TITLE PAGE

From hunter-gatherers to nomadic pastoralists: forager bands do not tell the whole story of the evolution of human cooperation

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Abstract: The history of humanity is a story of cooperation. Issues pertaining to the origin of human cooperation have, however, been characterized by a forager bias, the assumption being that they have a close link to our evolutionary past. In contrast little effort has been spent on documenting and explaining cooperative herding among nomadic pastoralists. As the Mongolian empire attest to nomadic pastoralists—in contrast to foragers—can form large-scale empires. In combination with the prevalence of small-scale cooperative herding groups, nomadic pastoral societies thus provide a fertile ground for expanding our understanding of the evolution of cooperation. In this paper I aim to extend our understanding of human cooperation through a comparison of the most well-known cooperative herding groups—namely the Mongolian *khot ail* and the Saami *siida*—and the most well-studied forager bands, namely the Hadza *camp* and Ache *band*.

Keywords: cooperation; review; hunter-gatherers; nomads; herding groups; bands.

INTRODUCTION

Cooperation is an important facet of human society and may be the principal driving force behind humanity's success (e.g. Francois *et al.* 2018), but explaining its origin remains a challenge (Smith *et al.* 2018, Francois *et al.* 2018, West *et al.* 2011). As early as the 14th century, the Arab philosopher Ibn Khaldun argued that a state could only be organized around a group with high *asabiya*—meaning a group which members have a high degree of collective solidarity (Turchin 2007). More generally, it has been argued that historical dynamics can be understood as a result of competition and conflict between groups (cf. Carneiro 1970) whereby the domination of one group over another is made possible through in-group cooperation (Turchin 2007). The history of humanity is thus a story of cooperation and our remarkable success is to a large degree due to high levels of cooperation among non-related individuals (Francois *et al.* 2018). Not surprisingly, there has been a dramatic increase in the interest in the evolution of cooperation: the number of published articles has increased by a factor of >50 during the last 25 years (Kantner 2018).

Foragers as an analogy of human evolutionary history

Our understanding of cooperation is, however, limited to only a few societies, namely forager societies. The assumption being that they have a close link to our evolutionary past—living in an evolutionary relevant context (Apicella *et al.* 2014). Hill *et al.* (2014:1) argue that “[...] modern hunter-gatherers offer the opportunity to examine features of that lifestyle that may be associated with important evolved human traits”. In a similar vein, Chaudhary *et al.* (2015) argue that because foragers represent most of humanity's evolutionary history, they offer the best insights into our evolution.

For anthropology specifically, foragers have had such a prominent place that “[...] we could almost write the discipline's entire history in terms of hunter-gatherer ethnology” (Kelly 2013:1). With respect to cooperation, Apicella and Silk (2019) argue that since most human diversity have a modern origin, human cooperation is better understood within a forager context. For the Hadza specifically, Smith *et al.* (2018:3) argue that they provide an important test case for evolutionary models of cooperation because “[...] their lifeways more closely approximate pre-Neolithic populations compared to samples drawn from industrialized settings”. While concerned about possible bias and the limitations of using present day hunter-gatherer societies as an analogy of humans' ancient ancestors, Marlowe (2005:54) nevertheless argues that forager societies are invaluable for testing hypotheses about the evolutionary foundation of human behaviour (see also Apicella *et al.* 2014). In sum, explanations of human cooperation are often made with reference to the small size and high degree of relatedness of forager groups (Stanford 2019).

From forager bands to nomadic herding groups

At the same time, Marlowe (2009) argue that foragers can acquire food without having to solve serious collective action problems. For example, while the Hadza might discuss the need keep neighbouring agro-pastoralists out of their area, as soon as they finish agreeing some individuals go right out and trade with or scrounge from them; in effect undercutting group-solidarity vis-à-vis outsiders (Marlowe 2009). Similarly, when dealing with free-riders or food hoarders the most common response is to 'move away from them' rather than 'making them leave' (Marlowe 2009).

Furthermore, Mathew and Boyd (2011) argue that while studies of contemporary foragers show that they cooperate extensively in small, face-to-face groups, numerous societies in human prehistory were larger than those of contemporary foragers. Ethnographic accounts suggest that such societies could mobilize on large scales (e.g. Turkana, Nuer) while lacking centralized political authority, formal law enforcement, or other coercive institutions (Mathew and Boyd 2011). Despite a heated debate there has been little progress in understanding the transition from cooperation in small-scale societies to that cooperation in large-scale societies (Powers *et al.* 2019). Or, with Boyd and Richerson's (2009:3281) words "[t]he scale of human cooperation is an evolutionary puzzle".

In contrast to forager societies, nomadic pastoralists have a historically demonstrated ability for both small-scale and large-scale cooperation. The capacity for collective action was, for example, a key factor in the rise of the Mongolian empire (Turchin 2007): In 1242 Europe stood on the precipice of destruction. Based in Hungary and Serbia, the Mongol armies were poised for conquering the rest of Europe (May 2007). Only the death of Ögedei—the Great Khan of the Mongols and son of Chinggis Khan—halted the Mongol advance; sparing Europe from the fate of an inevitable conquest (Chaliand 2004). Twenty-five years after the withdrawal, the Mongol empire reached its peak with the establishment of the Yuan dynasty—making it the largest land empire in history (Chaliand 2004).

My point of departure is that the basic building block of nomadic societies are the household and the cooperative herding group. Khazanov (1994) argue that the primary kin group is one form of social organization on which very little comparative work has been done. Similarly, Tapper (1979) argue that in almost any pastoral society, territorial holding units (e.g. tribe) subdivides into smaller groups for camping or herding purposes. Tapper (1979), however, argue that herding associations (e.g. camps) are instable compared larger associations. Among the nomads in the Iran, for example, herding units are economic in nature and "[...] socially and politically of minor importance compared with larger groupings" (Tapper 1979:48-9). Addressing the Yomut, Tapper (1979) argue that the basic community is the *oba* (a group of households—25-100 households—who together shared joint rights

to pasture and water, Irons 1974:640, Irons 1972:92). The cooperative Yomut camp is treated as somewhat irrelevant, Tapper (1979:56) just term them as fluid herding units of 2-10 tents (usually 4-5) that camp separately.

