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SUBSISTENCE HUNTING AND RESOURCE MANAGEMENT AMONG THE JU/'HOANSI OF NORTHWESTERN BOTSWANA

Robert K. HITCHCOCK
University of Nebraska
John E. YELLEN
National Science Foundation
Diane J. GELBURD
Natural Resources Conservation Service
Alan J. OSBORN
U.S. Fish and Wildlife Service
Aron L. CROWELL
Smithsonian Arctic Studies Center

ABSTRACT An assessment of subsistence hunting and natural resource management among Ju/'hoansi Bushmen (San) over a period of 30 years from the 1960s to 1995 was carried out as part of anthropological investigations of remote foraging and food-producing populations in the northwestern Kalahari Desert region of Botswana and Namibia. The Ju/'hoansi pursue a diversified set of resource management and utilization strategies, exploiting over 50 species of mammals, birds, and other fauna using a variety of tools and techniques. Wildlife offtake rates in the 1960s were well below replacement rates. Although changes have occurred over time in technology and in the use of dogs, donkeys, and horses in hunting, the numbers of animals taken by subsistence hunters were still below sustainable yields in 1995, and wildlife products continue to play a significant role in the socioeconomic and ideological systems of Ju/'hoansi. These findings underscore the importance of ensuring a continuation of the right to hunt legally and to engage in local community-based natural resource management projects.

Key Words: Kalahari Desert; Ju/'hoansi; Subsistence; Hunting; Socioeconomic change.

INTRODUCTION

Subsistence hunting and natural resource management are topics of increasing concern not only to scholars but also to development agencies and environmental organizations (Robinson & Redford, 1987, 1991; Hames, 1987; Hudson, Drew, & Baskin, 1989; Brown & Wyckoff-Baird, 1992; Swanson & Barbier, 1992; Alvard, 1995). Subsistence hunting will be defined here as the customary and traditional use of wild animals for purposes of meeting basic nutritional, material, social, and spiritual needs (Huntington, 1992; Hitchcock, Masilo, & Monyatse, 1995). Natural resource management consists of strategies employed by humans to deal with the environment and its components, including wild plants and animals (Savory, 1988).

In Africa, there has been considerable debate over the issues of subsistence and market-oriented hunting and the balance between natural resource conservation and development (Marks, 1984; Anderson & Grove, 1987; Adams & McShane, 1992; Bonner, 1993: Hitchcock, 1997). There is a perception, fueled in part by the media, that Africa is a continent in crisis, with illegal hunting of wild animals and overexploitation of timber, fuel wood, soil, and mineral resources being the rule rather than the exception (see, for example, Timberlake, 1988). Wildlife populations in a sizable number of African countries declined in the 1970s and 1980s as a result of a combination of hunting pressure, development, drought, habitat change, and disease. The efforts of African governments to reduce the levels of poaching and to conserve wildlife and other natural resources have had mixed results. There are indications that allowing local people direct access to the benefits from wildlife and other resources can lead to higher incomes and enhance conservation (Lewis, Kaweche, & Mwenya, 1990; Brown & Wyckoff-Baird, 1992; Child, 1995). On the other hand, there are those who argue that those programs that link conservation and rural development can result in the reduction of African wildlife (Barrett & Arcese, 1995).

In order to be able to assess the impacts of hunting and integrated conservation and development programs in Africa, it is necessary to obtain detailed baseline data against which changes can be measured. It is also necessary to do long-term monitoring of wildlife populations and predation rates. While there are some excellent data on the effects of hunting on wildlife populations in various parts of Africa (see, for example, Leader-Williams, Albon, & Berry, 1990: Fitzgibbon, Mogaka, & Fanshawe, 1995), there are relatively few studies which reveal long-term changes in patterns of wildlife utilization and trends in wildlife populations (for a notable exception to this generalization, see the work of Stuart Marks, e.g. Marks, 1977, 1984, 1994; Gibson & Marks, 1995). Without this kind of information, it is difficult, if not impossible, to determine the impacts which subsistence hunting and other factors have had on the sustainability of African wildlife populations.

This paper examines data on wildlife utilization over time among a population of former foragers, the Ju/'hoansi Bushmen (San) of northwestern Botswana and northern Namibia (see Fig. 1). It draws upon data collected in the late 1960s by John Yellen (1974, 1977) and in 1995 by Robert Hitchcock, Rosinah Masilo, and Poppy Monyatse (1995). Through an assessment of information on hunting and resource management practices over time, it is possible to demonstrate changes that have occurred as a result of various environmental, economic, social, and political factors in the Kalahari.

Among the Ju/'hoansi, foraging represented a significant source of subsistence and, to a lesser extent, income in the 1960s, and the use of wild resources continues to be a means of obtaining food, materials, and cash in the 1990s. Hunting among the Ju/'hoansi has been examined by a number of researchers (e.g. Marshall, 1976: 125-155; Lee, 1979: 128-151, 205-249, 265-269; Wilmsen, 1989: 225-267) and comparable information exists on several other populations in the Kalahari (e.g. the G/wi, G//ana, Nharo, !Xo, Kua; and Tyua (Tanaka, 1969, 1980: 30-35, 66-69; Silberbauer, 1965: 47-61, 1981a: 204-220, 270-274, 1981b; Campbell, 1971, 1978; Steyn, 1971; Murray, 1978; Hitchcock, 1982: 223-260; Osaki, 1984; Ikeya, 1994; Kent, 1996). The Ju/'hoansi and other local people in the Kalahari Desert are having

Fig. 1. Map of Namibia, Botswana and adjacent nations.

to cope with reductions in wildlife numbers and densities (Campbell et al., 1990; Resarch Division, Department of Wildlife & National Parks, 1994, 1995; Williamson, 1994). The question is, to what extent are the Ju/'hoansi responsible for the decline in wildlife in the areas where they reside? This paper addresses this issue, and it demonstrates that the trends seen in the environment and economic systems of the northwestern Kalahari have had important implications for the well-being of the Ju/'hoansi. The legal basis protecting subsistence hunting has become more uncertain in recent years, in part because of the widespread belief that local communities in remote areas of the Kalahari Desert are overexploiting wild animal resources. Thus, an examination of hunting and resource management over time has implications for policy-making and for the potential of community-based natural resource management projects, ecotourism, and safari hunting activities.

THE JU/'HOANSI OF THE NORTHWESTERN KARAHARI DESERT

The Ju/'hoansi (also spelled Ju/wasi and Zhu/twasi) are a population of Khoisan-speaking former hunter-gatherers residing in northeastern Namibia and northwestern Botswana (Fig. 1). The language that they speak is !Kung, part of the Northern Bushman group of Khoisan languages (Marshall, 1976: 15-28; Lee, 1979: 12, 29-

38; Barnard, 1992: 39-61; Dickens, 1994). The term Ju/'hoansi means real or genuine people. The Ju/'hoansi, who are often called !Kung in the anthropological literature, have been studied extensively by social scientists for over four decades; as a result, they have become some of the best-documented indigenous people in Africa (Marshall, 1960, 1976; Lee, 1965, 1979, 1993; Lee & DeVore, 1976; Yellen, 1974, 1977, 1990; Wiessner, 1977; Howell, 1979; Shostak, 1983; Marshall & Ritchie, 1984; Wilmsen, 1989; Biesele, 1990, 1994; Barnard, 1992: 39-61; Gordon, 1992; Bixler, et al., 1993).

At least 16 Namibian Ju/'hoansi are fully literate now in their own language through the use of a new orthography developed by linguist Patrick Dickens (Dickens, 1994), and they are using it in the teaching of Ju/'hoan youngsters in five village schools in the Nyae Nyae region of northeastern Namibia. Many more Ju/'hoan children are now becoming literate as a result of these educational activities, thanks in part to the teaching and the use of innovative curriculum materials which have been generated by local people themselves.

There are some 3,300 Ju/'hoansi in northern Botswana and some 2,000 Ju/'hoansi in northeastern and eastern Namibia. There were also Mbanderu (Herero-speaking) herders in the Dobe-/Xai/Xai area of Botswana, the majority of whom established residence there in the early 1900s after being forced out of Namibia as a result of the German-Herero wars (Marshall, 1976: 13, 16, 19, 58-59; Lee, 1979: 13-14, 354-369; Wilmsen 1989:90-92, 143-153; Pennington & Harpending, 1993: 6-8). Although the Mbanderu initially were refugees with few livestock and possessions, they have managed to build up their herds, and in some cases have become relatively wealthy pastoralists. This situation changed markedly in Botswana in 1996, however, with the destruction of tens of thousands of head of cattle by the Botswana government in an effort to prevent the spread of Bovine Pleuropneumonia, a lung sickness.

Another group of people residing in the Dobe-/Xai/Xai area of Botswana is the Batawana (Tawana), one of the eight major Tswana tribes (*merafe*) (Schapera, 1952: 93-102). In the 19th century, the northwestern Kalahari was a hunting area for the Batawana, who had a capital at Tsau and later at Maun (Lee, 1979: 77-80; Wilmsen, 1989: 138-139). Local Ju/'hoansi worked for the Tawana as guides, trackers, and members of butchering parties in exchange for which they were given tobacco or a portion of the meat obtained. Toward the end of the 19th century, the Batawana incorporated local people, many of whom were Ju/'hoansi, into the overarching sociopolitical structure as *batlhanka*, servants, and *balata*, "serfs" (Wilmsen, 1989: 101; Tom Tlou, Alec Campbell, personal communications). Some of these people became herders (*badisa*) on Batawana cattle posts.

In the 1960s, approximately 400 Dobe Ju/'hoansi lived in the northwestern Kalahari region of Botswana along with 300 Mbanderu and Batawana (Yellen, 1974; Lee, 1979). Population density was low, averaging 41 people per 100 square miles. Many of the Ju/'hoansi lived in camps averaging 20-30 people. They had relatively few possessions, owned no firearms, and most people practiced only a limited amount of agriculture and pastoralism (Lee, 1968, 1979, 1993; Yellen, 1974, 1977; Marshall, 1976).

Today, the Ju/'hoansi have mixed economies consisting of foraging, small-scale

livestock production, handicraft sales, and wage labor. They interact extensively with non-Ju/'hoansi groups and individuals, including business people, safari hunters, tourists, and government officials. The Ju/'hoansi have been involved in economic and human resource development activities for over two decades (Biesele, 1989; Lee, 1993: 146-151; Smit & Kappe, 1992; van der Sluis, 1992; SNV Botswana, 1994). These activities included the construction of schools and health posts, agricultural extension work, skills training, and institutional establishment.

Some Ju/'hoansi generate income through the manufacture and sale of ostrich eggshell bead necklaces and leather items, while others get part-time work with safari or mining companies. A few people have full-time jobs working for the North West District Council or the Botswana government. One Ju/'hoan woman, for example, works as a cook for the /Xai/Xai school. Some people earn income through the collection of thatching grass, building materials, and firewood for sale, and they take part in government-sponsored Labor-Based Public Works (LBPW) programs in exchange for a daily wage payment.

THE NORTHERN KARAHARI ENVIRONMENT

The Dobe/-/Du/Da region of the northern Kalahari Desert (Fig. 2) is approximately 11,000 km^2 in area and lies between 20° 45' to 21° 20' east longitude. "Dobe" and "/Du/Da" are water holes in the northern and southern limits of the region respectively (Yellen & Lee, 1976: 28). Besides the Aha hills and three dry river beds, the main topographical feature of the region is a system of parallel longitudinal dunes, 8 to 80 km in length, and oriented roughly east-west. These dunes are presently stabilized by vegetation, the dune crests being 1.5 km to 8 km apart.

The Dobe-/Du/Da area, the region on which this paper will concentrate, falls in the northwestern Kalahari Desert in what is defined by the Botswana government as the western communal remote zone (Zone 6) of North West District (Ngamiland) (Smit & Kappe, 1992). The region can be characterized as semi-arid tree-shrub savanna (Lee, 1979: 87-96; Yellen, 1977: 16-22; Yellen and Lee, 1976: 28; Thomas and Shaw, 1991: 99-106). The northwestern Kalahari where the study was undertaken lies in a transitional zone between the drier shrub savanna 180 km to the south and the more lush Okavango River region 180 km to the north. Not only is the Dobe-/Du/Da environment different from other parts of the Kalahari Desert, but there are variations within the region, as well. As one travels south from Dobe the country becomes a more open grassland, the dunes are higher and spaced further apart, and the average mean annual rainfall is lower at /Du/Da than at Dobe.

There are several important geographic features which affect human and animal populations in the Dobe-/Du/Da region. These features include the presence of hills (the Ahas) north of /Xai/Xai, the G/wihaba Caves in some low hills some 30 km to the east of /Xai/Xai, and the open savanna areas south of /Xai/Xai which stretch down to /Du/Da. In the past, /Xai/Xai was a permanent waterhole, as was /Gam to the southwest on the Namibian side of the international border (Lee, 1972: 133-134). There are also a number of seasonal pans (e.g. at /Du/Da) which are significant in terms of providing water during the rainy season and which serve as focal points

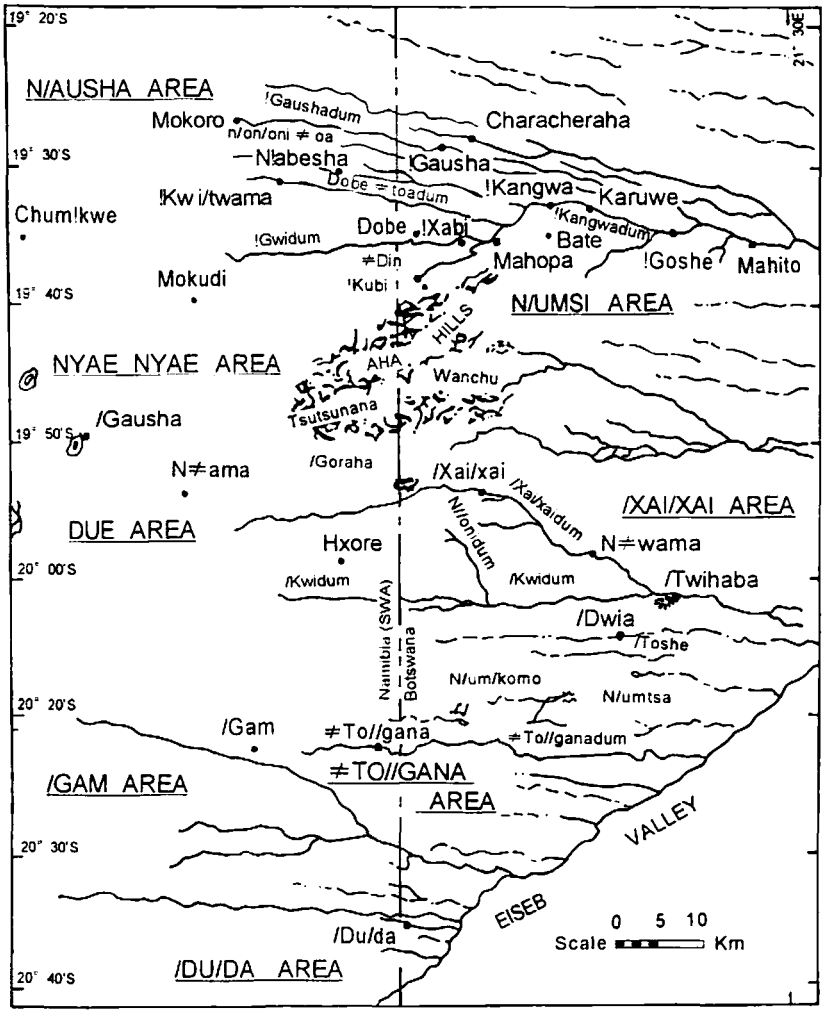

Fig. 2. Map of the /Xai/Xai and /Du/Da areas in Western Ngamiland and Northeastern Namibia.

for wildlife populations at various times during the year. These pans are sometimes found in the depressions between the east-west-trending dunes that are so common in the northwestern Kalahari.

The northern Kalahari Desert lies within the southern African rainfall region. The climate is one of hot summers, with a four to six month rainy season, and moderate to cool winters without rainfall. At 20° south latitude, the sun is directly overhead from early December to early January, but the hottest mean temperatures usually occur from October to February (33° to 43°C or 93° to 110°F in daytime shade). June and July are the coldest months in the region, with night temperatures dropping to freezing, but daytime temperatures average 24° to 27°C (70° to 80°F). Temperatures are fairly consistent on a yearly basis, but rainfall can vary from year to year as

much as 500%. Rainfall is concentrated in the hot summer months (from October to May) and the area is completely dry from June to September.

The Kalahari weather pattern is determined by the shifting relationship between two air masses: a tropical low pressure mass which draws southward the heavier, rainbearing equatorial system known as the Inter-Tropical Front; and a subtropical high pressure air mass flowing northward and eastward from the Atlantic Ocean. The extreme western edge of this Inter-Tropical Front passes over the northern Kalahari. Slight year to year variations in its position can have a dramatic effect on the amount of rainfall in the area. Average yearly rainfall can vary from as little as 239 mm in the drought of 1963 to 1964, up to 597 mm in the good rainfall year of 1967-1968, a swing of 250% (Lee, 1972).

The uncertainty of precipitation is increased greatly by month to month and place to place variation (Yellen & Lee, 1976: 31). Rainfall at Qangwa (!Xangwa) ranged between 224.7 mm and 935 mm in the period 1983 to 1990 and averaged 469.4 mm. Rainfall data obtained at Tjum!kui in Eastern Otjozondjupa Region in Namibia, just across the border from Dobe and /Xai/Xai, in the period 1964 to 1981 had a range between 51 and 997 mm per year and an average of 488 mm per annum (Marshall & Ritchie, 1984: 173, Table 13). Most rain in the northern Kalahari falls in the months between November and April, although it should be stressed that rainfall inputs tend to be highly variable both in time and space.

The hydrology of the northern Kalahari Desert is somewhat different from that of the central, eastern, and southern Kalahari. In the northern Kalahari there are three types of standing water sources: large pans in dry river channels; smaller *molapo* pans; and holes in large trees (e.g. monogongo nut trees). The central Kalahari, on the other hand, has no permanent standing water sources (Tanaka, 1980; Silberbauer, 1965, 1981a). In the northern Kalahari only the pans in the riverbeds tend to hold water throughout the year and are, therefore, the most important. The other two sources are subject to the amount of annual rainfall and seasonal variability.

The three dry river beds carry underground water which are transected at various points by large, circular hardpan depressions, providing the only permanent water sources. The !Xangwa Valley has 7 permanent and 2 semi-permanent water sources. Small seasonal pans located in the *molapos* (valleys between the dune ridges) and other low-lying areas fill with water during the rainy season and may last for a few days or even months. The only water source on the dune crests is found in the hollows in the trunks and root systems of large trees during the rainy season. The long-term as well as locational and seasonal rainfall variability has an important effect on resource distribution and consequently on animal and human population movements.

Scarcity of water is the most crucial limiting factor in the northwestern Kalahari (Yellen & Lee, 1976: 42-43). At the same time, spatial variation in resources also plays a role. Mobility is one means of overcoming the problem of heterogeneity in discrete vegetation associations. Food sharing and resource exchange enable Ju/'hoansi to gain access to resources that they otherwise have not been able to obtain.

From a Ju/'hoansi's point of view, the varied character of the landscape is extremely important for it increases the number of plant foods available for

exploitation. Compared with flatter areas in the Kalahari which receive a similar amount of rainfall, the number of plant species is relatively large. Since these associations are arranged in contiguous, parallel, and relatively narrow bands, an individual hunter or collector can exploit each of these in the course of a single day's trip.

