

# MAN THE HUNTER

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# What Hunters Do for a Living, or, How to Make Out on Scarce Resources

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The current anthropological view of hunter-gatherer subsistence rests on two questionable assumptions. First is the notion that these peoples are primarily dependent on the hunting of game animals, and second is the assumption that their way of life is generally a precarious and arduous struggle for existence.

Recent data on living hunter-gatherers (Meggitt, 1964b; Service, 1966; and papers in this volume) show a radically different picture. We have learned that in many societies, plant and marine resources are far more important than are game animals in the diet. More important, it is becoming clear that, with a few conspicuous exceptions, the hunter-gatherer subsistence base is at least routine and reliable and at best surprisingly abundant. Anthropologists have consistently tended to underestimate the viability of even those "marginal isolates" of hunting peoples that have been available to ethnographers.

The purpose of this paper is to analyze the food getting activities of one such "marginal" people, the !Kung Bushmen of the Kalahari Desert. Three related questions are posed: How do the Bushmen make a living? How easy or difficult is it for them to do this? What kinds of evidence are necessary to measure and evaluate the precariousness or security of a way of life? And after the relevant data are presented, two

further questions are asked: What makes this security of life possible? To what extent are the Bushmen typical of hunter-gatherers in general?

### BUSHMAN SUBSISTENCE

The !Kung Bushmen of Botswana are an apt case for analysis.<sup>1</sup> They inhabit the semi-arid northwest region of the Kalahari Desert. With drought every second or third year, this is, by any account, a marginal environment for human habitation. In fact, it is precisely the unattractiveness of their homeland that has kept the !Kung isolated from extensive contact with their agricultural and pastoral neighbors.

Field work was carried out in the Dobe area, a line of eight permanent waterholes near the South-West Africa border and 125 miles south of the Okavango River. The population of the Dobe area consists of 466 Bushmen, including 379 permanent residents living in independent camps or associated with Bantu cattle posts,

1. These data are based on fifteen months of field research from October, 1963, to January, 1965. I would like to thank the National Science Foundation (U.S.) for its generous financial support. This paper has been substantially revised since being presented at the symposium on Man the Hunter.

Table 1 *Numbers and Distribution of Resident Bushmen and Bantu by Waterhole\**

Name of Waterhole	No. of Camps	Population of Camps	Other Bushmen	Total Bushmen	Bantu
Dobe	2	37	—	37	—
langwa	1	16	23	39	84
Bate	2	30	12	42	21
!ubi	1	19	—	19	65
!gose	3	52	9	61	18
/ai/ai	5	94	13	107	67
!xabe	—	—	8	8	12
Mahopa	—	—	23	23	73
Total	14	248	88	336	340

\* Figures do not include 130 Bushmen outside area on the date of census.

as well as 87 seasonal visitors. The Bushmen share the area with some 340 Bantu pastoralists largely of the Herero and Tswana tribes. The ethnographic present refers to the period of field work: October, 1963–January, 1965.

The Bushmen living in independent camps lack firearms, livestock, and agriculture. Apart from occasional visits to the Herero for milk, these !Kung are entirely dependent upon hunting and gathering for their subsistence. Politically they are under the nominal authority of the Tswana headman, although they pay no taxes and receive very few government services. European presence amounts to one overnight government patrol every six to eight weeks. Although Dobe-area !Kung have had some contact with outsiders since the 1880's, the majority of them continue to hunt and gather because there is no viable alternative locally available to them.<sup>2</sup>

Each of the fourteen independent camps is associated with one of the permanent waterholes. During the dry season (May–October) the entire population is clustered around these wells. Table 1 shows the numbers at each well at the end of the 1964 dry season. Two wells

2. The Nyae Nyae !Kung Bushmen studied by Lorna Marshall (1957, 1960, 1965) have been involved in a settlement scheme instituted by the South African government. Although closely related to the Nyae Nyae !Kung, the Dobe !Kung across the border in Botswana have not participated in the scheme.