I'm arguing differently: despite the instability of the herding units, they are a fundamental unit for pastoral social organisation because they are concerned with daily cooperation. As I will demonstrate, the makeup of these groups is more similar cross-culturally than the larger associations consisting of several herding units (e.g. local exploitation group, consisting of "[...] a set of domestic and herding units periodically drawn together by a temporary mutual interest" Dyson-Hudson 1972:11). This also translates into settlement patterns: while pastoral households can camp together in larger groupings for parts of the year, networks of reciprocal help and cooperation develops within a subset of residential groups. Pastoralism is thus practiced in in a web of potential cooperative relationships; relationships that can be actualized and discontinued depending on social context and environment, i.e. cooperative networks can contract or extend depending on circumstance (Bird *et al.* 2019 makes a similar point with respect to foragers). Fundamentally, however, it is almost impossible for individual households to maintain production without cooperative labour investment and mutual help from other households (Khazanov 1994). Similarly, Næss (2012) has demonstrated that nomadic pastoralists form cooperative herding groups, consisting of several independent households, with the explicit aim of sharing and exchanging labour.

Not unlike the locus cooperative behaviour among foragers—meaning the *band*¹ (Smith *et al.* 2016, Smith *et al.* 2018, Bird *et al.* 2019, Smith *et al.* 2019)—the cooperative herding group is a social unit consisting of independent households that flexibly form and reform according to both external (e.g. pasture) and internal (e.g. population growth) factors. With the ability to form large-scale empires and the prevalence of cooperative herding groups, nomadic pastoralists thus provide a fertile ground for expanding our understanding of cooperation. Following Binmore (2006), it could be argued that increasing and extending our understanding of large-scale cooperation requires an understanding of how cooperation works in small-scale coordination problems.

In this paper I thus aim to extend our understanding of human cooperation through a comparison of nomadic cooperative herding groups and forager residential bands. As Ingold (1999:60) argue, "[i]f one takes "band" to refer to a local group of a particular kind, then there is no *a priori* reason why such groups should be exclusive to hunters and gatherers". The major contribution of this paper is—by comparing forager bands and cooperative herding groups—to reveal strengths

¹ The use of the word band has shifted over time: from signifying small coresidential group of people sharing a hunting territory to groupings larger than the family, i.e. an endogamous, land-holding group of some 250 persons (Kelly 2013:290). But more recently, the term has been used to refer to smaller coresidential group of people found among foragers (Kelly 2013:290). This last usage is the one taken here.

and weaknesses in our current understanding as well as pinpointing areas where more research is needed. This I will do through a comparison of the most well-known cooperative herding groups—namely the Mongolian *khot ail* and the Saami *siida*—and the most well-studied forager bands, namely the Hadza *camp* and Ache *band*.

THE EVOLUTION OF COOPERATION: DOMAINS OF COOPERATIVE BEHAVIOUR

Cooperation entails that individuals pay a cost to the benefit of others (Fotouhi *et al.* 2018) and cooperative group formation is a widespread phenomenon entailing both *benefits*, e.g. easier to find food and *costs*, e.g. more individuals between whom to divide the food (Mendl and Held 2001). Cooperation thus comprises a conflict between *self-interest* and *collective rationality* due to an opposition between what is best for oneself—not paying the cost of cooperation—versus what is best for others—paying the cost of cooperation (Simpson and Willer 2015). In short, collective action problems stem from the “[...] tension between public nature of benefits yielded by cooperation and private costs borne by cooperating agents” (Turchin *et al.* 2013:16384).

Kin selection—donor and the recipient of an altruistic act are genetic relatives—predicts that, all else being equal, individuals will be more likely to favour kin than non-kin, and close kin over more distant kin (Alvard 2003, Nowak 2006). In effect, kinship is important and individuals in small scale societies preferentially aid close kin over more distant kin and non-kin (cf. Allen-Arave *et al.* 2008). Kaplan and Gurven (2005) argue that a clear bias of meat distribution towards close kin living in other families, at the expense of distant kin and unrelated families, has been documented in several forager societies (see also Bird *et al.* 2019). On Ifaluk (Western Carolines), Betzig and Turke (1986) found that pairs of households sharing food are closely related compared to pairs of households in the population in general.

Saami reindeer herders in Norway give gifts to genetic relatives: kinship had a small but positive effect on the odds of gift giving (Thomas *et al.* 2015). Furthermore, closer kin were more likely to be named as co-operators compared to distant relatives and non-kin in self-reports (Thomas *et al.* 2018). Comparing gift-giving behaviour in Saami and Tibetan herding groups, Du *et al.* (2019) found that closer kin were more likely to receive gifts. Furthermore, Næss *et al.* (2010) found that kinship had a mediating effect on cooperative production: both labour and kinship had positive effects on individual herders’ herd size. Moreover, a positive interaction suggested that high levels of relatedness coupled with a large potential labour pool had an increasingly positive effect on herd size (Næss *et al.* 2010).

Nevertheless, while kin selection theory has provided a compelling explanation for helping behaviour this behavioural pattern is well documented in species that do not live in family groups

(Griffin and West 2002). Moreover, one could question it as an organizing principle for cooperation among humans. Genetically and culturally definition of kin can differ substantially: unilineal descent groups, for example, underestimate genetic relatedness. Nevertheless, unilineal descent systems are common among humans: 47% societies ($n = 857$) are patrilineal while 14% are matrilineal decent systems (Alvard 2003). In contrast, only 36% societies have bilateral kinship systems (Alvard 2003). Consequently, it could be argued that individuals may cooperate because it is in their own direct self-interest and not necessarily because of the benefits indirectly acquired through kin relations (Griffin and West 2002:20, Alvard 2003).

Among the Ache, for example, kinship had no effect on sharing patterns in forest camps (a kin bias of between-family sharing is strong in the settlement though, Gurven *et al.* 2002), supporting the notion that close kinship is not a prerequisite of effective cooperation (Gurven *et al.* 2004:40). Gurven (2006) found evidence of significant contingency in food exchange, especially for fish and meat, for both Ache and Hiwi (Venezuela). Among the Agta (Philippines), Smith *et al.* (2019) found that sharing is based on the recipients' level of need as well as kin relation and reciprocity—sharing with individuals that have shared with them previously (see also Smith *et al.* 2016). Pastoralist households in Namibia transfer food to others on demand (Schnegg 2015). Despite an inclusive sharing norm, reciprocal relationships emerged, especially for high-value goods; relationships not influenced by kinship (Schnegg 2015). Furthermore, while kin relations was important for gift-giving behaviour among herders in both Norway and Tibet, the most important factor was membership in the same herding group (Thomas *et al.* 2018, Thomas *et al.* 2015, Du *et al.* 2019). Furthermore, Næss *et al.* (2012) found that Saami reindeer herders tailor their strategies in relation to what other herders are doing: the probability, the amount, and the type of animal slaughtered is to a large degree influenced by the number of animals slaughtered by neighbouring herders.