Minor breaks in this pattern make for a certain amount of uneven distribution. !Goshe, for example, has extensive mongongo groves located within an 18 km radius of its waterhole. Dobe, by contrast, is 8 km from the nearest mongongo grove, and the number of nuts produced in it is relatively small.

A second source of spatial variation are numerous local "unique" spots or point resources that dot the region. Vegetation in the Aha Hills, for example, is distinctive, and the tsin bean, which is rare or absent to the north, is plentiful there. The extensive area of exposed hardpan just north of the Aha Hills again supports a distinctive vegetation, and the !Kubi waterhole, which lies within this region, is fringed with the only local occurrences of baobab trees. Dobe lacks baobabs and tsin beans, but is noted for its concentration of nut ivory palms, just as !Xabi is for its morula trees.

Hwanasi is another unique region. The Hwanasi salt pans are located in a shallow extinct river bed 32 km north of Dobe. During the rains, this otherwise inhospitable area serves as a magnet for large game such as gemsbok, kudu, eland, and giraffe: thus, it represents a rich hunting ground. But the richness of this hunting ground, as is the case with other areas, depends on the wide and often unpredictable movements of large ungulates. During the rains, concentration in the Hwanasi area takes place; in early winter, eland move for short periods of time into the area of hardpan just north of the Aha hills. In winter herds of kudu females and young return to browse on the shrubs in the same region.

Chronological factors must be considered in addition to, and in some respects is closely tied with, the geographical variation of the resource base. Most obvious is the regular and predictable passing of the seasons. Rain is the crucial factor: with the start of the rains, smaller seasonal pans fill and provide a widespread network of watering points. Then with the coming of winter, the pans dry one after the other until only the permanent water sources remain. During the main rains, leafy greens, fruits, and berries ripen. Mongongo nuts which had fallen the previous year remain on the ground in still edible condition. Seasonal game migrates into the region and groups of local ungulates are likely augmented as well.

Toward the end of the rainy season, the new crop of mongongo nuts fall, and bee hives are heavy with honey. In autumn and early winter, as pans dry, the number of available edible plant species decrease, although the last of the summer berries and mongongos near the permanent water sources are still plentiful. Ungulates decrease in number and distribution patterns shift. And as the winter and nearly summer follow each on the other, the country becomes dry and parched, and the resources exploitable from permanent water points gradually decrease. With the start of the next rains, the pattern, as all Ju/'hoansi know, repeats itself.

Under this annual chronological pattern there lies a less orderly and less predictable one. Because of its position relative to both the Inter-Tropical Front and the cool winds from the Atlantic, and the northern fringe of the Kalahari may experience extreme fluctuations in rainfall from year to year. Lee's analysis of rainfall records at Maun, located some 250 km east of Dobe, serves to underline this varia-

tion (Lee, 1972). Lee demonstrated that 29 of the years between 1922 and 1968, or 63%, could be considered to have normal rainfall, while in the remainder drought ranged from mild to severe. It is not possible to predict on the basis of one year's rainfall the amount of precipitation that will fall the following year.

Added to this yearly variation, geographic distribution must be taken into consideration. In an analysis of 1966-67 rainfall figures from 5 stations in the Ghanzi district, Lee (1972:132) notes that in November, Kalkfontein received only 3.5 mm while Scarborough, 50 km away, received 34 mm. As a result, the desert may be blooming in one area while a few hours' walk away it will still be parched. Given low average rainfall overall, even relatively slight seasonal variation may have significant consequences.

Shifting to a broader focus, one may consider similar questions of variation across the entire Ju/'hoansi range, and over a broader span of time. In considering geographic variation, the most salient fact is that rainfall varies considerably from north to south. This again is due to the movement of the Inter-Tropical Front. From the well-watered areas in southern Angola, the northern extremity of the Ju/'hoansi range, one moves southward into areas of increasingly lower rainfall as far as the Ghanzi District which roughly marks a southern Ju/'hoansi boundary.

Correlated with the rainfall and consequent floral variation are topographic changes. The system of well-formed alab dunes is limited to the northern part of this area, and as one moves from north to south the dunes, while pronounced, are spaced further and further apart until the pattern finally disappears (Thomas & Shaw, 1991). As one moves southward from the Aha Hills the country appears to open out: grassy areas, characteristic of molapo bottoms, expand at the expense of larger shrub and tree forms. The southern limit of the mongongo tree lies about 20 km south of /Du/Da (Lee, 1973: 3).

Environmental variation can be considered along two axes: regularity and predictability. Regular patterns include the typographical, floral, and faunal changes associated with the alab dune system. A broadly regular shift in topography, rainfall, fauna, and flora may be discerned along a north to south axis. Also, seasons are regular in that they follow one after the other on a yearly basis.

Irregularities may be noted in minor but important variations in the positioning of alab dunes in relation to water, in the scattering on numerous point resources, and in the day-by-day small-scale movements of larger game. Overall, rainfall trends, from both geographical and chronological points of view, may shift greatly not only in the short run, but from year to year, as well. Thus the Ju/'hoansi are in no better positions than statisticians to predict what next year's rains will herald. And although vegetation and most animals in this peripheral Kalahari region are of necessity adapted to wide fluctuations of this kind, the visible effects of rainfall variation can be considerable.

NATURAL RESOURCE MANAGEMENT AMONG THE JU/'HOANSI

Ju/'hoansi subsistence is diverse, with people exploiting a wide variety of resources. Strategies are related to the seasons, with the numbers and types of

resources changing, depending on availability. In the 1960s, in the dry season, the Ju/'hoansi tended to be more mobile and they exploited a wider array of plant foods than they did during the rainy season (Yellen, 1977; Lee, 1979, 1993). During the dry season they exploited more roots, gums, and leaves. The most stressful time of the year was at the end of the dry season, when food and water were least plentiful (Lee, 1969; Yellen, 1974.).

The Ju/'hoansi resource base includes approximately 150 species of plants and 100 species of animals out of a total of some 500 local species of plants and animals which they can identify. The vegetable foods include 30 species of roots and bulbs, 30 species of fruits and berries, and an assortment of melons, nuts, leafy greens and edible gums. The staples include the mongongo or mangetti nut (*Ricinodendron rautanenii*), which yields both an edible fruit and kernel (the kernel having a caloric content of 600 kcal per 100 g and a protein content of 27%), baobab fruit (*Adansonia digitata*), and the tsin bean (*Bauhinia esculenta*). Most of the vegetable foods are seasonal, but Lee states that:

> The vegetable foods are so plentiful for most of the year that the Ju/'hoansi can afford to exercise selectivity in their diet.... Over the course of a year only 23 species of plants make up about 90 % of the vegetable diet by weight, and one species, the mongongo nut, accounts for at least half of the total (Lee, 1968: 34).

The Ju/'hoansi, unlike other Bushman populations in the Kalahari, have a high degree of dependence upon the mongongo nut, which tends to be abundant in some parts of the northern Kalahari (Lee, 1973, 1979: 182-204).

One of the reasons that the Ju/'hoansi region have been able to sustain themselves over the long term is that they employed a variety of innovative natural resource management strategies (Lee, 1968, 1969, 1979; Marshall, 1976). These strategies included a generalized subsistence system in which a large number of plant and animal species were exploited, a land use pattern in which people spread themselves thinly across the landscape, and a population structure in which group sizes were relatively small and densities were low (Yellen, 1974, 1977; Howell, 1979; Lee, 1979).

Natural resource management among the Ju/'hoansi was by all accounts quite innovative, in part because of the wide-ranging and detailed environmental knowledge that they possess. The Ju/'hoansi and their neighbors monitored the region carefully, noting not only the distribution and abundance of desirable resources but also ecological trends. Data obtained on resource conditions were shared actively among group members, sometimes through elaborate stories and oral histories (Biesele et al., 1992; Biesele, 1993).

Local people adjusted group sizes and composition to resource availability and to the distribution of other groups. Group aggregation and dispersal patterns were related to the abundance of resources. In the 1960s, as resources were depleted in an area, people tended to move out, in part to avoid conflict among group members over the remaining resources (Lee, 1965, 1968, 1969, 1979). Another strategy was to switch to using alternative resources (Lee, 1969, 1972).

In the 1960s, mobility was an important strategy in the Ju/'hoansi's adaptation to

their semiarid ecosystem. They tended to be particularly mobile in the summer rainy season, whereas in the dry season (roughly from May to October) they remained sedentary around pans or pools. The average number of residential moves per year was 5 to 6 (Lee, 1968: 31), although some groups were known to shift their camps as many as 30-40 times (Yellen, 1974, 1977). Part of the reason for this mobility was the variation in the availability of moisture and food in the northern Kalahari.

In moving, usually all members of a camp would decide to go to another area. Although the actual members of a camp changed fairly frequently, most camps were composed of a sibling core group and their nuclear and/or extended families. Ju/'hoansi camps were often self-sufficient units with members foraging during the day and sharing the resources they were able to obtain when they returned to their camps in the evening. Vegetable and animal foods were usually obtained within a 4 to 6 mile radius of the camp area.

Lee's (1968: 37) studies in the 1960s indicated that the Ju/'hoansi spent an average of two to three days per week in subsistence activities. Vegetable foods provided 60-80% of the total diet by weight and were usually collected by women, who worked an average of two-four days per week. The men's major contribution to the diet was usually in the form of meat which they obtained through hunting or, in some cases, scavenging (Lee, 1968, 1969, 1979). Men also collected wild plant foods, although not at the same frequency as women.

The Ju/'hoansi actively managed their environment. They manipulated plant and animal resources in part through setting fire to the vegetation. According to Ju/'hoansi informants, this was done for several reasons. First, it was a means of increasing food plant diversity. Second, it was used by livestock owners to reduce shrubs and bush which limited grass growth. It was also employed to get rid of ticks, snakes, and other unwanted species. People also engaged in purposeful protection of certain species, notably groves of monkey orange trees (*no, mogorogorowana, Strychnos cocculoides*), burning small patches near the groves to ensure that large fires would not sweep through and kill the trees.

The Ju/'hoansi also sought to prevent the overexploitation of specific species through the use of taboos. These taboos included restrictions about the kinds of species that one could collect or consume. Restrictions were placed on the use of certain species (e.g. some tree species were not supposed to be used for firewood). Certain types of resources reportedly had different property rights situations than others. This was the case, for example, with baobab trees (*Adansonia digitata*), the rights to which were held by specific families who had to give permission to other people before they could use them (Lorna Marshall, personal communication).

The imposition of jural rules about resource use varied according to age, gender, and, in some cases, individual personal characteristics. Some animal parts were reserved for elderly people. Certain species of medicinal plants were supposed to be used only by people defined as traditional healers. Adult men were the only ones who were supposed to use arrow poison beetle larvae (Marshall, 1976: Lee, 1979).

FAUNAL RESOURCES IN THE NORTHERN KALAHARI

According to Ju/'hoansi informants, meat resources are less abundant and predictable than plants. At the same time, meat is highly prized. Hunters may get only a few large animals in any one year, but women almost invariably bring back at least some plant foods to camp. Meat provided 20 to 50 % of the diet by weight in the 1960s, depending in part on the season and the number of men hunting in the camp (Yellen & Lee, 1976: 39).

Three distinctions need to be made in analyzing the fauna found in the northwestern Kalahari: (1) distinctions between seasonal migrants and year-round residents; and (2) distinctions between fauna with restricted ranges and those with unrestricted ranges, and (3) distinctions between grazers and browsers. In the Dobe-/Du/Da region the known fauna include 57 species of mammals, 75 species of birds, 9 species of snake, 2 species of chameleon, 7 species of lizard, and 2 of frog.

The density and distribution of large ungulates is greatly restricted by the absence of available standing water and scarcity of food during a large part of the year. Table 1 presents data on the common mammals of the Dobe-/Du/Da region of northwestern Botswana and the Nyae Nyae region of northeastern Namibia. The larger, more mobile ungulates which are year-round inhabitants include kudu, gemsbok, eland, blue wildebeest, red hartebeest, and giraffe, the first four of these being the most common. These species appear to be more abundant during the rains, but this observation may only reflect their tendency to concentrate in limited areas with more lush food, salt pans, or other watering places. These large ungulates are usually seen alone or in groups of 2 or 3 but herds of up to 15 individuals occasionally are observed during the rains. The limited numbers, frequent movement, large ranges, and uneven distribution of all these mammals raises obvious difficulties for Ju/'hoansi hunters since it is difficult for them to predict on a day-to-day basis where game will be located.

Some species of mammals are only occasional visitors to the northwestern Kalahari region. Zebra are not common and are found in groups of no more than 12, roan antelope occur either singly or in groups of less than 5, and buffalo appear singly or in groups of about 8 or less during the rains or in early winter. These animals, along with impala, are seasonal migrants and enter the region from either the Okavango River to the north or from the swamps to the east during or immediately after the rains. At this time, individual elephants and baboons are observed occasionally. In comparison to the better watered areas to the north and east, where herds may number well over one hundred individuals, the low concentration and erratic appearance of these seasonal migrants is striking.

The smaller ungulates, such as steenbok, duiker, and warthog are more common than their larger counterparts and have more limited ranges. Steenbok and duiker occur most often in the flats, either singly or in pairs. Warthog, which usually are solitary, are distributed widely but appear to be associated primarily with flats and exposed hardpan areas. Antbears, porcupines, and springhares are all relatively abundant and easy to locate because of their conspicuous burrows which are located in molapos, flats, and areas with exposed hardpan. The hare is found primarily in river valleys and areas of exposed hardpan. All the major southern African carni-

vores are represented in the area although none of the large ones is common.

Table 1. Common mammals of the Dobe-/Du/Da region, Northwestern Botswana and the Nyae Nyae region, Northeastern Namibia.

Common Name	Scientific Name
UNGULATES	
Buffalo	*Syncerus caffer*
Duiker	*Sylvicapra grimmia*
Eland	*Taurotragus oryx*
Gemsbok	*Oryz gazella*
Giraffe	*Giraffa camelopardalis*
Red hartebeest	*Alcelaphus buselaphus*
Impala	*Aepyceros melampus*
Kudu	*Trafelaphus strepsiceros*
Roan antelope	*Hippotragus equinus*
Steenbok	*Raphicerus campestris*
Warthog	*Phacochoerus nethiopicus*
Blue wildebeest	*Connochaetes taurinus*
Zebra	*Equus burchelli*
CARNIVORES	
Aardwolf	*Proteles cristatus*
Bat-eared fox	*Otocyon megalotis*
Caracal	*Felis caracal*
Cheetah	*Acinonyx jubatus*
Genet	*Genetta genetta*
Brown hyena	*Hyaena brunnea*
Spotted hyena	*Crocuta crocuta*
Black-backed jackal	*Canis mesomelas*
Leopard	*Panthera pardus*
Lion	*Panthera leo*
Banded mengoose	*Mungos mungo*
Slender mongoose	*Herpestes sanguineus*
Mongoose	2 additional spp.
Ratel (Honey badger)	*Mellivora capensis*
Serval	*Felis serval*
Wild cat	*Felis lybica*
Wild dog	*Lycaon pictus*
Striped polecat	*Ictonyx straitus*
OTHER	
Antbear	*Orycteropus afer*
Baboon	*Papio ursinus*
Elephant	*Loxodonta africana*
Galago	*Galago senegalensis*
Scrub Hare	*Lepus saxatilis*
Pangolin	*Manix temmincki*
Porcupine	*Hystrix africaeaustralis*
Springhare	*Pedetes capensis*
Squirrel, Bush	*Paraxerus cepapi*
Squirrel, Ground	*Xeris inauris*

Note: Data obtained from Yellen (1974: 59-60).

Table 2. Common birds of the Dobe-/Du/Da region, Ngamiland, Botswana.

Common Name	Scientific Name
RESIDENT YEAR ROUND	
African Hoopoe	*Upupa africana*
Blacksmith plover	*Hoplopterus armatus*
Boubou shrike	*Laniarius ferrugineus*
Cape turtle dove	*Steptoepelia capicola*
Cardinal woodpecker	*Dendropices fuscescens*
Crimson-breasted shrike	*Laniarius atro-coccineus*
Crowned guinea fowl	*Numida meleagris*
Crowned plover	*Stephanibyx coronatus*
Double-banded sandgrouse	*Pterocles bicinctus*
Emerald spotted wood dove	*Tutur chalcospilos*
Fire finch	*Lagonostieta* sp.
Fork-tailed drongo	*Dicrurus adsimilis*
Grey hornbill	*Lophoceros nasutus*
Grey loerie	*Corythaixoides concolor*
Kori bustard	*Ardotis kori kori*
Lilac-breasted roller	*Coracias caudata*
Long-tailed shrike	*Urolestes melanoleucus*
Marico flycatcher	*Bradornis mariguensis*
Martial eagle	*Polemaetus bellicosus*
Meyer's parrot	*Poicephalus meyeri*
Namaqua dove	*Oena capensis*
Ostrich	*Struthio camelus*
Penduline tit	*Anthroscopus minutus*
Pied babbler	*Turdoides bicolor*
Red billed francolin	*Francolinus adspersus*
Red-crested korhaan	*Lophotis ruficrista rufricrista*
Red-eyed bulbul	*Pycnonotus nigricans*
Secretary bird	*Sagittarius serpentarius*
Sunbird	*Cinnyris* sp.
Swainson's francolin	*Pternistis swainsoni*
Vulture	several spp.
White-browed sparrow weaver	*Plocepasser mahali*
Yellow-bellied bush warbler	*Eremonela icteropygialis icteropygialis*
Yellow-billed hornbill	*Lophoceros flavirostris*
Yellow-billed kite	*Milvus aegyptius parasitus*
SUMMER MIGRANTS	
European swallow	*Hirundo rustica rustica*
Hammerkop	*Scopus umbretta*
Paradise Whydah	*Steganura* sp.
Red-billed teal	*Anas erythrorhyneha*
Shaft-tailed Whydah	*Vidua regia*
Spurwing goose	*Plectropterus gambensis*
White-bellied stork	*Sphenorhynchgus abdimii*
White-faced duck	*Dendrochygna viduata*

Differences in faunal composition and distribution may also be related to this north to south pattern, for in the north, water-dependent species such as zebra and buffalo are in evidence throughout the entire year, while eland are relatively uncommon. As one moves further south, numbers of desert-adapted species such as eland

and gemsbok increase. In the area north of the Aha Hills, eland are uncommon; to the south their numbers appear to be greater. Also, as one moves south, our subjective impression is that for a single species herd size decreases while range size expands. This pattern is characteristic of the faunal distributions for the Kalahari Desert as a whole, as well (Smithers, 1971; DHV Consulting Engineers, 1980; Thomas & Shaw, 1991: 233-238).

The density and distribution of large ungulates is affected by the availability of standing water and food during the year. Not surprisingly, the same is true for bird species. Table 2 presents data on some of the birds present in the Dobe-/Du/Da region. It shows the species that are there year-round and those that are primarily summer (wet season) migrants. Ten of these species are used regularly for food. Of the birds exploited most frequently by the Ju/'hoansi, the crowned guinea fowl is probably the most popular. It occurs in flocks of up to 20 individuals and has a widespread distribution. Ostriches, although not so abundant, are also widely distributed, and hunters are mostly interested in their eggs, which they use for food, water containers, or as materials for making beads.

Only a small percentage of the insects and other invertebrates present in the Dobe-/Du/Da region have been collected and identified. For the Ju/'hoansi, the most important of these insects are two species of beetle, *Diamphidia nigro-ornata* and *Polycada flexuosa*, which are used for poisoning arrows. One species of antlion has an annual outbreak in late November and early December, and Ju/'hoansi, especially women and children, exploit them avidly. Bee hives are found in most heavily wooded areas, and the honey in them ripens in late May and June. Honey is prized highly by the Ju/'hoansi, who consume it whenever possible.

