped by a complex net of push and pull factors, and not only by seasonal and temporal variations in resource availability.

In sum, the analysis of Rabari adaptive strategies depicts adaptation as a long-standing process which implies permanent reconfigurations of the ecological, social, and political conditions of the migration, and permanent adaptations. In our examples, the adaptive unit is the *dang* which specific institutional flexibility makes it a very efficient basis for collective action. Last, we see that adaptations that are taking place at the *dang* level have effects at the community scale as the diversification in ways to conduct pastoral activity by different *dangs* creates a complex mosaic of adaptive strategies spreading across expanding territories.

#### **b. Looking at the past: the Bagasra case**

In this section we use insights from our ethnographic data to draw hypotheses related to the mobility of pastoral societies in the archaeological site of Bagasra. The analysis is not based on the assumption that there is an historical continuity between archaeological and present times. Rather, we argue that the study of adaptive strategies used by contemporary pastoralists can be conceptually relevant in studies aiming at understanding the dynamics of ancient pastoral systems. Thus, beyond the obvious differences between past and present, we try to infer the role in past pastoral systems of the three aspects that have proven central in present pastoral systems: access to resources, mobility, and institutional settings. We do so by looking at available information related to one archaeological site in North Gujarat, Bagasra.

During the Holocene, the area of North Gujarat has seen the, sometimes simultaneous, presence of very diverse cultural and economic groups, from urban settlers to nomadic agro-pastoral people (Ajithprasad and Sonawane 1994, Ajithprasad 2004). One of the settlements inhabited during the Integration Era of the Indus Civilization (2600-1900 BC) was the small urban settlement of Bagasra, situated at the northern limit of the contemporary Saurashtra peninsula (Figure 1). Archaeologists have characterized the Integration Era as one of intensification of exchanges between the contemporary Gujarat area and the distant cities of Mohenjodaro and Harappa (Wright 2010). Research on this site unearthed numerous animal remains that revealed the pattern of stock raising and meat consumption (Bhan *et al.* 2005) (Chase 2010, Chase *et al.* 2014). Recently, analyses of a set of isotopes (strontium, carbon, oxygen) contained in the enamel of livestock teeth provided further

information about the types of food (wild or agricultural products) and the probable origin of the fodder the domesticated animals were fed upon (Chase *et al.* 2014). The results allow the identification of two main patterns in animal management in the Bagasra site. One first pattern relates to the management of small animals (sheep and goats) that were raised on the site and in close surroundings. Those animals were apparently fed on both wild food and agricultural by-products, which imply that the animals had access to the neighbouring fields after the harvest, were fed with crop processing leftovers, and browsed on fallow areas and/ or forests and scrubland. Small animals access to agricultural products can be interpreted in two different ways. It is possible that a population of farmers had a diversified livelihood and were also raising animals. In such situation, then the provision of fodder may have been sorted out at the household level, with farmers feeding their own animals through the farm resources (crop processing left over and fallow fields). However, it is also possible that two specialized groups existed, farmers and shepherds. In such situation, it is possible that the fields might have been an “open access resource” after the crop harvest (similarly to what we see in contemporary Gujarat), or that shepherds had to go through informal agreements with individual farmers, as we observe in contemporary times. Given the absence of chemical fertilizers at these times, we can reasonably assume that farmers had an interest in granting access to their fields to herds, for manure, which might have resulted in a balanced kind of relation.