COOPERATING IN GROUPS: CASE STUDIES

The Mongolian khot ail

Among Mongolian herders, cooperation, between several households, gave rise to a residential group known as a *khot ail*: a socio-economic unit where households cooperate in everyday herding tasks (Bazargür *et al.* 1993). Its primary function is to capture economies of scale (Cooper 1993, Mearns 1996, Upton 2008). For example, one household herding one species for the entire *khot ail* reduces the overall labour input required by individual members. In other cases, herding is done rotationally, leaving others free to pursue alternative activities such as felt and hay-making, vaccinating livestock, transporting milk for processing, moving, collecting wood, cutting hair and wool and preparing and mending winter shelters (Cooper 1993, Mearns 1996, Upton 2008). Additionally,

cooperative labour investment serves as an important risk minimizing strategy: during periods of heavy snow a large amount of labour is necessary for bringing animals back to camp shelters quickly as well as providing watch to keep animals safe. The *khot ail* also provides an important social safety net for poor households, e.g. through loaning and exchanging of food and livestock (Cooper 1993).

The word *khot* means ‘movable animal stalls or the stock fold and the yurt site’, while the term *ail* refers to a ‘livestock keeping family possessing its own stock and stock fold’ (Bold 1996:70). *Khot ail* thus meaning the ‘union of private livestock keeping families’. Bold (1996) argues that the *khot ail* was the main socioeconomic unit in Mongolia from the start of the 18th century until the 1950s. In contrast, Bazargur (1993) argues that it has a much longer history: the *khot ail* has existed as socioeconomic units even before the establishment of the Mongolian empire in 1206. Similarly, Allsen (1994) argue that below the level of the lineage and sub-lineage, the tribes of Mongolia were organised into *ayils*. This was the basic production unit, normally consisting of a single extended family with its own tents and herds. For purposes of cooperative labour or local defence, several *ayil* temporarily came together to form an encampment encircled by tents and wagons (Allsen 1994).

According to Potkanski (1993:132) the *khot ail* consists of 2-8 families, while Simukov (cited in Sneath 1993:202) found the average size to be around 4-5. The number of families depends on the prevailing natural conditions, e.g. the number of families belonging to a *khot ail* is closely connected to extent of available pasture (Bold 1996, see also Mearns 1996, Upton 2008, Cooper 1993). Notably, the *khot ail* changes annually (Potkanski 1993) and seasonally: often being largest during summer (Sneath 1993, Mearns 1996). According to Mearns (1996), membership is not fixed—individual households come and go. Often, however, they are formed around a relatively stable, core group of households who reside together for at least part of the year. Most *khot ails* have an acknowledged leader who is usually the most experienced male herder.

Mearns (1996) argues that the *khot ail* comprises a group of households who are often but not necessarily consanguineal or affinal relatives. Upton (2008, 2005) describes the *khot ail* as being based on kinship while Cooper (1993, see also Bold 1996) distinguish between three types of *khot ails*: (1) those comprised of close kin; (2) those comprised of a central core group of closely related households but with additional unrelated or temporary members; and (3) those made up of loosely related or unrelated households with no dominant family group. Finally, while animals were pooled together for herding purposes, they did not constitute a shared herd (Cooper 1993).

The Saami siida

Saami reindeer hunters had a social unit that was larger than the family, called *siida* (Lowie 1945). Its role was primarily economic and where members owned a tract of land; usually closed off by

natural lines of demarcation (Lowie 1945). In fact, the hunting *siida* could refer to the territory, its resources and the people that utilised it (Ingold 1978, Riseth 2000).

With the transition to reindeer husbandry—at least 400 years ago (cf. Næss and Bårdsen 2013:S1)—the *siida* was modified. Most notably, the size of the *siida* contracted (Ingold 1978): in Norway, the pastoral *siida* comprises 2-6 families—more often 3—herding their animals together in a single herd (Lowie 1945:452). In Sweden, Whitaker (1978:167) writes that the *siida* comprise 5-8 households. While contracting in size, the territory of the *siida* expanded to incorporate the longer migration necessary for reindeer pastoralism (Riseth 2000).

The *siida* has been described as a socioeconomic group whose members are united by kinship, live close together and pursue a common economic goal: that of successfully herding reindeer (Pehrson 1954). Moreover, it is flexible: occasionally local conditions, e.g. bad pasture, precludes families from joining (Lowie 1945). Additionally, changes in composition is often caused by birth, marriage and death, or by fluctuating fortunes in reindeer holdings (Ingold 1978:154, see also Paine 1994). Moreover, membership changes seasonally and annually: in Norway, the *siidas* are, for example, smallest during spring calving and largest during summer (Paine 2009). In Sweden, larger summer *siidas* segment into two or more smaller *siidas* at the onset of winter only to regroup again in spring (Ingold 1978). Moreover, conflicts can break *siidas*: if a member is dissatisfied with the *siida's* leader he can choose to herd alone or change *siida* (Solem 1970).

The *siida* has also been described in terms of equality: while a herd owner might be the boss of his family herd; in herding relations he is but one of several partners (Paine 1970). Herd owners treat each other largely as equals regardless of differences in wealth, age and domestic status (Paine 1970). Herding relationships are thus described as one of mutual dependence and trust between partners (Paine 1970).

Each *siida* had a leader, or *ised* (Solem 1970), meaning “master of the band” (Pehrson 1954:1077). He is not elected; rather wealth (i.e. herd size, Solem 1970) is a necessary, if not sufficient, condition of leadership (Ingold 1978, see also Pehrson 1954). Leadership is informal with authority resting on experience and skill (Solem 1970).

According to Pehrson (1964:90) *siida* is organised so that “[e]ach person in the band is related to every other person in the band either directly or indirectly through a third person”. A notable feature is the prevalence of siblinghood, which—according to Paine (2009:5, Pehrson 1954)—is not only biological but also “[...] a social construction of a sense of mutual identity independent of genealogy”. Sibling solidarity can be extended to include cousins and other affinal relatives of the same generation (Gjessing 1960). Kinship is defined in such a way that a new *siida*-member should be found among kin that is at least as close as second cousin. Only if this is impossible can one look for more distant kin. But this does not stop non-kin from becoming

members: helpers can after a while become full members (Jonassen and Kalstad 2003). Pertinently, the leader of the *siida* is “[...] always a member of this nuclear or dominant sibling group” (Pehrson 1954:1078).