Comparative data on faunal species exploited by both foragers and food producers in southern Africa have been obtained and are presented in Table 3. The data in this table reveal that the Dobe Ju/'hoansi tend to exploit more faunal species than do other groups in the western and central Kalahari Desert. At the same time, they tend to exploit fewer faunal species than do the Kua in the eastern Kalahari and the Tyua, who are sedentary food producers and part-time foragers in the northeastern

Table 3. Comparative data on faunal species exploited by foragers and food producers in Southern Africa[a].

Food Category	Dobe Ju/'hoansi	NyaeNyae Ju/'hoansi	!Xo	G/wi	G//ana	Nharo	Kua	Tyua	Tlokwa
Mammals	29	17	26	14+	33	20	35	52	31
Birds	8	8	9	?	7	34	8	18	
Birds' eggs	8	1	4	1	1	1	3	7	13
Amphibians	1	1	1	1	1	1	1	2	0
Reptiles	3	7	3	2	7	2	5	7	3
Fish	0	0	0	0	0	0	0	3	1
Insects	5	7	6	2	?	1	5	8	19
TOTALS	54	41	49	20+	48	29	57	97	100

[a]Data used in this table have been extracted from the following sources: Lee (1965) for the Dobe Ju/'hoansi; Marshall (1976: 128-129) for the Nyae Nyae Ju/'hoansi; Heinz (1966, 1978/79: 321-336, 1981/82: 99-101, 111-112) for the !Xo; Silberbauer (1965: 30, 1981a: 205, Table 9) for the G/wi; Tanaka (1976: 119, Appendix Table 4b, 1980: 66-68) for the G//ana; Steyn (1971: 294-297, 307, 316) for the Nharo; and Grivetti (1979: 245-257, 251, Tables I and III) for the Tlokwa. The category Insect includes insect products such as honey and the larvae of moths such as *phane*, the mopane moth (*Gonimbrasia belina*).

Kalahari. The group that exploits the highest diversity of faunal species is the Tlokwa, one of the eight Tswana tribes, who are sedentary agropastoralists and wage earners residing in and around the Botswana capital of Gaborone in southeastern Botswana.

SUBSISTENCE TECHNOLOGY OF THE JU/'HOANSI

In the 1960s, the Ju/'hoansi needed only a few, very effective tools to exploit their subsistence base. Having to transport all necessities as they move from camp to camp, material possessions generally were kept at a minimum. Women used only digging sticks or their hands in gathering vegetable foods, the larger basis of the Ju/'hoansi diet. They also used mortars and pestles to prepare some of the vegetable foods. Men had a slightly more elaborate technology for food procurement. They hunted with bows and arrows, spears, snares, and springhare hooks. The following is a short description of the items used in Ju/'hoansi subsistence pursuits.

Arrows—Arrows are composed of three main segments: the shaft, made from a segment of thick, straight grass stalk, a head and foreshaft which is now fashioned from a single piece of iron wire, and finally a bone or wood linkshaft, which is set between the foreshaft and the shaft itself. This permits the shaft to fall away upon impact and makes it difficult for an animal to remove the foreshaft by rubbing it against vegetation or the ground.

Quiver—The Ju/'hoansi select a section of straight, thick root from one species of tree, remove the pith, while leaving the bark intact, and cover the ends of the latter to form a quiver. To accomplish this, they build a small fire and, after it has burned out, they bury the root segment in the hot ash and sand. The bark expands more rapidly than the pith, permitting the removal of the latter. In the process, however, the bark itself often splits badly and is discarded. Quivers are usually made in camp.

Spears—Spears are made using poles 4-5 feet in length. They are tipped with iron spearheads that the Ju/'hoansi obtain through trade or purchase.

Adze—The small Ju/'hoansi adze is used both to chop wood and to scrape skins. The small iron blade is obtained through trade while the wooden handles are carved by the Ju/'hoansi themselves. The valuable blades are carefully saved and treated, but the handles, which often split, are discarded.

Knife—Metal knife blades, like adze blades, are obtained from outside sources, and the Ju/'hoansi carve their own handles and sheaths for them. The pointed blades, which are sharpened on both edges, average around 15 cm in length and are never knowingly abandoned. The wooden handles and sheaths, which are carved in a Mbukushu fashion, are discarded when broken.

Mortar and Pestle—Wooden mortars, which have a maximum size of about 30 cm in length and pestles, which the Ju/'hoansi carve from the same wood, are used for pounding a number of vegetable foods. They are also sometimes used to pound meat.

Snares—Snares, made of twine, are set up with a spring mechanism. For bird snares, the twine is usually about 18 inches long, with a small loop on one end and a short stick on the other. The twine is attached to a twig or pole and then set in a circle on small sticks.

Twine—The short, thick fibrous leaves from a small plant which resembles sisal are used to make twine. The outer covering is stripped from the leaves using the pointed end of a digging stick. Next, the inner fibers are separated in a similar way and then spun against the thigh to give a two-ply twine which may be of different thicknesses.

Carrying Net—Twine carrying nets, up to 1.5 m in length, are constructed by the Ju/'hoansi and can be used to transport almost anything which is non-liquid. When small objects such as mongongo nuts are carried, the net is lined with a thick layer of grass to prevent them from slipping out.

Digging Stick—Digging sticks are fashioned from straight, slender branches from 1.0 to 1.5 m in length. The sticks are smoothed, and one end is shaped to form a flattened point. Through use, the point is worn away, and continued resharpenings reduce the length of the stick. When the stick if finally discarded it is often left at the camp where it was last used.

Containers—Most families in the Dobe Ju/'hoansi group have an iron three-legged cooking pot obtained through trade either with non-Ju/'hoansi or with anthropologists, and these have replaced the traditional clay pots which were made by Tswana and Mbukushu. Iron pots are extremely rugged and, of course, are not thrown away. However, they are sometimes stored at an abandoned camp if the owners expect to return to the area in the near future. Metal cans are also replacing the ostrich egg shell as a water container, but shells are still widely used and, on breaking, the fragments may either be saved for bead making, or discarded. Bark trays, although rarely used if the metal cans are available, are sometimes cut and used to carry honey. The trays are nothing more than a section of roughly trimmed, undecorated bark and are discarded after use.

Fire Making Materials—Matches, flint and steel, and fire sticks are all employed by the Dobe group. Pads of fine grass stems are used to catch the spark from the flint and steel technique.

Fire Paddle—Implements which serve to stir and remove vegetable foods from the coals where they are cooked vary from simple, unaltered pieces of wood of convenient length to small paddles that are flattened at one end and pointed at the other. These items may be made relatively quickly and easily and are often discarded when a camp is abandoned.

Springhare hook—A 3-4 m long pole usually made up of thin *Grewia* sticks attached to one another with sinew. The stick has a piece of bent wire or metal at the end which serves as a hook. It is pushed down into the burrows of springhares and, upon coming in contact with the animal, the hook is manipulated to catch and hold it. The hunter then digs down to the springhare, removes it from the burrow, and dispatches it.

JU/'HOANSI HUNTING STRATEGIES

The Ju/'hoansi are considered by many in southern Africa to be excellent hunters. Hunting was usually restricted to Ju/'hoansi adult males who employed a number of different strategies. In some cases, individuals ranged out on forays from camps car-

rying bows and arrows in search of game. Hunting was also done cooperatively, something that was a necessity with certain kinds of prey (e.g. springhare). Generally, men from the same camp hunted together. Pursuit hunting of animals was often done in pairs. That way, if one man wounded a large animal, he could follow it while the other returned to camp to obtain assistance for stalking, killing, and butchering the prey. The butchering party could then carry the meat back to the residential location.

The most common method of hunting involves stalking. A man will either see an animal or its tracks and follow it cautiously until he is close enough to shoot it with a bow and arrow. The arrows are tipped with poison usually made from a beetle which slowly kills the animal pierced by the arrow. Depending on the size of the animal, the hunter may continue to stalk or chase it until it drops from exhaustion or until he can kill it with a spear, knife, stone, or stick. If it is a large animal, the hunter often returns to camp to enlist the help of the other hunters. Usually all the men (and sometimes other members of the families) return to the area the following day to track and kill the animal. By waiting overnight, the poison has had a chance to work and tracking the animal is usually not difficult. (See Appendix 1 for "Accounts of Ju/'hoansi Hunting Strategies".)

An intriguing aspect of resource access rights of Ju/'hoansi relates to arrow ownership. There is a rule among Ju/'hoansi which holds that the owner of the arrow which struck an animal is considered to be the "owner" of that animal. The arrow owner gets first pick of the meat from the animal, and it is he who takes charge of the distribution of the rest of the animal. In some cases, dogs are used to chase down animals. In these cases, the dogs' owners usually are entitled to a share of the kill even if they did not participate in the hunt.

Often one or more men may set out in the morning to go hunting without any specific objectives or prey in mind. A hunt frequently was spurred, however, by someone reporting evidence of certain animals in the area. Although no study has determined the exact importance of communication, there are many accounts of men going out to hunt after women have reported seeing evidence of prey on their gathering trips. In some cases, animals are procured during non-hunting trips. An animal may be killed while the men are moving their camp, gathering with the women, looking for honey, or going to visit another village. Men are usually prepared to hunt no matter what their immediate task is. They are usually looking for tracks, burrows, or other evidence of prey whenever they are on the move or travelling from one place to another, and they almost always carry their bows and arrows or clubs with them.

Some species of animals require specific procurement methods. Springhares and porcupines usually have to be dug out of their burrows. To catch porcupines, one man will often crawl into the burrow and block its exit. The location of the animal is then determined and the men dig down from directly above the porcupine. Springhares are usually obtained with the aid of a springhare hook (see "Subsistence Technology" for a description of hook and how it is used).

Snares are another common method of procurement. The snares, made of twine, are set up with a spring mechanism. In bird snares, the twine is attached to a twig or pole and then set in a circle on small sticks. The animal's preferred type of subsis-

tence food is placed in the middle of the trap and the trap is set to spring as soon as the animal attempts to eat the bait. Snares are most commonly used to trap birds but are often used to catch small ungulates, such as duiker and steenbok. Snares generally have a high success rate in relation to the amount of time expended in making and setting them. In June 1976, one hunter was observed to be stalking animals unsuccessfully for about ten hunting days before he decided to set some snares. In two days, he trapped two duikers and a steenbok in the snare he had set.

Ambush hunting was done by Ju/'hoansi in the 1960s and 1970s, but it has declined in importance in recent years. Ambush hunting is usually done at night from places of concealment, including hunting blinds, during the full moon (Crowell & Hitchcock, 1978). Blinds are usually built by pans or other watering or feeding areas frequented by animals. A blind is usually a small, circular depression about 1 to 2 m in diameter which is surrounded by a small stone or brush wall which is from 500 cm to 1 m in height. Usually one to three men will sit in the hunting blind and wait for an animal to come to the pan to drink. They then kill it with a spear or shoot it with a poisoned arrow. If the animal does not die immediately, they follow its tracks the next day. If they are able to locate the prey before predators or scavengers do, they dispatch it with a club, spear, or knife.

After killing an animal, butchering is either accomplished at the kill site or the animal is brought back to camp. The decision about whether or not to butcher the prey in the field usually depends on its size. Small mammals, such as porcupines or springhares, are usually brought back to camp whole, although they may sometimes be skinned at the kill site. Medium-sized animals, like duiker or steenbok, are sometimes brought back to camp or are butchered at the kill site. Large ungulates, like gemsbok, are usually butchered at the kill site. Some of the meat may be eaten while the men are butchering the animal.

Of the 26 detailed accounts of Ju/'hoansi hunting activities, only the gemsbok (a large ungulate) was butchered consistently at the kill site. Only one (of 6 that were killed) was brought back to camp whole and that was because it was "quite small". Appendix 1 includes a description of one duiker that was butchered in the same manner as the gemsbok, as well as a duiker and a steenbok that were brought back to camp whole.

The usual method of butchering at the kill site is as follows: The men first skin and butcher the animal. They may crack the cannon bones to eat the marrow in them and roast the liver and head and eat them. Sometimes the metacarpals and some ribs are eaten at the kill site. Other bones may be cracked for marrow (e.g., the tibia). Some of the innards, notably the liver, are usually cooked and eaten at the time of the initial butchering. The skin may be saved to use for clothing or blankets; it might be abandoned; or it may be cut into strips and saved for later consumption in stress periods. The meat from the animal that is not consumed immediately is taken back to camp for all to consume. If all the meat cannot be carried in one trip, some of it may be left hanging in a tree and retrieved the next day.

Meat from large animals which is brought back to camp, if not consumed immediately, is cut into thin strips and dried and made into what is known in southern Africa as biltong. These strips are hung in a shady place to dry; usually limbs of standing trees are used for this purpose. If suitable tree limbs are not available, a

simple rack is constructed, which often consists of three elements: a forked stick set vertically into the ground, a horizontal pole up to 3 m in length, one end of which rests in the fork, and a live tree or large bush which serves to support the other end of the horizontal pole.

The primary treatment of fresh animal skins occurs outside the camp circle. The skin from large and smaller-sized antelopes is dried and later cured to make either clothing or carrying bags. The drying stage always takes place slightly outside the camp circle, since it takes up a good deal of space and is likely to attract insects and carnivores. The skin is usually placed on a thin grass matting, hair side down, then stretched tightly in all directions and then finally pegged to the ground with a number of short, pointed wooden sticks. The hair often falls out naturally as the skin dries. The skins are sometimes made into karosses or blankets and sold as a means of generating income. Small leather pouches are also made by people which are used to carry personal items.

HUNTING DATA: THE DOBE GROUP'S ACTIVITIES

Between January and July, 1968, John Yellen observed "The Dobe Group" of Ju/'hoansi (Yellen, 1974, 1977). Detailed records were kept on the movements of /Toma and N!aishe, two married members of the Dobe sibling group, during the times in which they camped away from Dobe. The records include almost all the moves made during a yearly round, covering the period of heavy rains, autumn, and the first half of winter. During trips from Dobe, daily records of activity and movement were obtained. The records included the two brothers and any other members of the temporary camp in which they were living. Following this core group, Yellen recorded detailed information on 16 base camps with a total of 23 occupations. Tables 4 and 5 and Appendix 1 summarize the various data obtained.

It should be noted that goats and cow kills are not included in this data set. Goats were first kept by the Dobe group in 1969 and from then until recently the dependence on goat and cow meat has tended to increase (Yellen, 1990). At the time these data were obtained, however, domestic animals were not a significant part of the diet of the Dobe group, and they were not consumed during the course of the January-July, 1968 study period.

As can be seen in Table 4, the study included a total of 96 observation days. An analysis of these data revealed an average length of temporary camp occupancy as being 4.62 days. The average camp consisted of 7 adults and 7 children. During the total observation period, 32 porcupines (2 male adults, 5 female adults, 4 adults not identified as to gender, 2 young, and 2 immature) were recorded killed. Most of these were dug out of burrows and killed, except for one that was speared above ground. Nine out of 25 springhares (7 female adult, 2 female nursing, 4 male adults, 1 male young, 2 female immature, and 1 immature) that were recorded were caught with a springhare hook. Although there are no methods of procurement noted for the other springhares, it can probably be assumed that most of them were also caught with a springhare hook. Of 6 steenbok procured, 2 were scavenged from carnivore attacks and 2 were shot with poisoned arrows.

Table 4. Fauna procured by hunting-gathering Ju/'hoansi Bushmen based on Yellen's (1974) observations on "The Dobe Group" between January and July, 1968.

Camp No.	Date of Occupancy	Length of Occupancy	#Adults Present	#Children Present	Fauna Killed	Sex/Age	Method of Procurement
1a	Mid. Jan.	Several	3	4	PP	-/adult	—
	1968	days			PP	-/adult	—
1b	12-16	5 days	4	6	3SH	F/adult	SH hook
	Feb. '68				1SH	M/adult	SH hook
					PP	-/adult	—
					PP	-/immat.	—
					SB	M/adult	Scavenged from wild dog kill
					Tortoise	—	Picked up (gathered)
2	3-11	9 days	4	7	GB	M/adult	Shot with poisoned arrow
	Jan. '67				SB	-/adult	Shot with poisoned arrow
3a	3-11	9 days	8	13	Duiker	F/adult	Shot with poisoned arrow
	Feb. '68				Duiker	—	Shot with poisoned arrow and clubbed
					SB	-/immat.	Shot with poisoned arrow and clubbed
					2PP	-/immat.	—
					PP	—	—
					Tortoise	—	Picked up
					HH	—	—
3b	18-19	2 days	5	7	PP	F/adult	—
4a	19-22	4 days	4	6	—	—	—
4b	25 May '67	1 day	4	6	—	—	—
4c	6 days	6 days	7	7	3SH	—	—
	in Dec.				red-created Korhaaon	—	Snare
4d	27 Jan.—	7 days	4	7	2SH	—	Hook
					SB	-/immat.	—
					SH	F/adult	—
					PP	F/adult	—
					SH	F/adult	—
					SH	M/young	—
					Duiker	-/immat.	—
					PP	-/adult	—
					SH	-/immat.	—
4e	12-13	2 days	4	7	2SH	—	Hook
	Feb. '68						
5	14-15	2 days	4	7	HH	—	—
	Feb. '68				2SH	M/adult	—
					2SH	F/adult	—
6	20-22	3 days	5	7	GB	M/young	Shot with poisoned arrow
	Mar. '68				SB	F/young	—
7a	9-13	5 days	5	7	SH	M/adult	Hook
	Mar. '68				2SH	F/immat.	—
					3PP	—	1 dug out of burrow and killed

Table 4. (continued)

Camp No.	Date of Occupancy	Length of Occupancy	#Adults Present	#Children Present	Fauna Killed	Sex/Age	Method of Procurement
					PP	F/adult	—
7b	24-28 Mar. '68	5 days	10	7	PP	—	Speared (on surface)
					Warthog	—	Scavenged from leopard kill
8	Late Mar.-Apr. '68	1 month	5 nuclear families and 1 unmarried male		GB	—	—
					Duiker	—	—
					2SB	—	—
					PP	—	—
9	14-15 Mar. '68	2 days	5	7	PP	F/adult	Dug down into burrow and killed (4 in burrow)
					PP	M/adult	
					PP	-/immat.	
					PP	-/immat.	
					SH	F/nursing	—
10	15-26	12 days	13	11	GB	M/young	Shot with poisoned arrow
	Apr. '68				GB	M/young	Shot with poisoned arrow
11	12-14	3 days	13	11	PP	M/adult	all four PP in same
					PP	F/adult	
					PP	-/young	
					PP	-/young	
12	4-6	3 days	10	7	SB	—	Scavenged from caracal kill
	June '68				2PP	—	Dug down and killed in same burrow
13	30 May-3 June '68	5 days	10	7	GB	-/immat.	Shot with poisoned arrow and then hit near ear
14	4-10 June '68	7 days	18	8	Aardwolf	—	—
					Guinea fowl	—	—
					Duiker	—	—
					3PP	—	—
15	29 May '68	1 day	10	7	2PP	—	Speared
16	25-30 June '68	6 days	12	7	PP	—	Went into burrow and speared it
					3 Guinea fowl	—	Snare; one eaten by small carnivore
					PP	—	Dug up burrow and speared

SH=Springhare SB=Steenbok HB=Hornbill GB=Gemsbok PP=Porcupine

All 6 gemsbok were wounded or killed with poisoned arrows. One kill was done with a spear and another was carried out with a stick. Two out of the 4 duikers (1 female adult, 1 immature) recorded were shot with poisoned arrows. Two tortoises were obtained by being picked up when seen on the ground. Two hornbills and 1 guinea fowl were caught. One red-crested korhaan and 2 guinea fowl were snared. One aardwolf was caught, and a warthog was scavenged from a leopard kill. Based on a total of 8 species of animals obtained, 39% were porcupines, 29% were spring-

hares, 7% were steenbok, 7% gemsbok, 5% duiker, 4% guinea fowl, 2% tortoise, 2% hornbills, 1% red-crested korhaan, 1% aardwolf, and 1% warthog.