3. Bushman group structure is discussed in more detail in Lee (1965, pp. 38–53; and Chapter 17c, this volume).

had no camp resident and one large well supported five camps. The number of camps at each well and the size of each camp changed frequently during the course of the year. The "camp" is an open aggregate of cooperating persons which changes in size and composition from day to day. Therefore, I have avoided the term "band" in describing the !Kung Bushman living groups.<sup>3</sup>

Each waterhole has a hinterland lying within a six-mile radius which is regularly exploited for vegetable and animal foods. These areas are not territories in the zoological sense, since they are not defended against outsiders. Rather they constitute the resources that lie within a convenient walking distance of a waterhole. The camp is a self-sufficient subsistence unit. The members move out each day to hunt and gather, and return in the evening to pool the collected foods in such a way that every person present receives an equitable share. Trade in foodstuffs between camps is minimal; personnel do move freely from camp to camp, however. The net effect is of a population constantly in motion. On the average, an individual spends a third of his time living only with close relatives, a third visiting other camps, and a third entertaining visitors from other camps.

Because of the strong emphasis on sharing, and the frequency of movement, surplus accumulation of storable plant foods and dried meat is kept to a minimum. There is rarely more than two or three days' supply of food on

Table 2 The Bushman Annual Round

SEASON	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	SUMMER RAINS	SUMMER RAINS	SUMMER RAINS	AUTUMN DRY	AUTUMN DRY	AUTUMN DRY	WINTER DRY	WINTER DRY	SPRING DRY	SPRING DRY	FIRST RAINS	FIRST RAINS
Availability of Water	Temporary summer pools everywhere	Temporary summer pools everywhere	Temporary summer pools everywhere	Large summer pools	Large summer pools	Large summer pools	Fewest water points (permanent waterholes only in dry years)	Fewest water points (permanent waterholes only in dry years)	Fewest water points (permanent waterholes only in dry years)	Fewest water points (permanent waterholes only in dry years)	Summer pools developing	Summer pools developing
Group Moves	Widely dispersed at summer pools	Widely dispersed at summer pools	Widely dispersed at summer pools	At large summer pools	At large summer pools	At large summer pools	All population restricted to few points (permanent waterholes in dry years)	All population restricted to few points (permanent waterholes in dry years)	All population restricted to few points (permanent waterholes in dry years)	All population restricted to few points (permanent waterholes in dry years)	Moving out to summer pools	Moving out to summer pools
Men's Subsistence Activities	1. Hunting with bow, arrows, and dogs (Year-round)	1. Hunting with bow, arrows, and dogs (Year-round)	1. Hunting with bow, arrows, and dogs (Year-round)	1. Hunting with bow, arrows, and dogs (Year-round)	1. Hunting with bow, arrows, and dogs (Year-round)	1. Hunting with bow, arrows, and dogs (Year-round)	2. Trapping small game in snares	2. Trapping small game in snares	2. Trapping small game in snares	2. Trapping small game in snares	Running down newborn animals	Running down newborn animals
Women's Subsistence Activities	1. Gathering of mongongo nuts (Year-round)	1. Gathering of mongongo nuts (Year-round)	1. Gathering of mongongo nuts (Year-round)	1. Gathering of mongongo nuts (Year-round)	1. Gathering of mongongo nuts (Year-round)	1. Gathering of mongongo nuts (Year-round)	2. Fruits, berries, melons	2. Fruits, berries, melons	2. Fruits, berries, melons	2. Fruits, berries, melons	Roots, bulbs, resins	Roots, leafy greens
Ritual Activities	Dancing, trance performances, and ritual curing (Year-round)	Dancing, trance performances, and ritual curing (Year-round)	Dancing, trance performances, and ritual curing (Year-round)	Dancing, trance performances, and ritual curing (Year-round)	Dancing, trance performances, and ritual curing (Year-round)	Dancing, trance performances, and ritual curing (Year-round)	Boys' initiation*	Boys' initiation*	Boys' initiation*	Boys' initiation*	Boys' initiation*	Boys' initiation*
Relative Subsistence Hardship	Water-food distance minimal	Water-food distance minimal	Water-food distance minimal	Water-food distance minimal	Water-food distance minimal	Water-food distance minimal	Increasing distance from water to food	Increasing distance from water to food	Increasing distance from water to food	Distance maximal	Water-food distance minimal	Water-food distance minimal

\* Held once every five years; none in 1963-64.