The second pattern identified in animal management in the Bagasra site relates to the raise of large animals (cattle and buffaloes) fed on agricultural products during the two first years, moment of enamel formation. Isotopes analysis shows that the fodder for these animals always originated from the same areas, which suggests that bovid herds were kept and raised in one place. Furthermore, the high variations regarding the origin of fodder among individuals suggest that the large stock consumed in Bagasra originated from different places, often far from it. These elements allow several speculations. First, the mobility of large animals seem to have been low, which could be due either to the absence of rights to move across large areas for animal keepers, or to the unnecessary nature of moves, as food was available on site. Second, the provisioning of agricultural products during all animal youth and the minor importance of wild food in large stock diet further suggest that the second option is the more plausible. Third, altogether, these elements (i.e. low mobility, associated with a continuous production of animals, and a feeding mostly based on agricultural products), suggest that a well established institutional setting was implemented in the pastoral systems, and that large stock husbandry was rather integrated with other agricultural activities. The example of contemporary Rabari suggests that if the access to fields is not framed by a strong institutional setting and thus negotiated at the individual level, the non-cultivated areas constitute an important



fodder resource for herders. Thus, if similar conditions were set in the archaeological example, the enamel analysis would have revealed a more diverse diet, partly based on wild plants than it has.

Rather interesting is the stability of the pastoral production over times. The work of Chase et al. (2014) shows a constant provisioning in large stock across different periods (phase 2 and 3) and despite considerable economic and social changes during the same periods (i.e. decline of craft industries, weakening of long-distance interactions with the wider Indus civilization). Furthermore, permanence in pastoral land uses seems to have occurred over a large area. As we have shown in this article, the stability of pastoral system depends on a wide set of factors; these systems are particularly sensitive to changes, and better characterized by a constant dynamic state than by stability. Thus, the case of pastoral systems connected to Bagasra is quite interesting. What explains their stability in the context of the important changes happening in the area? A first hypothesis is that the pastoral production was taking place in areas politically disconnected from Bagasra, and thus not exposed to the same changes. In this case, the institutional settings would have remained stable through time, maintaining access to agricultural products and (low) mobility patterns for animal keepers. A second hypothesis is that the pastoral production systems were exposed to the changes documented in Bagasra, in which case they were able to maintain their viability through adaptation. In this line, we can assume that the local institutions related to pastoral production and framing access to resources or mobility were characterised by a high flexibility, allowing for adaptations to multiple changes.

As the town of Bagasra, an important place of meat consumption, seemingly acted as a market maintaining "high meat demand" for a considerable time, it may have played the role of a "pull factor" attracting pastoralists and/or facilitating the development and preservation of stable pastoral systems in its vicinity, and as such it may have been an important driver of the stability and maintenance of pastoral production systems in North Gujarat.

## V. Conclusion

The examples from modern north Gujarat show that nomadic pastoral systems are highly dynamic, characterized by a high flexibility/fluidity, a characteristic that has previously been noticed by several authors (FAO 2001, Casimir and Rao 2003, Galvin 2009). The contemporary examples from north Gujarat are framed in a moment of particularly fast and important changes. Notwithstanding the differences they have with prehistoric times, we think that they provide a good picture of the complex processes at stake when dealing with adaptation and change in pastoral systems. The Rabari

*dang*, with its flexibility and ability to adapt to ever-changing settings, display a form of resilience. The adaptations made by the Rabari pastoral groups at small scale makes possible for the larger system to adapt and survive; a by-product of such process is an increasing diversity in pastoral activities in the overall landscape. This implies that, when discussing change in prehistoric pastoral systems we need first to set the focus and understand the scale of observation and analysis. The type of “longevity” that we observe in Bagasra pastoral products, and that it can be interpreted as a stability of the system across time and space, could indeed be the result of smaller scale flexibility of the pastoral groups. This example highlights the need for ethnoarchaeological investigations at different scales and a research focus spanning the institutional settings, the integration between agricultural activities, and the relations between farmers and shepherd/nomads. Furthermore, there is a need to move beyond the deterministic approach that sees ecological changes as the only (or main) drivers in shaping societal changes in small scale pastoral/nomadic groups.

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Figure captions

Figure 1.

Map of Gujarat showing the research sites, the main patterns of migration of Rabari pastoralists from the Anjar taluka and the position of the archaeological site of Bagasra. Source: Adapted from d-maps.com (visited June 4, 2013) and Gujarat state map, Government of Gujarat.