The method of procurement was recorded on 40 animals. Three animals (4% of the total number of animals obtained, or 8% of the total number of animals recorded by procurement method) were scavenged. Nine, or 23%, were obtained with a springhare hook. Eleven (28%) were shot with poisoned arrows, and 9 (23%) were dug out of a burrow. Five, or 13%, were speared (2 porcupines were speared after being dug up on a burrow and 1 gemsbok was speared after being shot with a poisoned arrow). Four, or 10%, were snared and 2, or 5%, were picked up from the ground by hand.

It is interesting to note that the majority of animals obtained were fairly small mammals (68% were porcupine and springhare). The only large ungulate was gemsbok which comprised only 7% of the total number. The smaller ungulates (duiker and steenbok) comprised 13%, while the birds totaled 7%. Two of the conclusions that can be drawn from this data set are that the numbers of large animals procured by Ju/'hoansi are low, and that the killing of large prey is infrequent.

JU/'HOANSI HUNTING SUCCESS RATES

Data on hunting success rates of Ju/'hoansi, based on the data set obtained in 1968, are presented in Table 5. It can be seen from the information presented here that there were 25 unsuccessful hunt days out of 66 days when one or more men left camp with hunting as their objective. This means that hunting parties from a camp were successful 62% of their time. During the total camp occupations of 80 days, there were 14 days (18%) when no man left camp to go hunting. Therefore, they went hunting 82% of their time.

On 36 days (55% of the total number of hunting days), there was only one hunting party (18 [50%] consisted of 2 men, 9 [25%] with 1 man, 4 [12%] with 3 men, 3 [8%] with 4 men, and 2 [6%] with 7 men). During 25 days (38% of the total hunting days) there were 2 hunting parties (9 [36%] consisted of a 2 man party and a 1 man party: 7 [28%] were of 2 men; 4 [16%] were composed of 1 man each; 2 [8%] had a 3 man and 1 man party; 1 [4%] consisted of a 4 man party and a 3 man party; 1 [5%] was a 2 man, 3 man parties; and 1 [5%] was of a 4 man, 2 man parties). On 5 days (8% of the total number of hunting days) there were three hunting parties (2 [40%] consisting of a 2 man party and 2 one man parties; 1 [20%] consisting each of 1 man; 1 [20%] consisting of a 2 man, 4 man, 1 man parties; and 1 [20%] of a 3 man, 2 man and 1 man party).

The computed average number of hunting parties that left camp each hunting day was 1.53. The average number of members of a hunting party was 1.95. Of the 25 unsuccessful days, 14 (56%) days consisted of 1 party, 9 days (36%) were days when 2 parties hunted, and there were three hunting parties on 2 days (12%). The single hunting party was successful on 22 days (54% of the total number of successful hunting days). On two days (5%), only one out of three hunting parties was successful. On 10 days (24%) one out of two parties was successful. On 6 days (15%), both hunting parties were successful.

Table 5. Hunting success rate of Dobe Ju/'hoan in Northwestern Botswana.

Camp No.	Date of Occupancy	#of Day record	#male hunters in camp	No Hunt Days	No Hunt days but Fauna Killed	Hunting days	#of Hunting Parties	#in each Hunting Party	Fauna Killed/ Wounded	#of Parties Successful	#of Individual Successful
1b	12-16 Feb. 1964	5	2	3		1	1	2	2SH(Af)	1	2
						1	1	2	PP(i) 2SH(Af&m) SB(Am)scav-enged	1	2
2	3-11 June 1967	9	2	4		1	1	2	SB(A) Wound GB (Am)	1	2
						1	1	2	Killed Wound-ed GB	1	2
						1	1	2		0	
						1	1	1		0	
						1	1	2		0	
3a	3-11 Feb. 1968	7	4 men 2 sons	1		1	3	2(F&S) 1(F) 1(S)	Wound duiker	1	1
						1	2	2	2duikers	2	4
						1	2	1		0	
						1	1	2	SB	1	2
						1	1	4	PP	1	2
						1	2	4,3	SH	1	2
									PP	1	4
3b	18-19 Mar. 1968	2	3			1	2	2	PP	1	2
						1	2	2	GB Wounded	2	1
4a	19-22 Mar. 1967	4a	2			1	1	2		0	
						1	1	2		0	
						1	1	2		0	
						1	1	1	Wounded F/ adult GB	1	1
4c	6 days in Dec. 1967	6	3 men 2 sons			1	2	3,1	SH	0	
						1	3	1		1	1
						1	2	3,1		0	
						1	2	2	SH		
								1			
						1	3	3	Shared red-crested KH	2	1
								2	SH		1
								1			
						1	2	1,2		0	
4d	27 Jan. 2 Feb. 1967	6		2		1	1	2	Young SB SH	1	2
						1	2	2	F/Adult PP	2	2
								2	F/Adult SH		2
						1	1	2		0	
						1	1	2		0	
4e	12-13 Feb. 1968	2	2			1	1	2	SH	1	1
						1	2	1	2SH	1	1
5	14-15 Feb. 1968	2	2	1	1				HB caught in tree		
						1	2	1	SH M/Adult	2	1
								1	3SH 2F/adult 1M/adult		1
6	20-22 Mar. 1968	3	3			1	1	4	Kill wounded GB	1	4
						1	2	1	Immature F SB	1	1
								2			

Table 5. (continued)

Camp No.	Date of Occupancy	#of Day record	#male hunters in camp	No Hunt Days	No Hunt days but Fauna Killed	Hunting days	#of Hunting Parties	#in each Hunting Party	Fauna Killed/ Wounded	#of Parties Successful	#of Individual Successful
						1	2	1	Wound M Adult GB		1
								2	Wound young Kadu		1
7a	9-13 Mar. 1968	6	3 men 2 sons	1		1	2	2	2SH 1M/adult 1F/immat	1	2
						1	2	2		0	
						1	2	2	SH F/immat.	2	2
								2	3PP		2
						1	2	2	1PP	1	2
								1	F/adult		
						1	2	2,1		0	
7b	24-28 Mar. 1968	5	5 men 2 sons	1		1	1	2	PP	1	1
						1	3	2,2,1		0	
					1	3	1	2	Scavenged Warthog		2
						1	1	1		0	
9	14-15 Mar. 1968	2	3			1	1	3	4PP M/adult F/adult 2 immat.		
						1	1	2	2SH 2F/nursing	1	2
10	15-26 Apr.1968	4	7			1	1	1	Wound GB (M/yng)	1	1
						1	1	7	Kill Wounded GB	1	7
						1	1	1	Wound GB (M/yng)	1	1
						1	1	1	Kill Wounded GB	1	7
11	12-14 Apr. 1968	3	7 men 2 sons			1	1	2	4PP M Adult F Adult 2 young	1	2
						1	2	1		0	
						1	1	1	Wound male GB	1	1
12	4-6 June 1968	3	5			1	2	2	Scavenged SB	1	2
						1	2	1,2		0	
						1	1	3	2PP	1	3
13	30 May- 3 June 1968	5	5	1		1	2	2,3		0	
						1	1	1		0	
						1	1	4	Wound Immature GB	1	1
						1	1	3	Kill GB	1	1
16	25-30 June 1968	6	6 men 2 sons			1	1	1		0	
						1	1	3		0	
						1	1	1		0	
						1	2	4	2 guinea fowl		
								1	1PP	1	3
						1	2	1	PP		1
								2		1	
						1	3	2,4,1		0	

SH=Springhare SB=Steenbok HB=Hornbill GB=Gemsbok PP=Porcupine

Considering the success rate of the single hunting parties, they were successful 61% of the time and unsuccessful 39% of the time. When 2 hunting parties went out, both were successful 24% of the time, 1 was successful 40% of the time, and both were unsuccessful 36% of the time.

There is much that can be surmised about the movements of hunters and gatherers from these data. The yearly cycle of "the Dobe group" was studied according to the time spent away from the main settlement area of Dobe. Therefore, it must be remembered that this information emphasizes camp movements due to hunting trips. The average length of occupancy of these temporary camps is 4.62 days. The average camp population was made up of 7 adults and 7 children. During these trips, small mammals were the most common animal obtained, 68% of the prey being porcupine and springhare.

The total number animals obtained by Ju/'hoansi hunters as recorded by Yellen in 1968 was 84 (see Table 6). Eleven species of fauna were procured, three of which were birds, and one was a tortoise. The largest mammal obtained was a gemsbok; of the five gemsbok obtained, three of these were immature males and one was an immature individual whose sex was undetermined.

One of the questions that arises in the analysis of these data is the effect of seasonality on hunting success rate. Among the Ju/'hoansi, the year is divided into five basic seasons which are identified primarily on the basis of rainfall and temperature. The coldest season (*!gum*) is from May to August; the hot, dry season (*!ga*) is from September to October; the hot season in which the "little rains" fall (*!gabu-!gabu*) is in November and December; the warm season in which the "big rains" occur (*bara*) is from January to March; and the warm season with little or no rain except for an occasional downpour (*//obe*) is in April (Marshall, 1976: 67-71). Ju/'hoansi also take into consideration humidity levels, wind, vegetation changes, and breeding cycles of fauna and insects in their determination of seasonal changes.

In assessing the general seasonal cycle, it is useful to consider the relationships among three variables: season, group size, and the length of time a camp is occupied

Table 6. Fauna obtained by Ju/'hoansi hunters, 1968.

Animal	Female Adult	Male Adult	Adult Sex Unknown	Age and Sex Unknown	Male Immature	Female Immature	Immature Sex Unknown	Total
Aardwolf				1				1
Duiker	1			2				3
Gemsbok		1			3		1	5
Guinea fowl				4				4
Hornbill				2				2
Porcupine	4	2	3	14			7	30
Red-crested Korhaan			1					1
Springhare	7	4		1		2		14
Steenbok		1	1	1		1	1	5
Tortoise				2				2
Warthog				1				1
Total	12	8	5	28	3	4	9	84

(for that part of the year when more than one option is available). Analyses of the data on season, group size, and length of occupation reveal that there are positive correlations between the number of occupants and season, and between the number of occupants and the length of occupation. There is no correlation, however, between length of occupation and season (Yellen, 1974: 77-80).

Seasonality is shown to be an independent variable, thus group size is dependent on it, increasing as the rainy season gives way to winter. It is suggested that the length of occupation is dependent on the number of people and one possible reason for this may be considered. Food resources are fairly abundant during the time covered by this study. Camp shifts may therefore reflect changes in food preference, the availability of new vegetable resources, or new knowledge about the location of wide ranging and constantly moving large game. Other factors influencing larger settlements include congregating around water sources during the dry season. As the Ju/'hoansi note, people choose to move when they feel that they have used up too many of the local resources such as fuel wood.

One definite seasonal change is the decreasing availability of water. This suggests that group size will increase since the number of people remain constant and the number of alternate places in which to camp decreases. The positive correlation between group size and length of occupation may be due to the fact that as group size increases, so does the variety in the diet. This is because the large the group, the greater number of people engaging in hunting and gathering activities, which have a higher risk and lower chance of success.

In general, with more hunters there is a greater chance of supplementing the diet with meat. The larger the group size, the greater the opportunity there is to obtain a variety of both plant and animal foods. As Wilmsen (1973: 24) notes, "Hunters of gregarious animals (especially ungulates with wide seasonal ranges), although primarily affiliated with households units, operate most effectively in larger units and play an integrating role among associated households." Bands may, therefore, be seen as sets of ecologically linked role positions necessary for an effective multiple resource strategy.

A conclusion that can be drawn from these results is that there is a positive correlation between group size and hunting success rates. In general, the larger the group size, the greater number of people engaging in hunting and gathering activities. Ju/'hoansi hunters, therefore, operate most effectively in larger units and thus hunters play an important role in integrating larger social units or bands. As the Ju/'hoansi note, the greater number of hunters there are in a local group, the greater the chance there is of getting meat. This finding corresponds to the Ju/'hoansi perception that as group size increases, so does the variety in the diet.

From the observations of the Dobe group, it is possible to propose a Ju/'hoansi hunting model based on the seasonal cycle of subsistence foraging. This model is one of 2-3 nuclear families related by a core sibling group, which usually consisted of 2 or 3 good hunters. When group sizes were larger, there was greater chance of obtaining meat. Land use patterns were such that aggregation of Ju/'hoansi groups occurred during the dry season, when they settled close to pans containing water. Both hunting and gathering was done on a fairly regular basis. With the onset of the rainy season, the groups dispersed, moving out in small family groups to temporary

camps. Hunting success rates were not as great in the dispersed camp situations.

One of the changes that has occurred among Ju/'hoansi over time has been a breakdown in the size of groups. Whereas in the past the Ju/'hoansi resided in bands for at least part of the year, today most Ju/'hoansi groups live in nuclear families. This change in group structure has affected the viability of hunting, reducing the number of hunters available for cooperative endeavors. There has also been a change in the distribution of bands in the northern Kalahari landscape; this has resulted in part from the penetration of in-migrating cattle owners and from the establishment of water points and social services at specific localities where people have settled.

ACCESS, CONTOROL AND USE OF RESOURCES AMONG JU/'HOANSI

At the time of Yellen's original study in 1968, the Ju/'hoansi had customary rights to use land and other resources. Access to these resources were controlled by social groups (bands) which oversaw blocs of land (*n!oresi*) averaging between 300 and 600 km^2. The Dobe region thus was not an open access area. Rather, it was divided into tracts, each of which was occupied by a group whose core members had long-standing rights there. Land rights are inherited, although individuals could get access rights through various relatives and in-laws.

The focal points of the land use systems of the Ju/'hoansi were pans (Yellen, 1974, 1977; Lee, 1979). The territories generally consisted of one or more water points and a mixture of plant resource and game areas. Bands moved around in these areas, depending on the availability of water, food, and the distribution of other groups. Individuals were able to obtain access to other groups' areas through seeking permission from the areas "owners" (*n!ore kxausi*). Ju/'hoansi talk about who has rights in certain areas and refer to these areas as being "owned." At the same time, they stress that land and resource rights are flexible, something that is crucial in a highly unpredictable environment such as the northern Kalahari.

In the 1960s, individuals were allowed to hunt without licenses as long as they were considered "traditional" (i.e. subsistence hunters using weapons like bows, arrows, spears, and clubs). Since the late 1970s, however, people who wished to hunt had to obtain a Special Game License (SGL) under Botswana's Unified Hunting Regulations (Republic of Botswana, 1979). This restriction has reduced the number of people who have the right to hunt in the Dobe-/Xai/Xai area (Hitchcock et al., 1995).

When Yellen undertook his investigations with the Dobe group in 1968, the Dobe Ju/'hoansi were heavily dependent on hunted and gathered resources. There are indications that this situation has changed considerably since the late 1960s. Subsistence hunting and gathering has become more difficult, in part because of overgrazing of the area by livestock and the reduction of wildlife due to habitat changes and hunting pressure. Population sizes have expanded, and there are more firearms, horses, and vehicles in the area, which have tended to increase hunting efficiency. Wage employment opportunities have also expanded, and many young adults prefer earning cash to learning and utilizing foraging techniques. The long-

term viability of hunting and gathering as a strategy, therefore, has declined.

In 1965 a fence was built along the unguarded international border of Botswana and Namibia. Many Ju/'hoansi worked for the government in building that fence. This fence limited access to the western hunting area in Namibia and served to limit game movement. Ju/'hoansi were allowed to cross the fence legally, but in the 1970s the frequency of police and military police patrols increased, and as a result people felt uncomfortable foraging on the Namibian side of the border.

Changes in the degree to which Ju/'hoansi participate in foraging and food production can be seen in the Dobe area. During a high rainfall period of 1967 to 1970 many Ju/'hoansi planted and harvested crops of maize, sorghum, and melons. But they returned to hunting and gathering in the dry years of 1972-73 (Wiessner, 1977). By the mid-1970s, hunting and gathering was on the decline again as people moved more and more into pastoralism, agriculture, and wage labor (Gelburd, 1978).

The relationships between the local Ju/'hoansi groups and other people (e.g. Mbanderu and Batawana) in the region are significant, especially from the standpoint of affecting the viability of foraging and other subsistence strategies. There are cases where Ju/'hoansi were given rifles by other people in order to hunt for them. In exchange for the use of the rifle, the hunter had to give the owner of the weapon most of the meat from the animals obtained. There were also situations in which Ju/'hoansi were hired to work as herders or domestic servants, thus taking them out of the foraging labor force.

The extent to which the Ju/'hoansi have the opportunity to participate in the making of operational rules regarding land and resource management was limited. In the 1960s and 1970s, there were no Ju/'hoansi or any other Bushmen in the North West District Council, nor were there any Ju/'hoansi headmen recognized as having regional or local authority by the Batawana tribe, the dominant group in the district in which Dobe and /Xai/Xai lie. The local development institutions in western Ngamiland communities had few Ju/'hoansi representatives and those that participate usually chose to avoid speaking up in the meetings, in part because they did not feel comfortable speaking on behalf of their kin and friends. Land use plans devised by the government and the district council had only limited inputs from local people.

CHANGES OVER TIME IN JU/'HOANSI WILDLIFE UTILIZATION

In order to assess changes in wildlife offtake rates over time in the western Ngamiland region, we looked at information recorded by the various researchers who worked in the area. Lee (1965, 1968, 1969, 1979: 254-269) reported on a 28-day study of a group engaged in subsistence hunting at Dobe north of /Xai/Xai. The study was carried out during July-August, 1964. The range in size of the Dobe group in this period was from 23 to 40, with an average camp site of 30.9. The number of work days per week of adults ranged from 1.2 to 3.2 (Lee, 1969: 83-87, 1979: 256-259). This low work effort contributed to the notion that hunter-gatherers were the "original affluent society" (Lee & DeVore, 1968). One of Lee's findings was that men expended greater work effort than women (Lee, 1979: 261-262). It must be kept in mind, however, that women's work provided the bulk of the food, most of

which consisted of wild vegetable products (Lee, 1968, 1969, 1979: 261-262).

According to Lee's data, a total of 18 animals yielding 206 kg of meat were killed by the hunters in the Dobe camp during the study period (Lee, 1979: 265-269, Tables 9.6 and 9.7). Gifts of meat from the outside provided an additional 16 kg of meat, for a total supply of 222 kg. Meat from outside sources comprised only 7 % of the total. Based on Lee's calculations of 866 person-days of consumption in the Dobe camp, the average amount of meat consumed per person was 256 g (9.1 ounces) per day (Lee, 1979: 265-266).

Judging from Lee's information, 7 men did a total of 78 person-days of hunting in the July-August, 1964 study period. Hunting success rates for the Dobe group, calculated as the percentage of days on which animals were killed, varied from 0 to 38 % (Lee, 1979: 267). The average success rate was 23 %. What this means is that one kill was made for every four person-days of hunting. Hunting returns varied significantly from one person to another, a factor which is explained in part by hunting skill. It is interesting to note that none of the animals obtained by these hunters were killed with bows and arrows. Instead, the animals were killed with clubs, captured in snares, or killed with the aid of dogs.

Patricia Draper (1972, 1973, n.d.) collected data on work effort by Ju/'hoansi over a ten month period in 1969 at /Du/Da, south of /Xai/Xai in NG 4. There were 1,207 person days of observation. The total number of individuals at /Du/Da was 87. During this time hunters at /Du/Da killed 6 gemsbok, 3 eland, 3 duiker, and 2 porcupines. Men worked two-three times as much as women, in part because of the lack of mongongo nuts in the area (Draper n.d.: 5). Hunting parties were larger in size than at Dobe, with three to seven men going out on long-distance expedition hunts that lasted several days. Seasonal fluctuations in work effort were seen at /Du/Da, with low work effort for both adult males and females in the dry season (June and July).