† New Year's: Bushmen join the celebrations of their missionized Bantu neighbors.

hand in a camp at any time. The result of this lack of surplus is that a constant subsistence effort must be maintained throughout the year. Unlike agriculturalists who work hard during the planting and harvesting seasons and undergo "seasonal unemployment" for several months, the Bushmen hunter-gatherers collect food every third or fourth day throughout the year.

Vegetable foods comprise from 60-80 per cent of the total diet by weight, and collecting involves two or three days of work per woman per week. The men also collect plants and small animals but their major contribution to the diet is the hunting of medium and large game. The men are conscientious but not particularly successful hunters; although men's and women's work input is roughly equivalent in terms of man-day of effort, the women provide two to three times as much food by weight as the men.

Table 2 summarizes the seasonal activity cycle observed among the Dobe-area !Kung in 1964. For the greater part of the year, food is locally abundant and easily collected. It is only during the end of the dry season in September and October, when desirable foods have been eaten out in the immediate vicinity of the waterholes that the people have to plan longer hikes of 10-15 miles and carry their own water to those areas where the mongongo nut is still available. The important point is that food is a constant, but distance required to reach food is a variable; it is short in the summer, fall, and early winter, and reaches its maximum in the spring.

This analysis attempts to provide quantitative measures of subsistence status including data on the following topics: abundance and variety of resources, diet selectivity, range size and population density, the composition of the work force, the ratio of work to leisure time, and the caloric and protein levels in the diet. The value of quantitative data is that they can be used comparatively and also may be useful in archeological reconstruction. In addition, one can avoid the pitfalls of subjective and qualitative impressions; for example, statements about food "anxiety" have proven to be difficult to generalize across cultures (see Holmberg, 1950; and Needham's critique, 1954).

### *Abundance and Variety of Resources*

It is impossible to define "abundance" of resources absolutely. However, one index of relative abundance is whether or not a population exhausts all the food available from a given area. By this criterion, the habitat of the Dobe-area Bushmen is abundant in naturally occurring foods. By far the most important food is the Mongongo (*mangetti*) nut (*Ricinodendron rautanenii* Schinz). Although tens of thousands of pounds of these nuts are harvested and eaten each year, thousands more rot on the ground each year for want of picking.

The mongongo nut, because of its abundance and reliability, alone accounts for 50 per cent of the vegetable diet by weight. In this respect it resembles a cultivated staple crop such as maize or rice. Nutritionally it is even more remarkable, for it contains five times the calories and ten times the proteins per cooked unit of the cereal crops. The average daily per-capita consumption of 300 nuts yields about 1,260 calories and 56 grams of protein. This modest portion, weighing only about 7.5 ounces, contains the caloric equivalent of 2.5 pounds of cooked rice and the protein equivalent of 14 ounces of lean beef (Watt and Merrill, 1963).

Furthermore the mongongo nut is drought resistant and it will still be abundant in the dry years when cultivated crops may fail. The extremely hard outer shell protects the inner kernel from rot and allows the nuts to be harvested for up to twelve months after they have fallen to the ground. A diet based on mongongo nuts is in fact more reliable than one based on cultivated foods, and it is not surprising, therefore, that when a Bushman was asked why he hadn't taken to agriculture he replied: "Why should we plant, when there are so many mongongo nuts in the world?"

Apart from the mongongo, the Bushmen have available 84 other species of edible food plants, including 29 species of fruits, berries, and melons and 30 species of roots and bulbs. The existence of this variety allows for a wide range of alternatives in subsistence strategy. During the summer months the Bushmen have no problem other than to choose among the tastiest and most easily collected foods. Many species, which are quite edible but less attractive,