The Hadza camp

The Hadza live in the rugged hill country of the Eastern Rift Valley in northern Tanzania (Hawkes *et al.* 1997). At the time of European contact—around the beginning of 20th century—they lived entirely by hunting and gathering (Hawkes *et al.* 1997). Since the mid-1960s they have been subjected to a series of settlement schemes designed to encourage them to become farmers—schemes that have been unsuccessful where most of the Hadza have returned to the bush within a few months (Hawkes *et al.* 1997). Subsistence have been reported to be based almost entirely on wild resources, mainly meat, honey, fruit, and tubers (Hawkes *et al.* 1997).

The Hadza live in small *camps* that average about 30 individuals (Apicella, 2014 #3016:1796, or around 29 people, Smith *et al.* 2010:table 3), ranging from around 5 to over 100 (Marlowe 2009:419). They are central-place foragers, meaning that foraged and hunted foods are brought back to the camp. Camps shift location every 4–6 weeks as resources in the immediate area are depleted (Apicella *et al.* 2014, Marlowe 2009). A camp is usually occupied by a core group of individuals; having a relatively constant size and composition. Nevertheless, visiting between camps occur frequently and people change residence (Hawkes *et al.* 1997, Woodburn 1982). While there are continuities in the camp composition, they do not seriously limit individual freedom of movement (Woodburn 1982). Camp size and the number of camps vary seasonally: the band is at its smallest during the rainy season and largest at the end of the dry season (Woodburn 1982). The reason is the limited number of permanent waterholes which again restricts the number of possible camp sites. When rain returns, the default is to disperse into smaller groups because smaller groups have less conflicts (Marlowe 2005).

In general, women gather fruits and dig for underground tubers while men collect honey and hunt animals of any size; from rats to zebras (Apicella *et al.* 2014, Marlowe 2009). Men usually hunt alone (Smith *et al.* 2010), only recruiting help when tracking a wounded animal (Marlowe 2009). In contrast, women cooperate in groups of 3-8 individuals when collecting fruit and berries and when digging for tubers (Marlowe 2009:419).

Hadza economic life is characterized by nearly 100 percent taxation and redistribution and a high degree of egalitarianism (Apicella *et al.* 2014). Few capital goods or personal possessions exist, except for bows and arrows, and a few personal items. If one person has more than his or her share of a resource, such as two knives, the surplus will be demanded by others who have less (Apicella *et al.* 2014). Nevertheless, on average the portion of a hunter’s catch retained in his household is larger

than the share distributed to other households (Smith *et al.* 2010). In terms of sharing, package size matters: medium-sized and large game is shared widely across households if brought back to camp but when men bring honey back to camp, it is often shared with those present, but unlike larger game, it can be concealed and directed to a man's household (Marlowe 2009)

Individual Hadza identify strongly with areas but, according to Woodburn (1982), anyone may live, hunt and gather wherever he or she likes, without restriction. While a Hadza band might take the name of a well-known man it does not indicate leadership (Woodburn 1982). Nevertheless, older men with large families are likely to have more influence (Woodburn 1982). For Woodburn (1982) the fluidity of Hadza bands is subversive for the development of authority: individuals can just move away.

The Ache band

There are four living Ache groups in Paraguay, where the Northern Ache has been the subject of intensive study since 1980. Prior to meeting outsiders in the 1970s, the Northern Ache were full-time foragers who practiced no agriculture (Kaplan *et al.* 1990) and hunters spent almost every day of their lives hunting (Walker *et al.* 2002).

Currently, they live in settlements; practicing a mixed economy consisting of shifting cultivation, wage labour and foraging. Most of the calories consumed in the settlement comes from cultigens (~80%, Gurven, 2004 #599:371} while on forest treks it comes from meat from various game animals (~78 %, Gurven *et al.* 2002, Walker *et al.* 2002, Hawkes *et al.* 1982). On forest treks, starchy palm fibre, fruits, and larvae, is acquired by women while men acquire most of the meat and honey. About 60% of all game is captured by men coordinating their efforts (Gurven *et al.* 2002:96). Cooperation during hunts are both common and critical for successful hunting: men usually coordinate search patterns to stay within hearing range of each other, and they often search together in pairs during part of the day (Hill 2002). Preliminary analyses suggest that forming pursuit groups increases the total food available to the band (Hill 2002). Nevertheless, cooperative food acquisition is just one of several cooperative activities: Hill (2002:108) writes that cooperation is also integral with respect to child rearing, mobility, camp construction etc. The Ache spend about 20% of their time in the forest on extended travels, ranging in length from a few days to several weeks (Gurven *et al.* 2002:96, Gurven 2004:371, Walker *et al.* 2002).

Traditionally, bands averaged around 43 individuals (Smith *et al.* 2010:22). They were predominantly cooperative where members interchangeably adopted complementary roles in daily food acquisition and food were shared among most members (Smith *et al.* 2010). The band had no formal leader (Smith *et al.* 2010:23) and different bands were generally located at distances of 10–30 km from each other (Hill *et al.* 2014). Before contact, the Northern Ache lived in about 10-15

different residential bands—consisting of 15 to 60 individuals—whose membership was highly fluid (Hill 2002:109). Furthermore, residential bands split from and joined with other bands regularly (Hill 2002). All adults knew, and occasionally interacted with, all other adults in the Northern Ache population; outsiders were considered as lethal enemies. Furthermore, bands often split up for a day or two to forage only to reunite to share the proceeds (Hill 2002).

Bands were ideally organised around a father and his adult sons, but in practice they often consisted of a core set of brothers, or brothers and sisters, their children as well as some affinal kin (Smith *et al.* 2010). Furthermore, Ache frequently refer to non-kin associations and relationships; i.e. relationships based on mutual aid and assistance are also important (Hill *et al.* 2011, Supplementary online material). The mean genetic coefficient of relatedness between adults in 58 precontact Ache bands have been estimated to be only 0.054 (Hill *et al.* 2011:1288).

The Ache prize food sharing and sharing norms encourage members to share with everyone present, to give to those in need and to abstain from excessive consumption (Allen-Arave *et al.* 2008). Consequently, an average household keeps only 20–30% of the food it acquires and shares the rest with two to three other households (cf. Allen-Arave *et al.* 2008:308). Households prefer to distribute food to other households that contain kin and who provide ample food in return (Allen-Arave *et al.* 2008). Hunters do not distribute their own kills and no portions are specifically designated for the hunter's family or kin (Kaplan *et al.* 1990, Hill 2002). Furthermore, wives and children of hunters receive no greater portion of meat than any other individual in the band (Hill 2002).