If we take the mean of the offtake rates reported by Lee (1965, 1968, 1969, 1979) and those of Yellen (1974, 1977), it is possible to estimate that the Ju/'hoansi killed approximately 28 gemsbok, 77 steenbok, 19 duiker, and 33 warthogs per annum in the 1960s. The animals taken by the hunters represent approximately 8,900 kilograms live weight. Calculations of total wildlife biomass in the Dobe-/Xai/Xai area in the 1960s was estimated to be approximately 1,300.000 kg (Wolfgang von Richter, D. Martin Fleming, personal communications) and for these particular species it was 260.000 kg. Therefore, the Ju/'hoansi were harvesting approximately 3.4% of the total biomass annually. As evolutionary ecologist Kim Hill (personal communication) points out, this harvest rate is considerably lower than that necessary to stop the growth of wildlife populations in the region. One can conclude that the Ju/'hoansi harvest rates in the 1960s were not having a negative effect on the wildlife populations.

An interesting aspect of Yellen's subsistence work data is that while 61% of person days were spent hunting, 11% of the time of individuals was spent in honey extraction, and 7% in gathering wild plant resources (Yellen, 1977, Appendix B). Ju/'hoansi men devoted 79% of their days to subsistence work, that work done to obtain the resources to sustain a group. This figure is roughly comparable to that of other hunter-gatherers, including the G/wi and G//ana of the central Kalahari Game

Reserve (Tanaka, 1980: 77) and the Ache of Paraguay (Hill et al., 1985: 39-43).

One of the responses to resource depletion is to increase time and energy expenditure. According to some Ju/'hoansi, people do increase the amount of work in hunting when resources are depleted. One way that they do this is to go on long-distance expedition hunts in groups, usually with donkeys. As noted above, according to Yellen's (1974, 1977) data, there was a positive correlation between group size and hunting success rates. Judging from the data on hunting returns, Ju/'hoansi hunters tend to operate more effectively in larger units. It is to the advantage of the Ju/'hoansi, therefore, to engage in cooperative hunting.

Sometimes people at Dobe and /Xai/Xai opted not to expand their labor time. Instead, some individuals simply withdrew from the labor force, stopping hunting completely. An argument for why they do this was given by one informant who said that when they cease hunting, it shifts responsibility to other people. This has the advantage of allowing others to be the providers, a strategy which aims to ensure that amicable reciprocal relationships are maintained.

Data on hunting returns were obtained by Wilmsen at /Xai/Xai (1989: 225-235; Wilmsen & Durham, 1988) for the periods 1973-74, 1975-76, and 1979-1980. Wilmsen's data indicate that Ju/'hoansi households exploited at least 15 species of mammals, 9 species of birds, and 5 species of reptiles and amphibians (Wilmsen 1989: 230, Table 6.4; Wilmsen & Durham, 1988: 75-77, Tables 4.7 and 4.8). Foragers obtained an average of 8.2 kg of meat per month per person, but the returns varied significantly by season (Wilmsen & Durham, 1988: 74-81, Figure 4.4 and Table 4.11). The methods used to procure these animals included snaring, running them down, bows and arrows, spear hunting with dogs on foot, horse-mounted spear hunting, clubbing animals with a stick or throwing rocks, hooking them in a burrow, picking them up, or capturing them by hand.

For smaller antelope species such as steenbok and duiker and for birds, snares were an efficient and productive procurement method. Hunting animals from horseback with spears was another productive method, especially for eland, gemsbok, and giraffe. There was variation over time in the degree to which people depended on wild meat, with the 1979-80 period having a much lower degree of dependence due to a combination of the availability of government food aid, cash-for-work programs, and contributions from other households (Wilmsen, 1989: 232).

An assessment of traditional and modern subsistence strategies and material culture was conducted by Gelburd (1978) in 1976. Of 11 Ju/'hoansi men interviewed, only four had killed any animals, and the total number of animals they obtained was 9. It is interesting to note that these same four men were also practicing agriculture, kept livestock, and were engaged in wage employment at the time that they were interviewed (Gelburd, 1978: 106). Some of the other men in the sample said that they had not engaged in hunting because they were working for anthropologists (Gelburd, 1978).

Another set of data on hunting returns among Ju/'hoansi was obtained by Crowell and Hitchcock in 1976 (Crowell & Hitchcock, 1978). This data set was specifically on ambush hunting, the technique of waiting in concealment near places frequented by game, such as pans, river pools, game trails, or salt licks, until prey is near and then dispatching it. Several Ju/'hoansi hunters were interviewed about the ambush

hunting practices, and information was recorded on the places where this was done, the numbers of nights when ambush hunting was carried out, the characteristics and numbers of animals obtained, and the rates at which people were successful or unsuccessful in their hunts. The data on meat obtained through ambush hunting in the Dobe-/Xai/Xai region are presented in Table 7.

Table 7. Meat obtained through ambush hunting by Ju/'hoansi, Dobe-/Xai/Xai region.

Informant	Location	Nights with Data	Man-Nights with Data	Animals Obtained	Animal Weight (KG)	Estimated Usable Meat per Animal	Estimated Usable Meat Obtained	Number of Man Nights Meat Obtained
Do-1	!Gausha Pan	4	13	2 FA roan	118.38	65.11	130.22	12
				1 MI roan	63.5	34.92	34.92	
	!Gausha-ma Pan	6	9	1 MA kudu	117.02	64.36	64.36	2
Ku-1	Gui/o (salt lick)	3	6	1 FA Kudu	77.57	42.66	42.66	2
	/Gi Pan	2	11	3 FA duiker	9.36	5.15	15.45	11
				1 MA duiker	8.46	4.65	4.65	
				2 ? duiker	8.91	4.9	9.8	
				1 MA kudu	117.02	64.36	64.36	
Do-2	/Xai/Xai	1	5	0	0	0	0	0
	!Xabi Pan	1	2	1 FA kudu	77.57	42.66	42.66	2
				1 FA duiker	9.36	5.15	5.15	
Do-3	/Gi Pan	1	3	0	0	0	0	0
Totals		18	49	14 animals	616.15	333.92	414.23	29

Note: Table drawn from Crowell and Hitchcock (1978: 47, Table 2a).
* Mean kg of meat per man-night of hunting = 616.15/49 man-nights = 12.57.

At the various pans in the Dobe-/Xai/Xai area where ambush hunting was done, the species most often killed was duiker, usually female ones. All of the animals that came within range of a blind at /Gi were shot at, except for a hyaena which informant Do-3 ignored because he considered it inedible. The near absence of immature animals killed in this sample (one out of fourteen) probably resulted from lack of opportunity and not deliberate selection.

By dividing the total number of man-nights in the sample when at least one member of a hunting party killed and recovered an animal ("Number of Man-nights Meat Obtained") by the total number of man-nights with data for each sample, a hunting success rate of 0.59 (29/49) was derived. It should be noted that this measure of hunting success assumes that all meat obtained is shared communally among the members of an ambush hunting party, and that one hunter's success is counted as a success for the group as a whole. This is not always literally true, but it is expedient to work with this figure rather than with success rates for each individual hunter. As far as the appearance of animals at the ambush sites were concerned, there were only three nights in the ambush hunting sample. The longer ranges from which Ju/'hoansi hunters had to shoot at their game was due to the open nature of the pan margins at pans like /Gi and !Gausha, and the large number of game trails radiating

out in all directions from the water, leading to greater difficulty in predicting where game would appear from the bush.

Bows and poison-tipped arrows represented the primary weapon employed in ambush hunting, although spears were kept in the blinds for killing wounded game and for protection from possible attacks by lions and hyaenas. Several animals might be wounded with arrows during the night, and all of them would be tracked the next morning, with the hope that the poison would have taken effect overnight and killed or severely handicapped the wounded animals. The problem was that recovery was by no means certain, primarily because predators or scavengers often beat the hunters to the prey.

The recovery rate for the ambush hunting activities was 88% and the mean number of man-days spent tracking wounded animals was 1.5. We suspect that this figure is high. The average recovery rate for animals shot with poisoned arrows by the Ju/'hoansi is closer to 50% due to the frequency with which predators and scavengers reach the animal before those trailing it do and the numbers of times that the animal evades its pursuers.

The quantitative importance of ambush hunting as a strategy of Ju/'hoansi subsistence hunters, in terms of its contribution to the diet, is difficult to reconstruct from interview data. It is possible to say, however, that the inputs of meat from ambush hunting were much less significant than those obtained through pursuit hunting on foot. A factor which might have contributed to a lower overall productivity of ambush hunting in the Dobe-/Xai/Xai area was the number of water points that exist in the region. Kudu, which do not require drinking water to survive and become very wary under hunting pressure, might easily avoid a pan where one of their number had been killed, thus reducing ambush hunting productivity at that location.

Although ambush hunting was practiced by a limited number of people and thus was relatively unimportant in terms of its contribution to subsistence, it did have the advantage of providing an alternative method of obtaining meat in the dry season. It was significant because it was done in the period when plant resources were minimal in abundance and mobile hunting was difficult because of the paucity of surface water supplies.

The exploitation of wildlife by local people in Botswana, including Ju/'hoansi, varies. This is due to factors such as the availability of various kinds of weapons, numbers and experience of hunters, individual preferences on the part of hunters, and the existence of alternative sources of food and income. It is also due in part to the fact that different wildlife rules apply in the various rural areas of Botswana, depending on the Regional Wildlife Office personnel who work in them and how they interpret the fauna conservation laws (Hitchcock et al., 1995).

An example of the variable application of the wildlife laws can be seen in the case of ambush hunting. Ambush hunting at night had been declared unlawful in Botswana in 1940 (Spinage, 1991: 16), but there are no indications that Dobe Ju/'hoansi were arrested for using this strategy. In the case of the Nata River region, however, Tyua ambush hunters had been arrested for carrying out this practice (Hitchcock, 1995). This occurred, according to the Tyua, because there were two game scout camps on the Nata River, one at Modala and the other at Sepako, so the wildlife officials were able to cover the area relatively efficiently and listen for gun

shots at night. One of the reasons given by Ju/'hoansi for their use of ambush hunting in spite of the investment involved in construction of hunting blinds was that relatively few game scouts in the Dobe /Xai/Xai area chose to monitor wildlife usage after dark.

Examination of the data on hunting by Ju/'hoansi in the 1960s through 1980 reveals that changes occurred both in the strategies employed and in success rates. One change that occurred was in the use of hunting aids, specifically horses and donkeys (Hitchcock & Bleed, 1994; Wilmsen, 1989: 230-231; Wilmsen & Durham, 1988: 80). The use of horses and donkeys enabled local hunters to expand their coverage of areas and thus increase encounter rates of potential prey. Hunting on horseback was the most efficient method available to Ju/'hoansi in the 1970s (Wilmsen & Durham, 1988: 80). According to some of our informants, hunting from horseback is especially effective in getting eland (*Taurotragus oryx*) and other large antelopes. In the 1980s and 1990s mounted spear hunting was the preferred method for young men who had been able to gain access to horses either through purchase or loan. Informants noted that young males were being trained to ride horses and hunt from them rather than being taught how to conduct long stalks on foot using bows and arrows (Hitchcock & Bleed, 1994).

Another common faunal procurement strategy was spear hunting on foot with the aid of dogs. Dogs facilitate spear hunting both by finding the game and by chasing animals down and cornering them. Dogs were also effective, according to informants, in the hunting of gemsbok (*Oryx gazella*), since they would stop and fight back against the dogs, giving hunters the opportunity to move in and dispatch them with spears. Hunters often take dogs with them on long-distance expedition hunts, and the meat from these hunts is carried back to the villages on donkeys. In the case of the Ju/'hoansi studied by Lee in the Dobe-/Xai/Xai area in 1963-65, the large numbers of warthogs (*Phachochoerus aethiopicus*) and duikers (*Sylvicapra grimmia*) killed were a result of the existence of a well-trained pack of dogs (Lee, 1979: 143-144).

One of the differences between spear and bow and arrow hunting noted by our informants was that spear hunting was an effective method throughout the year, whereas bow and arrow hunting was more restricted in time. Poison arrows were used only during certain times of the year, mainly during the wet season. Informants pointed out that bow and arrow hunters had particular problems in the late dry season when poison supplies were exhausted and toxicity levels were reduced. It was during the late dry season that bow and arrow hunters had to resort to alternative strategies, including snaring, scavenging, and running animals down on foot (Hitchcock & Bleed, 1994).

Bow and arrow hunting is on the decline in many areas of the Kalahari, including the Dobe-/Du/Da area and the Central Kalahari Game Reserve, the two main areas where bow and arrow hunting is still done in Botswana (Tanaka et al., 1984: 18; Hitchcock & Bleed, 1994; Hitchcock et al., 1995). According to the Ju/'hoansi with whom we spoke, bow and arrow hunting has several drawbacks: First, it requires training and experience to be good at it. Second, it requires a knowledge of plants and insects as well as prey animals. Third, it is seen by some as being a less efficient means of getting meat since it often requires extensive inputs of labor in following up wounded animals, and even this labor expenditure does not guarantee prey recov-

ery.

Spear hunting appears to be somewhat more productive than bow and arrow hunting both in the case of ambush hunting and pursuit hunting on foot (Crowell & Hitchcock, 1978; Hitchcock & Bleed, 1994). Tanaka (1980: 68, Table 1) estimated that the total annual amount of meat obtained by bow and arrow hunting in the !Xade area of the Central Kalahari Game Reserve was 5,605 kg of meat per annum for a group of 50 people. The amount of meat obtained through mounted spear hunting recorded by Osaki (1984: 22-23) in the same area was 23,500 kg per annum, which averages out to 5,664 kilograms per annum for a group of 50 people.

Another trend in subsistence hunting in Botswana is an increase in the use of guns. Ironically, the shift toward gun hunting has reportedly led to a reduction in the availability of meat for local people, in part, it is argued, because the individuals who own the guns do not allow the hunters who they allow to use them to keep much of the meat that they obtain. This situation was seen in western Ngamiland in the late 1960s by Lee, who observed:

> When the !Kung men hunted with borrowed guns, the kill belonged to the gun's Herero or Tswana owner, not to the hunter. Therefore, even though hunting with guns was more efficient than hunting with bow and arrow, only a small proportion of the meat so killed found its way into the !Kung subsistence economy (Lee, 1979: 405).

Agreements were usually made between gun owners and individuals who wished to use the weapon as to how much meat the hunter would get from the animal that was killed and how much was supposed to go to the gun owner. In some cases, people would shoot two animals and give one of them to the gun owner. In other cases, the hunter would get half of the meat. It is interesting to note that Parry (1989:81) found rifle ownership in the Chobe Enclave and Mababe areas of north-central Botswana to be "significantly related" to lower consumption of wild meat. One possible reason for this situation is that people who are better-off economically tend to consume foods that are grown or purchased on the market.

It was not uncommon for there to be long-standing social and economic relationships between gun-owners and gun-users in which it was to the advantage of both parties to treat the other party fairly. There were, in fact, some instances in which individuals who used someone else's gun were left with little or nothing for their efforts, but these were uncommon (Hitchcock et al., 1995). Where this occurred, it was usually in situations where a non-local gun owner showed up in a community and asked someone he did not know to hunt for him.

There are some drawbacks to the use of guns. The expansion of gun hunting in rural Botswana reportedly has led to increases in the flight distances of prey animals, thus making them less accessible to bow and arrow and spear hunters. As a result, people are having to change their hunting strategies. Hunters are now having to spend more time looking for game, and they have to go farther and carry more equipment, including water and camping goods, on long-distance expedition hunts.

It is interesting to note that the Nyae Nyae Farmers Cooperative in Namibia (NNFC), located in the Eastern Otjozondjupa area just across from /Xai/Xai, has considered recommendations by some local people that hunting with guns and dogs

be allowed there (Hitchcock, 1992). After lengthy deliberations, the NNFC decided to turn down this request. As one member put it, "Bows and arrows are the tools we Ju/'hoansi have always used. If we let people use guns, they will destroy the rest of our game." Another person suggested that people be allowed to use guns as long as there were strict controls on where they were used and how many animals could be taken. The places where people were most in favor of using guns were the ones which had the lowest wildlife densities (e.g. Tjum!kui). The same correlation can be seen in Botswana, with gun hunting requested by people residing in remote area settlements with high population densities (Hitchcock et al., 1995). As of mid-1996, however, neither the Botswana or the Namibian government had passed legislation allowing subsistence hunters to use guns in hunting.

A problem facing the Ju/'hoansi in northwestern Botswana was that the wildlife laws in Namibia were somewhat different from those in Botswana (for a comparison of hunting activities and rights between Namibia and Botswana, see Table 8). In Namibia,for example, people are not allowed to hunt on horseback, whereas they are allowed to do so in Botswana. In Botswana, people must carry valid Special Game Licenses (SGLs) when they hunt, something that is not required in Namibia. In Namibia, only Ju/'hoansi are allowed to hunt in the Eastern Otjozondjupa region (Hitchcock, 1992), whereas in Botswana Remote Area Dwellers who are not Ju/'hoansi can hunt if they qualify for a Special Game License (Hitchcock et al.,

Table 8. Comparison of hunting activities and rights between Namibia and Botswana.

Namibia	Botswana
Area part of Eastern Otjozondjupa Region administered from Rundu	Area part of Community-Controlled Hunting Area (CCHA) 4 in North West District in Planning Zone 6 (Remote Zone) administered by NW District Council
Wildlife overseen by Ministry of Environment and Tourism	Wildlife overseen by Department of Wildlife and National Parks
Only Ju/'hoansi have right to hunt	Remote Area Dwellers (RADs) with Special Game Licenses can hunt
Do not have to carry a hunting license	Must carry a valid Special Game License (SGL)
Use of traditional weapons only	Use of traditional and modern weapons allowed
Can use traditional snares	No snares or traps allowed
Cannot use dogs to assist in hunting	Can use dogs to assist in hunting
No mounted hunting (horses, donkeys)	Mounted hunting is allowed (horses, donkeys)
Use of bows and arrows with poison	Use of spears, bows, occasional guns
Ambush hunting allowed	Ambush hunting not allowed
Limits on types of animals to be hunted	Limits on types of animals allowed to be hunted
No quota	Quota on number of animals to be taken (1996)
No safari hunting or citizen hunting other than Ju/'hoansi	Community controlled hunting area-may allow safari and citizen hunting
No shooting of predators	Shooting of some predators allowed
Resource management by Nyae Nyae Farmers Cooperative and local N!ore Kxaosi	No resource management committee or institution at present but N!ore Kxaosi play a role

1995). These wildlife policy differences made it problematic for Ju/'hoansi to work out which strategies they should use where. Their existence argues for greater efforts to be made by the Ministry of Environment and Tourism in Namibia and the Ministry of Commerce and Industry in Botswana to clarify the hunting regulations for people on each side of the border.

JU/'HOANSI HUNTING IN THE 1990S

Ju/'hoansi in the 1990s are having to cope with a whole series of changes in the ecology and political economy of the northern Kalahari. There has been a reduction in the numbers of animals and range of species present. Game animals are not found around local communities as often as they were in the past, and those animals that do exist in these areas tend to be relatively shy and are not as easy to hunt. Aerial wildlife census data on western Ngamiland reveal lower numbers of animals of most species than was the case in the 1970s (DHV Consulting Engineers, 1980; Research Division, Department of Wildlife and National Parks, 1995). Yet in spite of lower wildlife numbers, the exploitation of wild animals continues to represent a significant means of obtaining food, materials, and items for sale among the people of western Ngamiland.