Table 3 !Kung Bushman Plant Foods

Food Class	Part Eaten							Totals (Percentages)			
	Fruit and Nut	Bean and Root	Fruit and Stalk	Root, Bulb	Fruit, Berry, Melon	Resin	Leaves	Seed, Bean	Total number of species in class	Estimated contribution by weight to vegetable diet	Estimated contribution of each species
I. PRIMARY Eaten daily throughout year (mongongo nut)	1	—	—	—	—	—	—	—	1	c. 50	c. 50*
II. MAJOR Eaten daily in season	1	1	1	1	4	—	—	—	8	c. 25	c. 3 †
III. MINOR Eaten several times per week in season	—	—	—	7	3	2	2	—	14	c. 15	c. 1
IV. SUPPLEMENTARY Eaten when classes I-III locally unavailable	—	—	—	9	12	10	1	—	32	c. 7	c. 0.2 ††
V. RARE Eaten several times per year	—	—	—	9	4	—	—	—	13	c. 3	c. 0.1
VI. PROBLEMATIC Edible but not observed to be eaten	—	—	—	4	6	4	1	2	17	nil	nil
TOTAL SPECIES	2	1	1	30	29	16	4	2	85	100	—

\* 1 species constitutes 50 per cent of the vegetable diet by weight.

† 23 species constitute 99 per cent of the vegetable diet by weight.

are bypassed, so that gathering never exhausts *all* the available plant foods of an area. During the dry season the diet becomes much more eclectic and the many species of roots, bulbs, and edible resins make an important contribution. It is this broad base that provides an essential margin of safety during the end of the dry season when the mongongo nut forests are difficult to reach. In addition, it is likely that these rarely utilized species provide important nutritional and mineral trace elements that may be lacking in the more popular foods.

### *Diet Selectivity*

If the Bushmen were living close to the "starvation" level, then one would expect them to exploit every available source of nutrition. That their life is well above this level is indicated by the data in Table 3. Here all the edible plant species are arranged in classes according to the frequency with which they were observed to be eaten. It should be noted, that although there are some 85 species available, about 90 per cent of the vegetable diet by weight is drawn from only 23 species. In other words, 75 per cent of the listed species provide only 10 per cent of the food value.

In their meat-eating habits, the Bushmen show a similar selectivity. Of the 223 local species of animals known and named by the Bushmen, 54 species are classified as edible, and of these only 17 species were hunted on a regular basis.<sup>4</sup> Only a handful of the dozens of edible species of small mammals, birds, reptiles, and insects that occur locally are regarded as food. Such animals as rodents, snakes, lizards, termites, and grasshoppers, which in the literature are included in the Bushman dietary (Schapera, 1930), are despised by the Bushmen of the Dobe area.

### *Range Size and Population Density*

The necessity to travel long distances, the high

4. Listed in order of their importance, the principal species in the diet are: wart hog, kudu, duiker, steenbok, gemsbok, wildebeeste, springhare, porcupine, ant bear, hare, guinea fowl, francolin (two species), korhaan, tortoise, and python.

frequency of moves, and the maintenance of populations at low densities are also features commonly associated with the hunting and gathering way of life. Density estimates for hunters in western North America and Australia have ranged from 3 persons/square mile to as low as 1 person/100 square miles (Kroeber, 1939; Radcliffe-Brown, 1930). In 1963-65, the resident and visiting Bushmen were observed to utilize an area of about 1,000 square miles during the course of the annual round for an effective population density of 41 persons/100 square miles. Within this area, however, the amount of ground covered by members of an individual camp was surprisingly small. A day's round-trip of twelve miles serves to define a "core" area six miles in radius surrounding each water point. By fanning out in all directions from their well, the members of a camp can gain access to the food resources of well over 100 square miles of territory within a two-hour hike. Except for a few weeks each year, areas lying beyond this six-mile radius are rarely utilized, even though they are no less rich in plants and game than are the core areas.

Although the Bushmen move their camps frequently (five or six times a year) they do not move them very far. A rainy season camp in the nut forests is rarely more than ten or twelve miles from the home waterhole, and often new campsites are occupied only a few hundred yards away from the previous one. They do not undertake long marches of 30 to 100 miles to get food, since this task can be readily fulfilled within a day's walk of home base. When such long marches do occur they are invariably for visiting, trading, and marriage arrangements, and should not be confused with the normal routine of subsistence.