DISCUSSION

The composition of bands and herding groups

Among the Ache bands are ideally organized around a father and his adult sons (Smith *et al.* 2010:22–23) and the most common form of Hadza camp consists of two or three sisters and their families and—if alive—their mother as well (Smith *et al.* 2010). More generally, Ingold (1999:59) argues that bands typically consist of a senior sibling group while Hill *et al.* (2011) suggest that both bilateral kin associations and brother-sister affiliation are important characteristics of foraging social structure.

While both the Saami *siida* and the Mongolian *khot ail* has been characterized as flexible, they often form around a relatively stable, core group of households, often siblings. A similar pattern—the *ru skor* (encampment)—is found among Tibetan nomads. Referring to people who live alongside one another and herd their animals together, tents are united on the basis of kinship, territory and movements (Pirie 2005). Members are often close relatives, e.g. parents and their married children and brothers establishing new households tend to stay in the same group (Pirie

2005). Among the Yomut (Turkmenistan and adjoining parts of Iran and Afghanistan) the core of most *camp* groups consists of a cluster of households closely related in the male line: often a father and his independent sons or a group of independent brothers whose father is deceased (Irons 1972). Among the Somali the nomadic hamlets—called *reer*—is the basic unit of movement and is a social group formed around a nucleus of close male relatives, often brothers, or an extended family (Lewis 1999). The Gabra in Kenya are organised in *homesteads* or *homestead clusters*. A *homestead* consists of one or more tents—where each tent is ideally occupied by one nuclear family or household—belonging to a man and possibly to his married brothers and/or father and that live in closely located tents, pen their herd together, and share herding duties (Torry 1977). A *homestead clusters* refer to homesteads that are living in close proximity and are linked by affinal ties (Torry 1977).

While early anthropological studies suggested that forager societies were primarily kin based (Hill *et al.* 2014), most individuals in bands are genetically unrelated (Hill *et al.* 2011). In a study of 32 forager societies, Hill *et al.* (2011) found bands to be composed of individuals either (1) distantly related by kinship and/or marriage or (2) unrelated altogether. Surprisingly, primary kin generally made up less than 10% of a band (Hill *et al.* 2011). As we have seen, a similar pattern has been observed for the Ache: a mean genetic coefficient of relatedness of 0.054 and a focus on relationships described in terms of mutual aid (Hill *et al.* 2011). Comparing Hadza and Ache inter-band interaction rates, Hill *et al.* (2014:7) found “[...] that affinal kinship is about as important as genetic kinship for interactions between hunter-gatherer adults”. Similarly, Bird *et al.* (2019) argue that most nomadic foragers live in groups dominated by links between non-relatives. Among whale hunters in Indonesia, lineage membership rather than genetic kinship determines hunting group formation (Alvard 2003, see also Allen-Arave *et al.* 2008). In a study of six Agta camps and three BaYaka camps (Congo-Brazzaville), Migliano *et al.* (2017) found that friendship is important: both groups had between one and four unrelated ‘close friends’ with whom they interact as frequently as with close kin. With respect to sharing knowledge, strong friendships are more important than family ties (Migliano *et al.* 2017). In sum, Hill *et al.* (2011) suggest that foraging social structure can be characterised by (1) bilateral kin associations; (2) brother-sister affiliation; (3) affinal alliances; and (4) co-residence with unrelated individuals.

While less concerned about quantifying the genealogical relationship between members of herding groups, a similar pattern is found in nomadic societies. Among reindeer herding districts in Northern parts of Norway, the average coefficient of relatedness between licensed herders ranged from 0.0244 to 0.1964 ($n = 20$ districts, cf. Næss *et al.* 2010, Næss *et al.* 2012). And while sibling groups formed the basis of the *siida*, siblinghood was not only construed in a biological sense but could be extended to include cousins and other affinal relatives (Gjessing 1960). Similarly, while Mearns (1996:313-14) found that in 18 of 30 *khot ails* kinship was important, in twelve it was not.

Moreover, around 50% of the relationships—in *khot ails* where kin relations were important—consisted of affinals. As for the Tibetan *ru skor*: while membership is often based upon kin relations, this is, however, regarded “[...] as an inevitable product of family division rather than as a qualification for membership of the group” (Pirie 2005:87). Among the Brahui (Baluchistan), the *khalk* (camp) is organised on the basis of both kinship and affinity, but camp formation is mainly voluntarily, contractual and dynamic (Swidler 1972). Similarly, among the Basseri kin relations are irrelevant to the composition of *herding units*. While married sons initially tend to stay in their father’s group, these bonds are broken at any time and relationship between members is contractual and characterised by equality (Barth 1961). And while the Yomut *camp* consist of a father and his independent sons (or a group of independent brothers whose father is deceased), the core group often join with non-kin and cooperation is extensive (Irons 1972).

With respect to the formation of the *kraal* among the Massai in Kenya, some households may be related to one another but the Maasai hold that a camp should not consist exclusively, or even predominantly, of members of one clan or smaller descent group (Helland 1977). Similarly, while kinship seems to be important for the Borana, to become a member of a *camp* one has to be willing to work and cooperate; uncooperative or lazy individuals are not welcome, even if they are close relatives to existing camp members (Dahl 1977). In short, membership in a camp is based on free alliances and day-to-day cooperation rather than clan affiliation (Dahl 1977).

Finding the balance: flexibility and stability

There is a difference between changing company and changing places. With respect to nomadism, we mostly mean the second. Thus, nomadic foragers are often tied to places that are continually occupied—at least seasonally—but where members of each site may change almost from day to day (Ingold 1999). The ability to move, i.e. change groups, allows would-be co-operators to assort positively as well as limit the rate at which they are exposed to defectors. There are indications that simply providing the option to move allows cooperation to persist for a long period of time (Efferson *et al.* 2016). There is, however, a frequency-dependent caveat: reciprocal relationships demand a certain level of group stability. Christakis (2019) argue that the tendency to be helpful or unhelpful depend on how the social world is organized. In an experiment where individuals could only choose to cooperate or not, cooperation eventually broke down. Even though people usually started out being generous, faced with defectors they retaliated. In another version they could choose to cooperate or not as well as with whom to associate with. Now things went differently: people could choose to interact with cooperative people and break ties with defecting people. In short, allowing a certain amount of *fluidity* in social ties and some control over whom to interact with made all the

difference indicating that neither too much rigidity nor too much fluidity is optimal for cooperation to prevail (Christakis 2019). Among foragers, high mobility poses a problem of how to receive the benefits of food transfers from others as repeated interactions are less frequent (Smith *et al.* 2016). In effect, more stable camps with fewer changes in membership makes it possible for reciprocal partnerships to develop because the same individuals interact repeatedly with one another over time, increasing trust and a reputation for sharing (Smith *et al.* 2016). For example, reservation-living Ache—with reduced mobility—share meat according to reciprocal partnerships while highly mobile, i.e. forest-dwelling, Ache distribute meat between all campmates (Smith *et al.* 2016).