The community of /Xai/Xai in the northern Kalahari was selected for investigation in 1994 because it had been identified by the Department of Wildlife and National Parks and the North West District Council as a potential community-based natural resource management (CBNRM) project site (Hitchcock et al., 1995). In addition, detailed data had been obtained on /Xai/Xai foraging, food production, and other economic activities in the 1970s (Wilmsen, 1976a, b, 1989; Wilmsen & Durham, 1988; Wiessner, 1977). Baseline household data had been collected in 1994 in /Xai/Xai by two Dutch development workers as part of a community-based natural resource management project (for a description of these efforts, see SNV Botswana, 1994).

/Xai/Xai is a village in which 90% of the households hunted at least some of the time in the recent past. It was also an intriguing case because it was made up not only of households engaged in subsistence hunting, but also ones doing herding, agriculture, and wage labor. The government of Botswana, through the Remote Area Development Program in the Ministry of Local Government, Lands, and Housing, had designated /Xai/Xai as a Remote Area Dweller (RAD) settlement in the 1970s, and a school, health post, nurses and teachers quarters, a kgotla (public meeting place), and other facilities were constructed there (Hitchcock, 1996).

The population of /Xai/Xai in 1995 was 368 persons, up from 117 in 1964 (Lee, 1979: 54, Table 3.8), 142 in 1973 (Biesele, et al, 1989: 119, Table 2), and 154 in April, 1976 (Wilmsen, 1976b: 31, Table 2). The breakdown of the population of /Xai/Xai was 321 Ju/'hoansi in 24 households, 47 Mbanderu in 4 households, and 20 "immigrants." Immigrants are defined as those people who had come in to work at the school, health post, and other District Council and Remote Area Development Program (RADP) facilities.

In the 1980s, because of drought in the northwestern Kalahari, food relief opera-

tions were initiated by the government of Botswana. Maize meal, oil, and other goods were provided to families in the /Xai/Xai region. There were also cash-for-work programs in which people were paid to work on projects such as road-building and clearing of fields. By the latter part of the 1980s, the people of /Xai/Xai were fairly heavily dependent on the food and cash provided under the drought relief programs, so much so, we were told, that they preferred not to plant crops even though they were given seeds by the Remote Area Development Officer (RADO) and the Ministry of Agriculture.

Subsistence hunting and gathering, which many people continued to engage in, has become more difficult in the /Xai/Xai area, according to informants, because of changes in the local environment. These changes are due, it was said, to overgrazing of the local area by livestock, the building of fences which have restricted game movements, and drought. Some people admit that wildlife changes may be due to population growth and technological change, including greater numbers of horses, firearms, and vehicles in the community. Wage employment opportunities have also risen. Many young adults prefer earning cash to learning and utilizing foraging techniques.

Over the past twenty years, dryland agriculture has become more significant as a source of subsistence for some of the people in the /Xai/Xai region. Crop production of nearly all /Xai/Xai households had variable degrees of success. In 1994 local people planted maize, millet, beans, melons, and other crops, but many of them had insufficient seed to ensure substantial yields. The most successful fields were those owned by Mbanderu in the valley close to the /Xai/Xai Pan. The fields in the sandy areas away from the pan, most of which belonged to Ju/'hoansi, tended to have much greater degrees of crop failure. These fields, which in many cases were not fenced, were also the scene of fairly severe livestock damage, something that affected yields and as a result caused social tensions between stock-owners and farmers.

Some /Xai/Xai residents have applied for arable land to the Sub-Land Board and have been granted it. Access to grazing land and water points, however, has proven to be more problematic. When the /Xai/Xai Ju/'hoansi attempted to register their wells in the pan with the Tawana Land Board in the 1970s, they were told that such an action was not legal. Thus, they were able to prevent encroachment of outside groups seeking to establish rights in the /Xai/Xai area.

As Wilmsen (1976b) notes, current land divisions around /Xai/Xai reflect very old spatial patterns. Each group that came in to /Xai/Xai was accommodated on the side of the pan corresponding to its area of origin. In the 1970s, camp locations conformed to land use divisions in such a way that each camp lay at the apex of its territorial segment in what Wilmsen (1976b) termed the /Xai/Xai pie.

One of the assumptions often made about traditional land management systems is that they are relatively simple in both structure and function. Clearly the /Xai/Xai example shows that this is not the case. Tswana land management systems included a major village surrounded by agricultural (lands) areas, grazing areas, and, beyond that, hunting areas. The grazing areas were subdivided into areas allocated to tribal sections or other groups of people, some of whom were *bafaladi* (literally, "foreigners," people not of Tawana origin). Permission to use the resources in these districts

had to be granted by the overseer. Grazing by some of the Mbanderu residing in /Xai/Xai was done in areas north and east of /Xai/Xai in the area now designated as the NG 3 Wildlife Management Area (SNV Botswana. 1994: 8; Ngamiland District Land Use Planning Unit. *et al.* 1994). Wildlife Management Areas (WMAs) are areas within Botswana that have been zoned for wildlife utilization purposes (Republic of Botswana, 1986: 2-3).

At /Xai/Xai today. there are three major areas used by local groups of Ju/'hoansi: (1) the area stretching north of the pan at /Xai/Xai which includes the Aha Hills. (2) the /Gwihaba Caves area to the east of /Xai/Xai. which includes several sets of hills and the land surrounding them. and (3) the area south of /Xai/Xai stretching down to /Du/Da. Some kin groups at /Xai/Xai have rights to land on the Namibian side of the border. as well. but these areas are not used as actively as they were in the past. The current foraging areas of Ju/'hoansi residents are thus arranged in flower-petal like fashion around the north. east. and south side of /Xai/Xai Pan.

The landscape around /Xai/Xai is divided into tracts which comprise the basic subsistence and residential areas of the local kin groups. These areas. which some anthropologists have called "territories," contain a number of different kinds of resources which are necessary to sustain a group. Numerous researchers have mentioned the importance of territoriality in the northern Kalahari (Marshall, 1976: 71-79, 184-195: Wiessner. 1977: 48-59; Lee, 1979: 58-61, 334-339; Wilmsen. 1989: 51; Barnard, 1992: 223-236). Each of these territories, which the Ju/'hoansi at /Xai/Xai call *n!oresi* (sing. *n!ore*), was a named area that was elliptical or roughly circular in shape. Their boundaries were defined on the basis of variations in the landscape and vegetation, and even though generally unmarked, people were aware of where they began and ended.

It is important to note that there are variations in the types of Ju/'hoan territorial units, and that these *n!oresi* were internally differentiated. Figure 3 shows the traditional Ju/'hoan land use system. The internal variations can be seen in this figure.

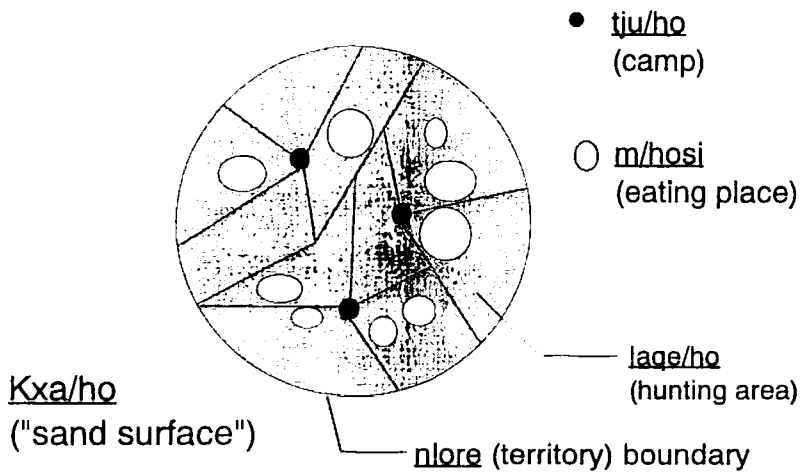

Fig. 3. Ju/'hoansi land use system.

with some areas devoted to hunting, others to gathering, and still others to residence. According to Ju/'hoansi informants, some *n!oresi* are considered residential while others are used only for hunting and gathering. Each residential *n!ore* has one or more "eating places" (*'m/hosi*), which may or may not be shared with contiguous *n!oresi*. A residential *n!ore* also has an associated "hunting place" (*!aqe/ho*) or direction of usual hunting. These hunting areas are sometimes shared with nearby residential *n!oresi*. What this means, in effect, is that Ju/'hoan territories are by no means simple communally managed areas held in the name of groups residing within them (Biesele et al., 1992).

Territoriality had several functions, according to /Xai/Xai informants. First, it served to define who had access to resources and who did not. Second, territoriality spaced people out in such a way that there were theoretically fewer conflicts over resources. Third, given that the landscape was divided into specific parcels where people resided for extended periods of time, it was likely that detailed environmental knowledge would be gained from long-term use and monitoring activities. Fourth, territories served a kind of communication function, providing people with information as to the whereabouts of other groups. Finally, one of the useful features of territories was that they allowed groups to conserve their resources, providing them with a means to adjust the numbers of users to the numbers and densities of plants, animals, and other items.

Major changes occurred in the /Xai/Xai region as a result of the parcelling out of land by the Batawana paramount chief to tribal members. The people who were granted the land had the right to oversee that area, to extract resources, and to exploit the labor of the people living there. A Motawana named Mhapa was granted rights over the area to the west of the Okavango Delta and south of the Aha Hills (Lee, 1979: 78-79). The Batawana overseer, who was called a *modisa*, was a kind of district governor who was supposed to ensure the proper management of the natural and human resources in his area and to pass important information along to the paramount chief (Schapera, 1943; Hitchcock, 1980). Like the chief, this overseer had the right to collect tribute, which included ivory, ostrich feathers, skins, and meat of wild animals. Some of this tribute he kept for himself, while a portion of it went to the paramount chief, particularly the skins of lions and the tusk of an elephant lowest to the ground (Alec Campbell, personal communication).

According to informants, the *modisa* of the /Xai/Xai area subdivided the region into grazing districts (*dinaga*) which were allocated to subclans and extended families. The Batawana group that had grazing rights in the /Xai/Xai area granted concessions to Mbanderu with whom they had *mafisa* (long-term livestock loan) relations (Wilmsen, 1976b). Each *naga*, or sometimes several *dinaga*, had an overseer whose job it was to ensure the proper use of the area. The *modisa* was supposed to see to it that wells and their associated cattle posts were not too close to one another. Theoretically, this overseer had the right to order people who had too many cattle in one place to reduce their herd sizes or to vacate the area. In practice, however, this rarely, if ever, occurred.

The degree to which the Ju/'hoansi control their land came into serious question in the mid-1970s, when the Government of Botswana announced the Tribal Grazing Land Policy (Republic of Botswana, 1975; Hitchcock, 1980). While the /Xai/Xai

area initially was zoned as communal land. suggestions were made that at least some of the area should become commercial ranches. Water rights were granted to non-local people by the Tawana Land Board in the area between the Okavango Delta and the Namibian border. Thus far, only one borehole, at Xhaba, is in place. If the North West District Council follows its district land use plan, the only new boreholes that will be granted will be for domestic or mixed use (mixed meaning for people. draft animals, and garden watering). Those water point allocations made within the past five years can be developed. but the maximum number of livestock that can be kept on them (e.g. in Wildlife Management Areas) is 50 (Ngamiland District Land Use Planning Unit *et al.*. 1994:32).

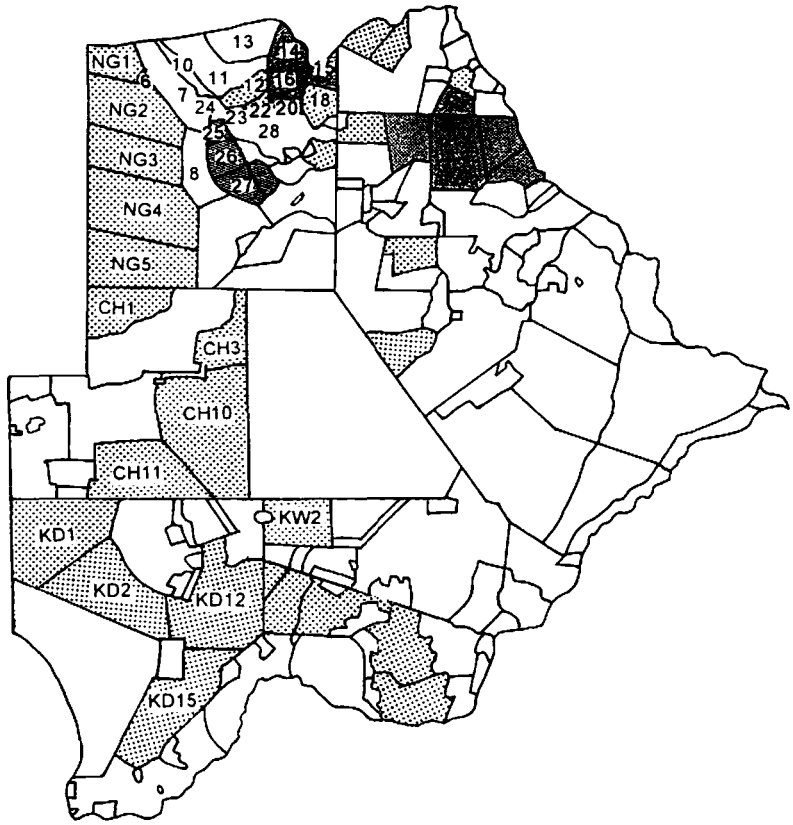

Fig. 4. Map of Botswana showing controlled hunting area boundaries.

One of the problems with the current land use plan in western Ngamiland is that the divisions of the Wildlife Management Areas in the region do not reflect the on-the-ground territorial and land use patterns of resident populations. The western part of the district is divided into a series of Controlled Hunting Areas (CHAs) (see Figure 4). These Controlled Hunting Areas are regions within which the Department of Wildlife and National Parks grants licenses to hunt or to carry out other kinds of natural resource management and utilization activities (e.g. photographic safaris). Table 9 presents data on the various controlled hunting areas in North West District. There are 5 Controlled Hunting Areas in which the majority of Botswana's Ju/'hoansi reside (N [for Ngamiland] 1-5). Four of these areas are Community-Controlled Hunting Areas (CCHAs), while one (NG 2) is zoned for citizen hunting and photographic safari use.

The problem facing the people of /Xai/Xai is that they are allowed only to hunt in the Controlled Hunting Area in which they live. Although /Xai/Xai is located in CHA NG 4, people also hunt and gathering in the zone designated as NG 3, and sometimes they undertake long-distance foraging trips to NG 5. If they are not

Table 9. Zoning of controlled hunting areas in North West District, Botswana.

Controlled Hunting Area	Size (sq km)	Zoning Type
NG 1	2,970	community
NG 2	7,448	citizen hunting, photographic
NG 3	5,760	community
NG 4	9,293	community
NG 5	7,673	community
NG 6	225	photographic
NG 13	2,750	no zoning
NG 14	2,325	multi-purpose
NG 15	1,250	multi-purpose
NG 16	1,350	multi-purpose
NG 17	63	photographic
NG 18	1,815	community
NG 19	180	photographic
NG 20	1,610	multi-purpose
NG 21	230	photographic
NG 22	580	single
NG 23	340	photographic
NG 24	530	photographic
NG 25	630	photographic
NG 26	1,725	multi-purpose
NG 27a	250	photographic
NG 27b	165	photographic
NG 29	1,820	multi-purpose
NG 30	905	multi-purpose
NG 31	225	photographic
NG 32	1,225	multi-purpose
NG 33	57	photographic
NG 34	870	community
NG 41	2,045	community

Note: Data presented here were obtained from the North West District Land Use Planning Unit, from van der Sluis (1992), and from Okavango Community Consultants (1995).

allowed to use NG 3 and 5, it will mean that they will have much less land on which to hunt, something that could well lead to land use conflicts and possibly, expanded rates of resource decline. It could also result in disagreements among community members and between people in /Xai/Xai and the North West District Council and the Botswana Government.

IMPACTS OF HUNTING ON WILDLIFE SUSTAINABILITY

One of the questions asked about the Ju/'hoansi was whether or not they actively practiced conservation. There is a major debate in conservation biology and anthropology as to whether indigenous peoples engage in conservation (Redford and Robinson, 1993; Alvard, 1995). Some analysts (e.g. Durning, 1992) argue that natural resource management rules of indigenous peoples helped to maintain biological diversity, while others (e.g. Hames, 1991) argue that social rules do not determine the success of resource management so much as behavioral factors such as the kinds of technology employed and population sizes and densities.

A variety of perspectives on these issues were offered by the people who were interviewed in western Ngamiland. There were those who said that people purposely do not hunt or gather in places where resources are depleted but instead declare those areas off limits. They maintained that people complied with these resource access restrictions and that they generally did not attempt to take resources without permission. On the other hand, there were individuals who claimed that people did not forage in depleted areas simply because the rates of return were low and thus it was not worth the effort. According to them, freeloading and trespassing were the rule rather than the exception. Rather than give up on foraging as wild resources declined, they argued, people tended instead to intensify their efforts (Hitchcock et al., 1995).

The crucial question that must be asked is: are resources being exploited by local people at the "optimum sustained yield?" In order to answer this question, one needs research information on a variety of topics, including resource types and densities, exploitation methods, extraction rates for various resources, time and energy allocation data, and numbers and distribution of people.

The total area used regularly by the residents of /Xai/Xai is approximately 2,000 square kilometers. The area where people forage, graze their livestock, cultivate fields, and collect products such as medicinal plants stretches south to /Du/Da, east to /Gwihaba, west into Namibia, and north into the Aha Hills (Figure 2). Aerial census data for western Ngamiland in the period 1989-91 indicated that the average biomass for wildlife was 5,467 kg per square kilometer while the biomass estimate for livestock was 15,607 kg per square kilometer (van der Sluis, 1992: 30-33). The general trend in wildlife numbers and densities in the /Xai/Xai region is downward, according to Department of National Parks and Wildlife Management Regional Wildlife Office officials. /Xai/Xai residents also felt that there were fewer wild animals in the region today than there were in the past.

The hunting situation has changed considerably in /Xai/Xai. Marshall (1976: 130) notes that virtually all Ju/'hoansi adult males participated in hunting in the period

between 1951 and 1957. The number of men engaging in hunting declined to the point where only 45% of the men took part in hunting in 1973-74 (Wiessner, 1977: 85). According to people that we interviewed, even fewer people hunt today than was the case in the 1970s. One reason given for this reduction in the number of hunters was that the Department of Wildlife and National Parks was allocating fewer Special Game Licenses than it had in the past (see Hitchcock, Masilo & Monyatse, Appendix 7). In 1995, only 15 SGLs had been allocated, in spite of the fact that twice that number of people qualified for SGLs according to members of the /Xai/Xai Village Development Committee.

One of the reasons given for the diminished numbers of hunters was that people in the /Xai/Xai region had more economic alternatives open to them than they did in the past. Some people worked as herders for other people, others kept *mafisa* cattle, and still others produced crafts for sale. A few people worked in Namibia on occasion (e.g. for the Nyae Nyae Farmers Cooperative). Two people said that they did not have to hunt because they were provided with food through the District Council (e.g. destitute rations or income through labor-based public works projects). One informant mentioned that he hunted less today because he spends more of his time in agricultural activities.

In order to get an idea of the level of offtake of various species in the /Xai/Xai area, interviews were conducted of hunters. The informants were asked what they had obtained in the past year, what the age and sex of the prey was, and how and when they got it. Half of the people that were interviewed had hunted in the previous year (Hitchcock et al., 1995, Appendix 8). The data on the animals that they obtained are presented in Table 10. It can be seen that the hunters had taken individ-

Table 10. Wildlife obtained by special game license holders at /Xai/Xai, 1994-95.

Species	Scientific Name	Quota for NG 4 in 1995 by DWNP	Number Obtained by /Xai/Xai SGL Holders
1. Hartebeest	*Alcelaphus bucelaphus*	105	1
2. Springbok	*Antidorcas marsupialis*	29	0
3. Kudu	*Trafelaphus strepsiceros*	100	7
4. Impala	*Aepyceros melampus*	11	0
5. Warthog	*Phacochoerus nethiopicus*	15	3
6. Gemsbok	*Oryx gazella*	49	5 (1 confiscated)
7. Eland	*Taurotragus oryx*	10	4 (all confiscated)
8. Duiker	*Sylvicapra grimmia*	1,086	11
9. Steenbok	*Raphicerus campestris*	1,390	5
10. Monitor lizard	*Varanus* spp.	0	4
11. Wildcat	*Felis lybica*	0	4
12. Blackbacked jackal	*Canis mesomelas*	0	2
13. Bat-eared fox	*Otocyon megalotis*	0	0
14. Silver fox	*Vulpes chama*	0	0
15. Genet	*Genetta genetta*	0	0
16. Caracal	*Felix caracal*	0	0
17. Spotted Hyena	*Crocutua crocuta*	5	1
18. Baboon	*Papio ursinus*	5	0

Note: Data on quotas obtained from the Department of Wildlife and National Parks.

uals of eleven different species of wild animals. The animal killed most frequently by /Xai/Xai hunters was duiker. All of the hunters we interviewed had obtained at least one duiker. The next most common animal killed was kudu, which were taken by two of the four hunters. One had killed a hartebeest and two had killed warthogs. None of our informants mentioned getting ostrich or wildebeest, which they noted had been struck off their Special Game Licenses by the Department of Wildlife and National Parks in 1991.

Only one of the hunters we spoke to at /Xai/Xai had gotten five large animals in the previous year. Large animals are defined here as those animals which weigh over 100 kg. At /Xai/Xai they include giraffe, hartebeest, wildebeest, eland, gemsbok, kudu, and roan. Some of these species are not on the Special Game License (e.g. roan) and others are protected under fauna conservation legislation (e.g. giraffe) (Government of Botswana, 1961; Republic of Botswana, 1992).

Several observations can be made about the hunting activities of Ju/'hoansi at /Xai/Xai who have Special Game Licenses. First, hunters tend to go after larger prey items. They are selective in their decisions, choosing adults, especially ones which are fat. Hunters said that they specifically did not go after young or immature animals because the returns in terms of meat would be lower and they did not want to use up their licenses on smaller prey items. It is interesting to note, however, that none of the hunters obtained all or even most of the animals they were allowed to take on the Special Game License (for a list of the animals that people can hunt on a Special Game License, see Appendix 2).

Another conclusion about SGL-hunters at /Xai/Xai was that they usually hunted some distance away from the community. They did this in part because prey densities were higher the farther one got from /Xai/Xai. They also did it, they said, because it gave them an opportunity to get away from home and to engage in an activity which they enjoyed tremendously. Most of the hunts which were successful in terms of procuring large game animals were expedition-type hunts in which a group of men, sometimes as many as 8, would go out for an extended period with donkeys and dogs or, in some cases, horses. These expedition hunts were usually for a period of four days to two weeks. Much of the hunting was done with spears rather than with bows and arrows. Mbanderu hunters also went out on long-distance hunts, usually with horses and guns, and Ju/'hoansi sometimes accompanied them. The return rates on these horse-and gun-hunting trips were higher than was the case for other kinds of hunting activities, something that was true in the 1973-80 period (Wilmsen & Durham, 1988: 80-82, Table 4.11) and in 1995 (Hitchcock et al., 1995).

Two of the hunters interviewed at /Xai/Xai had been arrested along with five other people at /Du/Da in July, 1995. At the time they were apprehended, they had killed four eland and a gemsbok, all of which were confiscated by the Anti-Poaching Unit (APU) along with four horses and eleven donkeys. The weapons the men were using were also confiscated. The loss of the horses and donkeys was a severe blow to these men since these animals were used for a variety of purposes besides hunting.

The men who were arrested were philosophical about what had happened to them. They were not bitter about being arrested, since they said that they were well-treated by the game scouts. On the other hand, the men said that they were extremely

unhappy that they could no longer hunt eland on Special Game Licenses. They felt that it was unfair that SGL hunters could not hunt eland, whereas elands were listed on the DWNP annual quota for the area and could be killed by citizen and safari hunters (Department of Wildlife & National Parks, 1995). The fact that eland had been taken off the SGL also caused consternation since it was a highly favored species due to its high fat content and its symbolic significance (for a discussion of the importance of eland, see Schapera, 1930: 119; Marshall, 1976: 92, 244, 276, 307; Biesele, 1993: 108-114, 197-198).

Table 11. Animals obtained by two Nambian Ju/'hoan hunters in the Nyae Nyae region, 1994-95.

/Aotcha 1	N//oaq!'osi 1
steenbok	female kudu
kudu	steenbok
wildebeest	steenbok
duiker	male kudu
duiker	gemsbok
hartebeest (not recovered)	male kudu
kudu	female kudu
kudu (gotten by hyena)	female warthog
duiker	male warthog

Note: Information provided by Megan Biesele and Steve Barclay.

We were able to obtain comparative information on the returns of two Ju/'hoan hunters from the Nyae Nyae region of Namibia based on interviews done in June, 1995 (Megan Biesele, Steve Barclay, personal communications). These two men, one from /Aotcha and the other from N//oaq!'osi, hunted with bows and arrows. Each man hit nine animals with arrows. In the case of the first man, most but not all of the animals were recovered, while in the case of the second, all of the animals were recovered. The data for these two men are shown in Table 11.

Together, these two hunters got 6 kudu, 3 duiker, 3 steenbok, 1 wildebeest, 1 gemsbok, and 2 warthog. Only one of the men got five large animals, the amount considered by Lee (1979: 216) to be a good return rate for a Ju/'hoan hunter.

Based on the data that we were able to obtain from the people we interviewed, combined with information provided by /Xai/Xai residents who spoke at the Natural Resource Management workshop in October, 1995, offtake rates of SGL-holders for most species are sustainable at current levels. Hunters are getting fewer animals than allowed for under the 1995 Department of Wildlife and National Parks quota for NG 4 (Hitchcock et al., 1995). It is ironic, therefore, that the Department of Wildlife and National Parks officials in the region felt that some species were being taken at rates that were higher than were sustainable given rates of replacement. When asked about this discrepancy, the wildlife officers said that there were certain species which were fewer in number than was the case in the past, notably eland and wildebeest, and said that they felt that this was due to hunting by Special Game License Holders. Local people responded by saying that while it was true that the numbers of wildebeest and eland were lower, they were not allowed to hunt them on the 1995

Special Game Licenses given to them by the Regional Wildlife Officer from Maun. It was these kinds of inconsistencies in Botswana government wildlife policy that subsistence hunters found so vexing.

PATTERNS OF USE OF HUNTING PRODUCTS

Differences exist among Dobe-/Xai/Xai households in terms of their socioeconomic situations and their patterns of hunting and use of wildlife products. Research done at /Xai/Xai in the 1973-1980 period by Wilmsen (1976a, b, 1978a, b, 1982a-c, 1989; Wilmsen & Durham, 1988) stressed the diversified resource procurement and production strategies that were employed by local people. Wilmsen stratified /Xai/Xai homesteads into several categories: (1) pastoralist, (2) independent, (3) forager, (4) client, and (5) reliant. The pastoralists were those people who derived over half their subsistence and income from herds they managed themselves. The independent category was made up of those households whose members owned livestock but who relied on foraging for more than half their income. Foragers were people who owned no livestock other than donkeys and dogs and who derived 95% of their income from wild sources. Client homesteads were those employed by local pastoralists. The reliant category consisted of those people who were dependent on drought relief food, outside employment or government assistance programs (Wilmsen, 1989: 225-226).

Hunting returns data obtained by Wilmsen (1976a, b, 1989) in the period from 1973 to 1980 at /Xai/Xai reveal that there were significant differences among various categories of households in terms of meat production and procurement methods. The pastoralists at /Xai/Xai hunted almost primarily from horseback, and they tended to use guns. Favored prey items were large game animals (Wilmsen, 1989: 227). The pastoralist households had the highest rates of return of all households, with an average of 10 kilograms per person per month. It is important to note that not all of this meat was consumed by the households responsible for obtaining it. Some of it was shared with other households that were related primarily through kinship. The sharing of meat was of crucial significance in /Xai/Xai in the 1970s, and that is still the case today.

Hunting at /Xai/Xai was and is done for a variety of purposes. First, it was carried out in order to provide food for consumption by the household. Second, it was done in order to obtain raw materials for making clothing and other requirements (e.g. leather carrying bags, ostrich egg containers). Third, it was conducted in order to provide material for the production of crafts, which were then used by the household, exchanged with other people, or sold. Finally, hunting generated surpluses with were distributed to other people; this gave people who might otherwise not have access to meat the opportunity to partake of the harvest. It also created social ties and reciprocal obligations which bound the community together (Marshall, 1976: 295-303; Wilmsen, 1976a, b, 1989; Wiessner, 1977).

Meat-sharing is a crucial aspect of Ju/'hoansi social and economic relations (Marshall, 1976: 295-303; Wiessner, 1977). One reason for sharing is that it ensures that the meat from large body-sized prey is consumed before it spoils. Sharing also

helps even out the variance in hunting success. Based on what we were told, some individuals are excellent hunters, while others are lucky to get any animals at all when they go hunting. As Marshall (1976: 295) notes about meat-sharing, "The fear of hunter is mitigated: the person whom one shares will share in turn when he gets meat; people are sustained by a web of mutual obligation." Ju/'hoansi meat-sharing depends in part upon the body size of the prey; the larger the prey item, the more likely it is to be shared.

A major change that has occurred over time in the /Xai/Xai area has been a breakdown in the size of groups. Whereas in the past, group size in the /Xai/Xai area averaged 25-35 persons (Marshall, 1976: 158; Lee, 1979: 158; Wilmsen, 1976b: 22-23), today group size at /Xai/Xai averages around 13 persons (see Hitchcock, Masilo & Monyatse, 1995, Tables 1 and 7). This change in group size has affected the viability of hunting, reducing the number of hunters available for cooperative endeavors. It has also affected the extent to which meat is shared, with fewer people today participating in meat-sharing networks than was the case in the past. Based on the limited information we were able to obtain at /Xai/Xai in October, 1995, the return rate today is roughly 1.2 kg per person per month, a figure substantially lower than was the case for foragers in the 1960s and 1970s. It should come as no surprise, therefore, that people complained frequently of having insufficient meat to eat.

According to local people in Xai/Xai, fewer people today are sharing meat and more people are selling meat that they obtain from hunting. Some of them are using it only to meet the subsistence needs of their immediate families. Those people that sell meat generally fall into the category of those who are better-off economically and who are not hunting on Special Game Licenses. In those cases where SGL-holders accompanied other people in the community who had guns on hunts, the SGL-holders were reportedly given a "substantial share" of the meat, something that Wilmsen (1989: 232) noted was the case in the 1970s as well.

The nutritional importance of meat brought in to /Xai/Xai by SGL-holders is something that can only be estimated, given the fact that only a portion of the SGL-holders in the community were interviewed, and it was not possible get detailed observational data on the wild animals obtained. There were significant differences between gun-owners and hunters using traditional weapons in terms of return rates. Gun-owners got at least three times as much meat as did people who had Special Game Licenses and who used bows and arrows and spears and dogs in 1994-95.

In the 1970s, as mentioned previously, Wilmsen (1989: 232) noted that foragers at /Xai/Xai had nearly as high a rate of wild meat returns as did the pastoralists, averaging over 8 kilograms per person per month in the 1973-1980 period. It is interesting to compare this rate of return to that of the G/wi in the !Xade area of the Central Kalahari Game Reserve investigated by Silberbauer (1965, 1972, 1981a, 1981b) who were known for having significant degrees of dependence on wild meat. The G/wi had a return rate of 7.8 kg per person per month (Silberbauer, 1981a: 486, 1981b: 204). The G/wi and G//ana of the central Kalahari, who were investigated by Tanaka in the period from September, 1967 to March, 1968, had a return rate of 6.8 kg per person per month (Tanaka, 1980: 66-68).

The hunting returns of Ju/'hoansi and G/wi foragers varied significantly on a seasonal basis (see Figure 5). For the Ju/'hoansi, meat was most plentiful in April,

while for the G/wi it was at its peak in January. The period of lowest availability of meat was in September for both the Ju/'hoansi and the G/wi (Wilmsen, 1989: 238-240; Silberbauer, 1981a: 483-486). This seasonal low in wild meat corresponds to what we were told was happening at /Xai/Xai today. People said that they were relying on other kinds of food in the late dry season, including inputs provided by pastoralists (meat and milk from domestic animals) and some food obtained through government assistance programs. The government assistance programs include goods or cash given to pregnant and lactating mothers, food for children under the age of five, and rations given to people defined by the North West District Council as destitutes. Virtually all of the people interviewed at /Xai/Xai were getting at least some food or cash through government programs. In most cases, however, this food was targeted to members of the household other than the household head (Hitchcock et al., 1995).

A strategic response to resource depletion in the /Xai/Xai region has been to shift to using alternative resources. Virtually all of the people interviewed at /Xai/Xai participate in the gathering of wild plant foods. Some of these plants are crucial to the nutritional well-being of local households since they contain sizable amounts of proteins, fats, and oils. Mongongo nuts in particular represent a key resource in /Xai/Xai. One of the reasons that people expressed concern about potential land zoning changes in western Ngamiland is that they were afraid that they would not be able to gather mongongo and other wild plant resources in certain areas designated as conservation zones. They have been told by North West District officials, how-

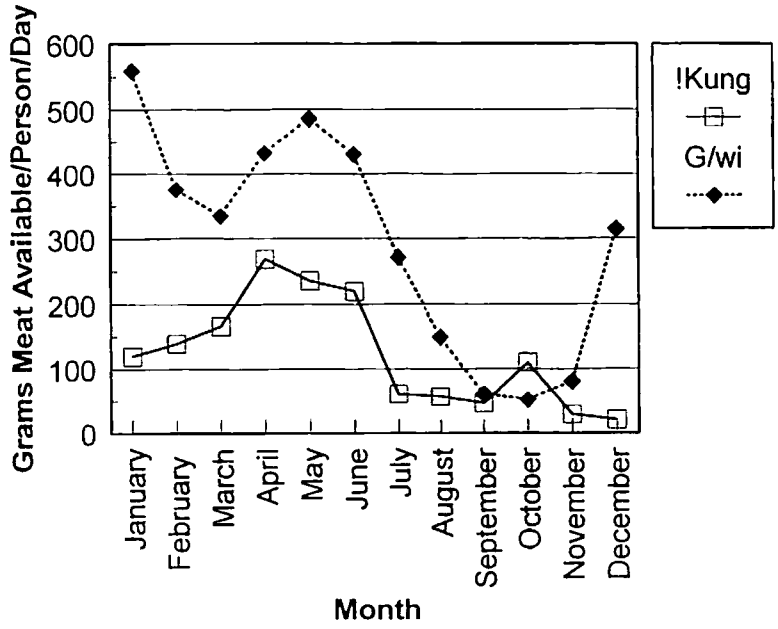

Fig. 5. Meat consumption data for G/wi and !Kung.

ever, that they will still be allowed to collect wild plants in the newly established Wildlife Management Areas and National Monuments. Local people said that they would like to see these stipulations in writing.

The production of crafts from local wild game and plant resources is a means by which local people have generated cash (Wilmsen, 1976a, b, 1989; SNV Botswana, 1994; Hitchcock, Masilo & Monyatse, 1995). In the past, crafts were purchased by tourists, anthropologists, and others visiting or working in /Xai/Xai. Recently, the SNV volunteers working in /Xai/Xai, Edwin Ruigrok and Tineke Alons, helped establish a new crafts operation called !Kokoro Crafts (SNV Botswana, personal communication). There are currently 63 members of this cooperative, which is aimed at providing marketing opportunities for local people, something it has done successfully thus far.

The sale of crafts, especially ostrich eggshell beads and necklaces of glass beads, is an important source of income for women in particular at /Xai/Xai (Wilmsen 1976a, 1976b: 14-15, 26, Table 3). The problem that the Ju/'hoansi are facing today, however, is that the Botswana government has passed new legislation on ostrich management that requires people to get a permit before they can exploit ostrich eggs (Republic of Botswana, 1994). Ostrich farming is going to be given priority by the Botswana government over other forms of ostrich utilization such as hunting. What this means for women who make ostrich eggshell beads is that before they can collect eggs in the field, they must first form an organization which must then apply to the Department of Wildlife and National Parks for a permit. Once they get such a permit, which is by no means a certainty, they will be subject to monitoring and assessment. Under the recent legislation, Ju/'hoansi and other Remote Area Dwellers will not be able to exploit ostrich eggs as individuals, something that will have a negative effect on their income. If they ignore the ostrich regulations, they could be subject to arrest. Not surprisingly, Ju/'hoansi women and other rural women in Botswana are vociferous in their opposition to this legislation.

A PROFILE OF SPECIAL GAME LICENSE-HOLDERS AT /XAI/XAI

It is possible to construct a general profile of Special Game License holders and others at /Xai/Xai based on a set of socioeconomic criteria. The main criteria for determining the category into which individuals were placed were (1) source of subsistence (i.e. whether the person obtained food mainly from the bush or from other sources); (2) livestock possession or holding, (3) employment status, (4) access to sources of income (5) access to government assistance programs (e.g. destitute payments from the District Council), (5) possession of an agricultural field, (6) the characteristics of one's social support system (e.g. kinship group size and structure), (6) number and nature of personal possessions (e.g. gun, plow), (7) specialized skills possessed (e.g. whether the person was a traditional healer), and (8) type of housing.

When these criteria were applied to the various households in /Xai/Xai, it was apparent that the Special Game License holders tended to fall into the category of the poorest people in the community (Hitchcock et al., 1995; Edwin Ruigrok & Tineka Alons, personal communications). Most of the SGL-holders owned very few

livestock. Half of them had fields, most of which were small (ranging in size from 1,600 km^2 to 40,000 km^2). None of the SGL-holders had a gun, and in order to be able to use a gun (which was uncommon), they had to go hunting with wealthier members of the community, mainly Mbanderu, who sometimes treated them poorly, according to the Ju/'hoansi.

Some of the SGL-holders had family members who received food from government or who were classified as destitutes. Only two of the people with SGLs had been employed, and this was only on a temporary basis, primarily for safari companies who brought tourists into the area for a few days at a time. One of the few sources of income for most SGL-holders besides hunting and gathering was craft production.

/Xai/Xai SGL-holders mainly fell into the category of foragers as defined by Wilmsen (1989: 225-238). Approximately a quarter of the households with Special Game Licenses can be categorized as clients since they worked for pastoralists and received milk, meat, and sometimes cash for their services. The clients tended to hunt less than did the foragers, and they had smaller amounts of meat inputs into their households. They still were able to get access to meat, however, through sharing networks. Some SGL-holders get a portion of their subsistence and income from government sources of from transfers from other sources (e.g. from the people classified as immigrants who are working at /Xai/Xai for the North West District Council or government). It is apparent, therefore, that people who hold Special Game Licenses are somewhat heterogeneous in terms of the ways in which they make their living, but in general they tend to be the poorest members of the community.