Nevertheless, band membership can be fluid (Smith *et al.* 2018, Wrangham 2019, Marlowe 2005): families might move to different bands to join family or escape problematic relationships or individuals can also move back and forth between bands. Furthermore, bands might fuse with other bands and, two months later, split off again (Marlowe 2005). Among the Hadza, individuals continue to live with, on average, only one in five of their bandmates from the previous year (Apicella and Silk 2019). Although the most common form of Hadza camp consists of two or three sisters and their families (Smith *et al.* 2010), they are not fixed—there is constant movement in and out while a camp remains at one site (Woodburn 1982).

Among the !Kung (Ju/'hoansi) people can—and do—move from one camp to another and from one area to another, either temporarily or permanently (13% each year, Woodburn 1982). Visits between camps is the main source of this fluctuation. Approximately, 35% divides their residence among two or three different camps which may or may not be within the same area (Woodburn 1982). The Dobe band of the Ju/'hoansi spent the winter–spring dry season at a permanent water source. During and after the rains, they break up into smaller subgroups; moving into the surrounding area where they build short-term camps near seasonal water sources. At each camp, they exploit nearby food sources until most of the desirable food is consumed whereupon they move on to another temporary camp (Brown *et al.* 2010).

Friendship is also important in bands: both the BaYaka and the Agta have at any given time a few 'close friends', resulting in high between-camp mobility. The BaYaka moves between camps on average every 22.8 days while the Agta moves on average every 12.5 days (Migliano *et al.* 2017:3).

A similar pattern is found among nomadic pastoralists: the composition of the Somali *reer* can be both permanent and temporary (Lewis 1999). The composition of a hamlet is constantly fluctuating: a man may stay with his brother on one occasion and with another at a different time. Moreover, while several agnates might decide to move together at one time, at another they might decide to separate and move with others (Lewis 1999). As for the Massai *kraal*, differences of opinion over herd management often cause families to break away and join other camps. Moreover, although some camps maintain a core set of members over several years, most camps change

frequently in composition (Helland 1977). The Borana *camp* seems to be more permanent: while Dahl (1977) argue that conflicts over labour allocation, grazing strategies or personal factors may arise within a camp, it is considered a serious matter for a household to leave because of such a problem. Among the Gabra, the *homestead clusters* might keep together for part of a season or up to several years (Torry 1977). The *ru skor* has also been described as flexible: they changed as a result of topography (Ekvall 1968) or because environmental, demographic, political, and social conditions varied at different seasons and areas. Similarly, as noted above, the *khot ail* changes annually and seasonally, being largest during summer. While individual households can come and go, it is often formed around a relatively stable, core group of households residing together for part of the year (Mearns 1996). The Saami *siida* tended towards seasonal aggregation and dispersal where the larger summer *siidas* segmented into two or more smaller bands at the onset of winter, and regrouped in spring (Ingold 1978:151, see also Paine 2009).

Forage parties and dual camp systems

The forager residential band can split into smaller *forage parties* only to return to the campsite for sleep (Marlowe 2005). Among the Martu, for example, residential bands are loosely comprised of a set of hearths—spatially identifiable clusters of individuals who sit and sleep together when in camp. Nevertheless, it is the foraging group—consisting of individuals from different hearth groups—that is the unit of production and provisioning (Bird *et al.* 2019). Among the Ache too, bands often split up for a day or two to forage for specific resources in known locations, then reuniting to share the proceeds the food (Hill 2002). More recently, Dyble *et al.* (2016) found that among the Agta and Mbendjele (Republic of Congo) there are three levels of social organisation: (1) the *household*—defined as the occupants of single dwelling; (2) the *cluster*—consisting of 3-4 households that share food among themselves—and (3) the *residential camp*.

A similar pattern is observed among nomadic pastoralist too: the cooperative herding group can be made up of a subset of households that reside together. Among the Basseri, for example, people live and reside together in *camps* but to facilitate herding, Basseri households within camps usually unite in smaller herding units (Barth 1961). The members of a herding group usually live together, since they wish to be close to their animals—kept in mixed herds at milking time and at night (Barth 1961). Similarly, the Gabra organise themselves on a day-to-day basis into main- and satellite-camps. Herders place a large portion of their herd in satellite camps, located in areas that have easy access to water; areas that are often many miles from the main camps (Torry 1976). A main camp consist of homesteads or homestead clusters. A survey of 30 camps indicated an average of 14 homesteads in each camp (ranging from 5 to 34, Torry 1977:162, no measure of homestead

clusters is provided). This in contrast to the Saami *siida* and the Mongolian *khot ail* where herding and living together is closely connected. So is also the case with the Tibetan *ru skor*. Ekvall (1968:28) translates the term as *tent-circle*, because Tibetan pastoralists traditionally lived in tents and camped in a circular fashion. This, however, seems to be a pattern for Eastern parts of Tibet. In the western parts, herders live and reside together in “small groups” (Tibetan: *tsho chung*). These groups are separated geographically and are also recognized as distinct groups by the government (Næss 2003). Nevertheless, only a subset of households herds their animals together. For example, Næss (2003) demonstrates that among the Aru nomads, one small group—consisting of 13 households living together—were separated into 6 different herding groups (ranging in size from 1 to 3 households, Næss 2003:93).

Comparing the camel herding Rwala Bedouins (Arabian Peninsula) with Somali herders, who in addition to camel also keep sheep and goats, Rubel (1969) argue that different livestock needs to a large degree explains the adoption of a dual camp system for the Somali. The camel camps are temporary encampments consisting of camels of closely related agnates. The nomadic *hamlets*, in contrasts, comprise groups of related nuclear families where women and children care for the herds of goats and sheep (Rubel 1969). Among the Rwala, the agnatic core forms the basis for the camp²; while among the Somali, we see a dual camp system with camel camps of closely related agnatic males and nomadic hamlets with up to 32% non- agnatic kin (Rubel 1969). In sum, expanding from camel herding to also herding sheep and goats increases demand for pasture. Consequently, affinal ties becomes important as a source for increasing social networks among the Somali. Non-agnatic ties are very frequently used to gain access to pasture and water for sheep and goats among the Somali (Rubel 1969).