An examination of the contemporary socioeconomic system in /Xai/Xai thus reveals that there were a number people living at or below the absolute poverty level (APL). The APL can be defined as the income level below which a minimum nutritionally adequate diet plus essential non-food requirements can not be afforded. Some of the non-food requirements include matches, candles, and soap. The poorest of the poor in /Xai/Xai were people who lacked sufficient resources to support themselves and their dependents. Without access to Special Game Licenses, relief programs, and livestock products provided by pastoralists in the community, people would be much worse off than they are at present.

Analyses of the population of /Xai/Xai by the Community-Based Natural Resource Management Project personnel indicated that about half of the male adults (N = 80) are able to hunt (Edwin Ruigrok, personal communication). About a third of those people are still able to hunt with a bow and arrow (roughly about 16% of the male population of /Xai/Xai). A third of the hunters are familiar with hunting from horseback using guns or spears.

A major concern of the people residing in and around both /Xai/Xai is whether or not they will be able to continue to hunt using Special Game Licenses. Informants expressed dissatisfaction about the low numbers of Special Game Licenses that were granted to people in 1995 (N = 15). Recent information from the government of Botswana indicates that the Regional Wildlife Officer in North West District decided not to give out any Special Game Licenses whatsoever in 1996. The result could well be that poorer people in /Xai/Xai, most of whom are Ju/'hoansi, will experience

potentially severe nutritional and socioeconomic difficulties.

As if the declining wildlife populations, reduced numbers of licenses available to subsistence hunters, higher population densities, and changes in land tenure rules in the Dobe-/Xai/Xai region were not enough for the Ju/'hoansi to cope with, the Botswana government has had to begin destroying tens of thousands of cattle in Ngamiland. This is being done in an effort to eradicate a highly contagious lung disease (bovine pleuropneumonia) which was first reported in the !Kaudum (Xaudum) Valley north of Dobe in February, 1995. Thus far, Botswana Veterinary Department officials and soldiers from the Botswana Defense Force (BDF) have had to kill over 220.000 head of cattle, a process which will have devastating impacts on local people. The government is giving compensation to livestock owners for the losses that they suffer at a rate of 80% of the market value of each animal, or approximately 500 Pula per head. The destruction of the cattle will not only affect livestock owners but also those who depend on them for jobs, food, and gifts of milk, meat, and other goods. It is likely that the culling of the livestock at /Xai/Xai will lead to increased pressure on local wildlife resources.

Remote Area Development Program personnel and other people working in rural Botswana realize that efforts will have to be made very quickly to provide the neediest members of /Xai/Xai, Dobe, and other Ngamiland communities with livelihood supports. These supports could come in the form of cash income obtained as part of a flow of benefits from community-based resource management projects (CBNRMPs). Such benefits include household-level or individual payments (e.g. from safari hunting or ecotourism activities), sales of handicrafts, and employment. Livelihood supports could also be provided in the form of expanded government cash-for-work and relief programs. From the perspective of the Ju/'hoansi, ensuring access to wildlife through provision of licenses to continue to carry out subsistence hunting is even more crucial now than ever since it would give them a means of avoiding having to depend totally or to a significant degree on aid from the Botswana government or relief agencies.

In 1996, the members of the /Xai/Xai community established a Quota Management Committee (QMC) to oversee the wildlife quota provided by the Department of Wildlife and National Parks for NG 4 (Edwin Ruigrok, personal communication). This committee is both representative of the various members of the community and it is considered by them to be an accountable management group. The need for such a group was underscored by the decision of the government of Botswana to only allow those communities with management committees to have access to wildlife resources in North West District. The community decided that the quota would be used for subsistence purposes, but later on, if there were sufficient numbers of animals in NG 4, some of the animals would be put up for sale, thus bringing in revenues from safari operators who would bring safari hunters to the area.

Community tourism operations began in 1996, with arrangements being made between people at /Xai/Xai and safari companies to bring in people to visit the area and see sites of cultural and natural significance (e.g. the community itself, the Aha Hills, and the caves at /Gwihaba). These visits enabled the people of /Xai/Xai to gain access to economic benefits (e.g. payment for serving as guides) and opportuni-

ties for the sale of crafts besides those available through !Kokoro. The people of /Xai/Xai had worked out an ambitious plan in conjunction with the Natural Resource Management advisor and this plan was submitted to the North West District Council for approval. Given the fact that livestock and individual subsistence hunting options were no longer available, the people of /Xai/Xai were counting on a positive response from the council so that they could implement their plans.

CONCLUSIONS

This study has examined changes over time in subsistence hunting among the Ju/'hoansi of northwestern Botswana. Based on the data presented here, several important conclusions can be drawn. First, subsistence hunting continues to be an important part of the social, economic, and ideological systems of the Ju/'hoansi. This is the case even though the densities of game animals have declined substantially since the 1960s. Animals not only have economic value to the Ju/'hoansi, they also have social and spiritual value, as can be seen in cases where animals that have been shot by hunters are asked for forgiveness or where animals are central figures in Ju/'hoan folkore, ritual, and ideology (Lewis-Williams, 1981: Biesele, 1993).

Second, the extent to which Ju/'hoansi households utilize subsistence hunting as a strategy depends on a number of factors. These factors include the number of hunters in the household, the types of hunting equipment employed, environmental fluctuations, the availability of alternative sources of income, food, and materials, and, since the late 1970s, the possession of a Special Game License (Hitchcock, et al., 1995).

Third, the carrying out of subsistence hunting activities is more complicated in the northwestern Kalahari now than it was in the 1960s. This is due to the imposition of hunting regulations which are part of Botswana conservation legislation and to the expanded presence of the state in rural areas in the form of game scouts, police, and anti-poaching units. Certain types of hunting are done less frequently now than was the case in the past, one example being ambush hunting from blinds at night and the other being cooperative hunting drives that involve large numbers of hunters. As the game regulations have become more detailed and restrictive, the numbers of conflicts between subsistence hunters and wildlife managers and agents have increased. Arrests of people for violating hunting laws and confiscation of their possessions have exacerbated social tensions and contributed to impoverishment of local households.

Fourth, the question of who is or is not a "traditional hunter-gatherer" has become a focus of increased attention in Botswana. An assumption often made about hunter-gatherers is that they are self-sufficient societies (i.e. they do not depend on outside agencies for any inputs). In fact, there are no Ju/'hoansi or other Remote Area Dwellers in Botswana today who are totally self-sufficient. All of them obtain at least some goods or cash from the outside, and many have done so for a considerable period of time. The members of western Ngamiland communities participate extensively in the cash economy, buying and selling goods on the market and receiving cash or payments in kind for their services. Most Ju/'hoansi obtain their

food and other requirements from a variety of sources, the bush being but one of them. The fact that they have mixed economies and participate in the cash economy should not, in the opinion of the Ju/'hoansi, result in their being denied the right to engage in subsistence hunting.

A major criterion that was used to define hunter-gatherers in Botswana was that having to do with "nomadism," or the tendency for groups to move from one place to another in the course of obtaining resources or visiting other people. Today, there are few, if any, groups that make residential moves from one place to another on a regular basis. Most people live in stationary settlements, and if they leave their homes, they usually do so for limited periods of time (e.g. going on long-distance hunting trips or going into town to seek employment). This was true in the case of both Dobe and /Xai/Xai in the 1990s. The hunts that people undertake today tend to be either expedition-type trips involving a number of people or, alternatively, opportunistic hunts by individuals or, in some cases, pairs of hunters, usually accompanied by dogs.

Some people in Botswana define hunter-gatherers on the basis of the kinds of technology they use. If they utilize bows and arrows, digging sticks, and carrying bags made of animal skin, then they are considered to be hunter-gatherers. Some Department of Wildlife and National Parks officials told us that they use the criterion of whether or not individuals wore leather clothing (especially loincloths in the case of adult males) as the basis for determining if a person was a "traditional hunter-gatherer." Today very few people, usually only elderly males or young boys, wear leather loincloths. What this could mean for the Ju/'hoansi and other subsistence hunters is that they could be prevented from hunting simply on the basis of their wearing trousers or other items of modern clothing.

Botswana is in a unique position in Africa in that it has provided the legal basis for access to wildlife resources to a specific class of people who are defined according to their social and economic status. The Special Game Licenses were designed to ensure that people who depended on wild animals for part of their diet and household requirements were able to continue to have the option of obtaining game without fear of being arrested. The issue that the Government of Botswana faces now is how to ensure that those people still depend on wildlife do not face destitution as a result of the dropping of Special Game Licenses. Providing people with free single game licenses under new fauna conservation legislation is one way to do this. For this strategy to work, however, efforts will have to be made to ensure that equitable and just decisions are made about who qualifies for such licenses.

The politics surrounding subsistence hunting and wildlife conservation have become more complicated in the southern African context in the 1980s and 1990s. International agreements such as the Convention on Trade in Endangered Species of Flora and Fauna (CITES) are playing increasingly significant roles in determining the kinds of activities that can be undertaken by local people. Environmental organizations, including both international ones as well as local non-government groups, are debating wildlife policy issues and are attempting to influence government decisions on how to handle wildlife utilization and natural resource management (Kalahari Conservation Society, 1983, 1988, 1995; Princen & Finger, 1994; Williamson, 1994). Not surprisingly, the Ju/'hoansi, like other indigenous peoples,

are arguing vociferously for continuation of the right to hunt, saying that it is a basic socioeconomic right under international law.

Finally, the nature of the resource base, population size and structure, rules surrounding land tenure and use, technologies used by local people, and the types of local institutions that exist in the Dobe-/Xai/Xai region have changed considerably. The Ju/'hoansi had relatively unrestricted access to resources within their own groups' territories in the 1960s, but this situation no longer prevails. Today, the Ju/'hoansi groups cannot hunt freely, nor can they find sizable numbers of wild animals or other kinds of natural resources without considerable expenditures of time, effort, and, often, cash. The question remains whether or not the Ju/'hoansi will be able to continue to meet their household needs with natural resources and at the same time have a say in how they can go about earning a living in the complex world of modern Botswana.

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——— Accepted *May 27, 1997*

Authors' Names and Addresses: Robert K. HITCHCOCK, *Department of Anthropology, University of Nebraska-Lincoln, Lincoln, NE 68588-0368, USA;* John E. YELLEN, *Anthropology Program, Division of Social, Behavioral, and Economic Research, National Science Foundation, 4201 Wilson Blvd., Arlington, VA 22230, USA;* Diane E. GELBURD, *Natural Resources Conservation Service, U.S. Department of Agriculture (USDA), P.O. Box 2890, Washington, DC 20013-2890, USA;* Alan J. OSBORN, *U.S. Fish and Wildlife Service, MidWest Archaeological Center, National Park Service, Federal Building, Room 474, 100 Centennial Mall North, Lincoln, NE 68508-3873, USA;* Aron L. CROWELL, *Smithsonian Arctic Studies Center, Anchorage Museum of History and Art, 121 W. 7th Ave., Anchorage, AK 99501, USA*

Appendix 1. Accounts of Ju/'hoansi hunting strategies.

The following accounts are descriptions of hunting by "the Dobe Group" recorded by John Yellen in 1968. These accounts are organized according to the animal procured, and they show the various methods employed. Camp numbers and dates of the hunting trips are also included. All of the accounts refer to hunts that occurred in 1968 unless noted otherwise.

Duiker

Camp 3

2/3-2/4 : 3 men track 2 duikers. They see the young duiker run away and assume the mother is near. N!aishe goes to where the young one was standing and imitates its sound. The mother appears and starts toward N!aishe. The first arrow misses, but the second arrow wounds it. They follow her a short distance but then return to camp. They return to track her a short distance but then return to camp. They return to track the adult female the next day. They shoot it once and miss. They later find it, unable to get up. They kill it with a stick. Butchering: At the kill site they skin the duiker and crack the cannon bones, eating the marrow in them. The rest of the animal is brought back to camp.

Camp 3

2/4 : /toma and son shoot a young duiker, killing it quickly. It is brought back to camp whole. The 2 duikers obtained on 2/4/68 last 2 days for 4 adults and 7 children.

Camp 3

2/5 : Snare is set for a duiker known to be in the area (set in the morning). /toma hunts around and returns to check the snare at noon but finds nothing.

Camp 3

2/5 : In the morning a snare is set for the young of a duiker killed the day before. N!aishe returns to camp and returns to check snare later in the afternoon. He finds that the duiker had been trapped but was strong enough to break the springpole on the trap.

Gemsbok

Camp 6

3/20 : N!aishe, /toma and families and /gau (5 adults, 6 children) go after a wounded gemsbok. After they find that it has gone a long way, however, all return to camp except for /toma's eldest son and the three men. They find the half grown male gemsbok dead and proceed to skin and butcher it. Butchering: Butchering is completed at the kill site where they also eat the liver, some ribs, and also crack one tibia, and all four cannon bones for marrow. The rest of the animal, except for one horn, part of the backbone, and the already cracked bones are carried back to camp.

Camp 3

3/19 : Three men go hunting in hwanasi. /toma, hunting with /gau, wounds a young male gemsbok with an arrow. N!aishe, hunting alone, wounds two gemsbok but neither arrow is in a good position. The men return to camp at about four in the

afternoon. The next day the group moves closer to hwanasi where the eventual kill is made.

Camp 10
4/15 : /toma had wounded a gemsbok with an arrow the day before. Six men from the camp go after it and find it dead. Butchering: At the kill site they butcher it, eating all the marrow from the cannon bones, some ribs, the liver, and the head. The rest of the animal is carried back to camp and eaten there.

Camp 10
Week of
4/16 : /toma wounds a young male gemsbok. The next day 6 men go after it and find it alive but unable to run. They kill it with a spear. Butchering: They butcher it at the kill site. The men eat the marrow from the cannon bones, some ribs, and part of the liver. The skin and the horns are left at the kill site and the remainder of the animal is carried back to camp.

Camp 6
5/22 : /toma hunts alone and wounds an adult gemsbok. N!aishe and /gau hunt to the north where /gau shoots a young kudu. All the men return to camp and agree to concentrate on getting the gemsbok because it is a larger animal and because it is heading south in the direction they want to go.

Camp 4
5/22 : /toma, hunting in hwanasi, wounds an adult female gemsbok. The next day the camp (2 families) move to the kill area. They recover the dead gemsbok and cut the meat into biltong (strips of dried meat).

Camp 13
6/1 : One man wounds a young gemsbok with the third arrow. The next day, three men go after the wounded gemsbok. The men find it very weak and kill it by hitting it near the ear with a stick. They eat nothing at the kill site because the animal is quite small. They carry it back to camp.

Camp 2
6/4-6/5 : An adult male gemsbok is wounded. The 2 men return to camp and begin tracking the next day. They chase and tire it, killing it with spears around noon. Butchering: At the kill site, they skin and butcher the gemsbok. They roast the liver, some meat, and metacarpals and eat all of this at the kill site. Meat from the four quarters, the heart, the lungs, metatarsals, chest, ribs, and backbone are brought back to camp that day and the rest is left in a tree. The next day the men return to the kill site (hunting along the way) to carry the remainder of meat, except for the skin, back to camp. At the kill site, the head is roasted and the meat is cut from it. The next day, /toma and his wife again return to the kill site to obtain the skin which had been roasted in the fire and placed in the tree. The skin is later cut into strips and eaten.

Guinea Fowl
Camp 15
6/28 : N!aishe sets 4 guinea fowl snares. /gau and both ka//ka's set about 10 each.

N!aishe's son sets two. Later in the day they check the snares and find that each ka//ka has trapped a guinea fowl.

Camp 15
6/29 : The men check the snares they had set the day before. They find that they had trapped 1 guinea fowl, but it had been eaten by a carnivore.

Porcupine
Camp 4
Dec. 1967 : The men see a porcupine but are unable to get it out of its burrow.

Camp 3
2/10 a : /toma and N!aishe's son go out hunting and kill a young porcupine. Butchering: The porcupine is skinned at the kill site and brought back to camp.

Camp 3
2/11 : Three men and their families go out gathering. The men kill a porcupine along the way which is later eaten completely in camp.

Camp 9
3/14 : N!aishe, /toma and families and /gau (5 adults, 7 children) are moving to new camp. On the way they detour to a porcupine burrow the women had seen the previous day while gathering. The men crawl part way down the burrow to determine where the nest is located. They then dig down to it from above. Their first hole misses the nest, but their second one succeeds and they kill all four porcupines in the burrow.

Camp 11
4/12 : Two men kill four porcupines in the same burrow. Butchering: They skin them at the kill site and take the bodies back to camp.

Camp 7
5/11 : /toma, his son, and /gau hunt together. /gau crawls down a porcupine burrow to block off the porcupines' passage while the other men dig down from above and kill three porcupines.

Camp 7
5/25 : /toma, and his oldest son go out hunting and see a porcupine in the open, close to camp. /toma spears it, brings it back to camp and hangs it in a tree.

Camp 15
5/29 : 10 adults and 7 children were in the process of moving camp when one of the women sighted 2 porcupines. Two of the men run over and spear them. Since it is getting late, they make camp near there and consume the animals.

Camp 12
6/4 : Three men go to a porcupine burrow that another man had seen the day before. They dig directly down from above the burrow and kill two porcupines. They bring the animals back to camp whole.

Camp 15
6/28 : As they go out to look for honey, /gau and ka//ka see a porcupine burrow. /gau goes down into it, widening it as he goes, and spears the porcupine.

Camp 15
6/29 : Five men, 4 women, and 7 children go out to collect honey. They also go to a porcupine burrow which one man had seen some time before. Ka//ka digs down to the porcupine from above and spears it.

Red-Crested Korhaan
Camp 4
12/67 : /toma, his eldest son, and /gau go out hunting in the morning and set a snare for a duiker they had seen the precvious day. They also set a trap over a red-crested Korhaan's nest. They find that they have trapped the Red-crested Korhaan but not the duiker when they return to check the traps in the afternoon.

Springhare
Camp 1
2/13 : Two springhares are caught with a hook and are brought whole back to camp.

Steenbok
Camp 3
2/6 : Two men go after a steenbok that one of them had seen the previous day. They track it but miss it with the first arrow they shoot. Both men then wound the steenbok, chase it, and kill it with a stick. They carry it back to camp whole and share it with everyone but their wives who do not eat steenbok.

Camp 9 (scavenged)
2/15 : An adult steenbok killed by four wild dogs is found. The remains are brought back to camp.

Camp 11
4/12 : Dam wounds a steenbok, but the rain washes the tracks, and he never recovers the animal.

Camp 12 (scavenged)
6/4 : Two men go out hunting and come across a steenbok killed by a caracal. They return to camp with it.

Warthog (scavenged)
Camp 7
5/27 : /toma and /gau are returning to camp when they seen the remains of a warthog that was killed by a leopard. They eat the hind quarter and carry the rest back to camp.

Appendix 2. Species and numbers of animals that can be taken on a Special Game License (SGL).

Species	Number	Species	Number
Hartebeest	4	Duiker	30
Ostrich	2	Steenbok	30
Wildebeest	4	Monitor Lizard	10
Lechwe	3	Wild cat	50
Springbok	4	Jackal	U
Kudu	1	Bateared Fox	50
Impala	4	Silver Fox	10
Sitatunga	1	Genet	50
Buffalo	2	Caracal	10
Tsessebe	1	Monkey	20
Warthog	3	Spotted Hyena	20
Gemsbok	2	Wild Dog	U*
Eland	1	Baboon	U

Plus all birds (except conserved species).

U—Unlimited
U*—Unlimited (but this is a conserved species under the *Wildlife Conservation and National Parks Act, 1992*
Note: This is the original list of animals and species on the Special Game License under the *Fauna Conservation [Unified Hunting] Regulations, 1979*, Second Schedule, Regulation 7(1). A number of the species on the SGL were deleted in the early 1990s, including buffalo, ostrich, eland, wildebeest, and wild dog.