Group size

Dual camp formation reflects a complicating aspect of designating relevant levels of social organisation with respect to cooperation; in effect what is the relevant group? The social brain hypothesis takes as it's starting point that that primate brain size correlates with group size. Dunbar (1992), for example, uses the correlation between group size and the size of the neocortex relative to the rest of the brain to argue that the group size of humans over some evolutionarily significant period must have been about 150. More recently, it has been argued that human communities have

² But among the Rwala, Sweet (1965) argue that the *tent cluster*, together with its non-member dependents—if any—is the minimal or real herding unit. The kinsmen of this cluster are likely to be descendants of one grandfather. There is a level of fluidity: when a man has acquired camels, a tent, and a wife, he is under no obligation to remain with his father's, brother's or uncle's cluster, but may independently move with others (Sweet 1965).

a naturally layered structure—15, 50, 150, 500 and 1500. A pattern suggesting natural fission whereby groups having distinct sizes that represent optimal values maximising e.g. coherence and thus stability (Dunbar and Sosis 2018). While optimal community size depends on the socio-ecologic environment, Dunbar & Sosis (2018) wonders if there are sweet spots at which communities are likely to be more successful because they map better onto natural grouping patterns.

The forager band usually consists of fewer than 50 people (in a sample of 294 bands from 478 societies the mean and median size of the band was found to be ~48 and ~30 individuals respectively, Marlowe 2005:table 1), where 10-20 are married adults; around half the population are children while some adults are unmarried, i.e. either young or widowed (Wrangham 2019). Hill et al. (2011:1286) report in a study of 32 hunter-gatherer societies an average band size of 28.2 adults. While nomadic foragers might periodically gather in larger groups, Kelly (2013:172) argue that they live most of their lives in small groups, often fewer than 25. Using a sample of 339 hunter-gatherer societies Hamilton et al. (2007) found a cross-cultural regularity in group size: starting with a single individual, groups seem to increase by a factor of about 4: families consisting of 4-5 people, a residential groups of about 14-17 people, social aggregation (e.g. during winter camps) of 50-60 people, periodic aggregation of 150-180 people, and an entire population of 730-950 people (see also Kelly 2013:172). While band size varies, according to Wrangham (2019) they are always small.

In comparison, little systematic and comparative work has been undertaken with respect to the size of herding groups. According to Levine (1995:70), for example, the *ru skor* varied in size, ranging in size between five and ten households (see also Yeh 2003:510). Barth (1961:21-22) estimates that the size of the Basseri *herding units* ranges between two to five tents. More generally, the size of these cooperative herding groups ranges from 1 to 40 households (Table 1).

Apart from the social brain hypothesis, decision-making might influence group size: the larger the group the more difficult it is to come to an agreement (Kelly 2013). Johnson (1982) argue, for example, that when there are more than six social units acting together, then a new level of hierarchy appears to coordinate activities. Among foragers, a group of twenty-five people could contain about four or five families and so increasing group size beyond this might require leaders to coordinate the families separate foraging effort (Kelly 2013:172). Pertinently, people accustomed to an egalitarian social order might respond to a leader by breaking away from: In effect groups fragment as they grow beyond twenty-five people (Kelly 2013:172). While not concerned with decision-making, there is evidence pertaining to group fragmentation among Kazakhs. Hudson (1938) describes that when a Kazakh came of age, he was provided with his own tent and a share of his father's livestock. Father and son customarily placed their tents together and continued to graze together, but over the course of generations pastures became limited for the increasingly large group. Subsequently, some herders set out for themselves to establish an independent group

(Hudson 1938). While the relationship between founder and descendant group might have started out as close, eventually they became competitors (Hudson 1938). This pattern points to an important aspect of nomadic pastoralism, namely that population growth must be accounted for through expansion of grazing area. Hjorth (1981) argue that pastoralism is viable if the population—both human and animal—stay static, or if population growth can be met with territorial expansion.

The why and how of group living

Socially, nomadic pastoralism is practiced in a web of potential relationships; relationships that can be actualized and discontinued depending on social context and environment. Widespread and diffuse social ties have advantages for a broad variety of nomadic peoples, regardless of environment or type of livestock herded (Pastner 1971). While organisation might appear rigid—e.g. only agnates in camel camps—the ever-changing ecological and social circumstances connected with pastoralism may result in the manipulation, modification, or even contravention of rules or norms (Pastner 1971). Similarly, Bird et al. (2019) argue that forager group size and composition emerge from histories of investments to supply resources that support expansive social relationships, in effect foragers are nested in expansive networks of social interaction in a large and complex society.

The composition of the Basseri herding group, for example, seems to be determined by considerations of (1) the availability of labour; (2) the sizes of herds; and (3) the distribution of friendship and mutual trust (Barth 1961). The formation of the *khalk* among the Brahui is connected to the constant struggle of creating herds of optimal size relative to grazing efficiency. Shifting camp membership serve to combine households in order to create a herd which come as close to 500 as possible. When approaching this number, the camp will no longer accept additional members; and when numbers are substantially higher a group of households will splinter off and form their own *khalk* (Swidler 1972). The *homestead clusters* of the Gabra enjoys economies of scale and they “[...] pen their camels together, send their stock to the wells and pastures together, share meat and exchange milk animals” (Torry 1977:168). More generally, Næss (2012) found that by cooperating herders reap benefits with respect to economise of scale, i.e. reducing within-household costs of labour investment through cooperation (Næss 2012). Empirically, cooperative labour investment has been found to have a positive effect on production—measured as herd size—in Saami reindeer husbandry (Næss et al. 2010, see also Næss et al. 2009).

Among foragers, Dyble et al. (2016) suggest that different levels of groupings serve to facilitate different needs, e.g. inter-sexual provisioning, kin provisioning, and risk reduction reciprocity. Hooper et al. (2015) argue that labour division with respect to sex and age as well as economies of scale can help explain the size and composition of foraging groups. Practically, the

nature and scope of cooperation among foragers is quite variable both within and between groups, but size and composition are influenced by the social and ecological environment (Hooper *et al.* 2015). Cooperative hunting is likely to be maintained when coordinated action increases individual hunting success, prey encounter rates or harvest size obtained, or reduces the costs of search and pursuit leading to increasing per capita foraging return rates (Smith 1997, Alvard and Nolin 2002, Bird *et al.* 2012, see also Kaplan *et al.* 1990). Alvard and Nolin (2002) found that return rates from cooperative whale hunting are greater per capita than those from solitary fishing. In contrast, among the Martu cooperative hunting of sand monitors is, on average, associated with a significant decrease in per capita foraging returns (Bird *et al.* 2012). More generally, it is widely recognized that a beneficial result of pooling hunted game or gathered plant is connected to risk minimisation (Gurven 2004). Among the Hiwi and Ache, for example, large, high variance food items are shared more widely than small, easily acquired food items (Gurven 2004:366).

Leadership and decision-making

The pastoral herding groups can be described as mildly hierarchical. Leadership and decision making have been described as relatively egalitarian: among the Yomut decisions whether to split up or merge *camps* are based on discussion and agreements among all the involved household heads (Irons 1972:92). Among the Somali and the Borana, seniority seems to be important: in the *reer* leaders are always referred to as ‘elder’ or ‘old man’ as in the expression ‘elder of the hamlet’ (Lewis 1999:60-1) while male head of the Borana *camp* is referred to as the ‘father of the camp’, but despite this most decisions are taken together (Dahl 1977:145). Among the Tibetan *ru skor*, however, leaders are elected at meetings attended by most of the adult men. They have the task of coordinating with local authorities as well as sorting out problems within the group. They also deal with leaders of other *ru skors* in the event of disputes and attend the councils of leaders from all the *ru skors* in the lineage or clan (Pirie 2005:89). In the Brahui *khalk*, leadership is arguably settled through the number of in-laws in the *khalk*: the man with the most becomes the informal leader (Swidler 1972). Nevertheless, his control is weak at best since decisions affect every member of the *khalk*; a leader thus must mobilise a consensus among household heads (Swidler 1972). Also, as we have seen, leadership in the Saami *siida* and the Mongolian *khot ail* had to do with experience and was not a formal position. Moreover, among the Saami decisions are often made *ad hoc*—in response to unforeseen and unpredictable events—when herding (Paine 1970). In the Maasai *kraal*, members feel that the camp should reflect a friendly arrangement where no one has authority to order other people about (Helland 1977).

A similar pattern is found among foragers: bands might have a headman and some men are respected more than others; usually the elder men of the band (Wrangham 2019). Furthermore, Wrangham (2019) argue that when a group decision is needed, authority is situational; decision-making has a consensual basis (Flanagan 1989). Similarly, Woodburn (1982:444) argues that in immediate return systems there are either no leaders or leaders who have very limited power. Nevertheless, older men with large families are likely to have more influence than others (Woodburn 1982:445). A similar situation is described for the !Kung: some individuals can be characterised as leaders, but in a very limited role (Woodburn 1982). Pertinently, personal ambition for wealth or power excludes a person for such a leadership role; rather they should be generous, modest and egalitarian (Woodburn 1982) and the Ju/'hoansi are—according to Smith et al. (2010:24)—“[...] one of the most thoroughly egalitarian societies known in the ethnographic record” (but in general, Smith et al. 2010:30 forager societies have a ‘moderate’ level of inequality—most measures of wealth had a Gini coefficient ranging from 0.1 to 0.4—roughly comparable to that of Denmark).

CONCLUDING REMARKS

To sum up, the cooperative herding group is *relatively small* (Table 1) and *relatively flexible*: it changes in size and composition throughout the season and members are relatively free to change group affiliation. Moreover, by being *based on kinship* (both actual and fictional), formed around a core sibling group the herding groups allows members to maintain face to face communication; monitor each other; and punish individuals that break rules, i.e. the characteristics that to a large degree favour the maintenance of cooperation as well as deterring free riding tactics (e.g. Alvard 2003, Griffin and West 2002, Næss et al. 2012). Furthermore, by being *informally led* by a wealthy and skilful person but where *decision-making is mostly consensual* the herding groups are mildly hierarchical (i.e. characterised by relative egalitarianism). A similar pattern is found in forager societies.

However, cooperation has been a more explicit task for researchers focusing on foragers than nomadic pastoralists. Not surprisingly, this is evident in the data material available: while documentation of cooperative herding groups are more qualitative in nature (exceptions are e.g. Næss et al. 2010, Næss et al. 2012, Næss et al. 2009, Thomas et al. 2018, Thomas et al. 2015, Du and Mace 2018, Schnegg 2015); forager studies are more quantitative in nature. Future studies enhancing our understanding of cooperation should aim at rectifying this. Furthermore, forager and pastoral studies have focused on different cooperative domains: among foragers most studies are concerned with cooperative *utilisation* of produce while among nomadic pastoralist the focus has mainly been on cooperative *production*. Hill (2002) argues, for example that little is known about

cooperative food acquisition among foragers, at least with respect to quantitative data on cooperation. This even though food sharing is often argued to follow from cooperative food acquisition (Hill 2002). Similarly, Kaplan et al. (1990:136) argue that they have come to realise that the distinction between solitary and cooperative hunting seems void: “[...] most resources exploited by the Ache are done so within the context of a cooperative acquisition pattern”.

Cooperative herding groups represent a missed opportunity for understanding cooperation in general as well as providing pertinent information for solving large-scale coordination problems. Increasing and extending our understanding of large-scale cooperation requires an understanding of how cooperation works in small-scale coordination problems (e.g. Binmore 2006). The first step along the way is to broaden our understanding of cooperation by extending our analysis to also include nomadic pastoralists.

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TABLES

Table 1. Size and distribution of cooperative herding groups. Size refer to number of households.

Sources in main text.

NAME	GROUP	SIZE	COUNTRY	KEY LIVESTOCK
SIIDA	Saami	2-6	Norway, Sweden, Finland	Reindeer
RU SKOR	Tibetan	5-10	China	Yak
KHOT AIL	Mongolian	2-8	Mongolia	Horse
HERDING UNIT	Basseri	2-5	Iran	Sheep
CAMP	Yomut	2-10	Turkmenistan, Iran and Afghanistan	Sheep
HOMESTEAD^a	Gabra	>=1	Kenya; Ethiopia	Camel
CAMP^b	Borana	10-40	Kenya; Ethiopia	Cattle
KRAAL	Maasai	6-8	Kenya	Cattle
KHALK	Brahui	NA	Pakistan	Sheep
REER	Somali	1-6	Somalia	Camel

^a *Homestead cluster* might be the correct designation since homestead alone do not solve labour issues, so homestead go together in clusters, changes by season; see main text for discussion.

^b A Borana camp consist of individual 'homesteads'; a homestead is like a household consisting of a herd-owner, his wife or wives and their unmarried children, which Dahl (1977:140) designates as the core household.

FIGURES

Figure 1. Old World distribution of nomadic societies who organise herding in cooperative herding groups. Locations are centroids of countries. See Table 1 and Appendix A for details. Map created in R (R Core Team 2017) with the use of the *rnaturalearth* package (South 2017).