### *Demographic Factors*

Another indicator of the harshness of a way of life is the age at which people die. Ever since Hobbes characterized life in the state of nature as "nasty, brutish and short," the assumption has been that hunting and gathering is so rigorous that members of such societies are rapidly worn out and meet an early death. Silberbauer, for example, says of the Gwi

Bushmen of the central Kalahari that "life expectancy . . . is difficult to calculate, but I do not believe that many live beyond 45" (1965, p. 17). And Coon has said of the hunters in general:

The practice of abandoning the hopelessly ill and aged has been observed in many parts of the world. It is always done by people living in poor environments where it is necessary to move about frequently to obtain food, where food is scarce, and transportation difficult. . . . Among peoples who are forced to live in this way the oldest generation, the generation of individuals who have passed their physical peak is reduced in numbers and influence. There is no body of elders to hand on tradition and control the affairs of younger men and women, and no formal system of age grading (1948, p. 55).

The !Kung Bushmen of the Dobe area flatly contradict this view. In a total population of 466, no fewer than 46 individuals (17 men and 29 women) were determined to be over 60 years of age, a proportion that compares favorably to the percentage of elderly in industrialized populations.

The aged hold a respected position in Bushman society and are the effective leaders of the camps. Senilicide is extremely rare. Long after their productive years have passed, the old people are fed and cared for by their children and grandchildren. The blind, the senile, and the crippled are respected for the special ritual and technical skills they possess. For instance, the four elders at !gose waterhole were totally or partially blind, but this handicap did not prevent their active participation in decision-making and ritual curing.

Another significant feature of the composition of the work force is the late assumption of adult responsibility by the adolescents. Young people are not expected to provide food regularly until they are married. Girls typically marry between the ages of 15 and 20, and boys about five years later, so that it is not unusual to find healthy, active teenagers visiting from camp to camp while their older relatives provide food for them.

As a result, the people in the age group 20-60 support a surprisingly large percentage of

non-productive young and old people. About 40 per cent of the population in camps contribute little to the food supplies. This allocation of work to young and middle-aged adults allows for a relatively carefree childhood and adolescence and a relatively un strenuous old age.

### *Leisure and Work*

Another important index of ease or difficulty of subsistence is the amount of time devoted to the food quest.<sup>5</sup> Hunting has usually been regarded by social scientists as a way of life in which merely keeping alive is so formidable a task that members of such societies lack the leisure time necessary to "build culture."<sup>6</sup> The !Kung Bushmen would appear to conform to the rule, for as Lorna Marshall says:

It is vividly apparent that among the !Kung Bushmen, ethos, or "the spirit which actuates manners and customs," is survival. Their time and energies are almost wholly given to this task, for life in their environment requires that they spend their days mainly in procuring food (1965, p. 247).

It is certainly true that getting food is the most important single activity in Bushman life. However this statement would apply equally well to small-scale agricultural and pastoral societies too. How much time is *actually* devoted to the food quest is fortunately an empirical question. And an analysis of the work effort of the Dobe Bushmen shows some unexpected results. From July 6 to August 2, 1964, I recorded all the daily activities of the Bushmen living at the Dobe waterhole. Because of the coming and going of visitors, the camp population fluctuated in size day by day, from a low

5. This and the following topic are discussed in greater detail in Lee, "!Kung Bushman Subsistence: An Input-Output Analysis" (1969).

6. Lenski, for example, in a recent review of the subject, states: "Unlike the members of hunting and gathering societies [the horticulturalists] are not compelled to spend most of their working hours in the search for food and other necessities of life, but are able to use more of their time in other ways" (1966, p. 121). Sahlins (Chap. 9b, this volume) offers a counter-argument to this view.



of 23 to a high of 40, with a mean of 31.8 persons. Each day some of the adult members of the camp went out to hunt and/or gather while others stayed home or went visiting. The daily recording of all personnel on hand made it possible to calculate the number of man-days of work as a percentage of total number of man-days of consumption.

Although the Bushmen do not organize their activities on the basis of a seven-day week, I have divided the data this way to make them more intelligible. The work-week was calculated to show how many days out of seven each adult spent in subsistence activities (Table 4, Column 7). Week II has been eliminated from the totals since the investigator contributed food. In week I, the people spent an average of 2.3 days in subsistence activities, in week III, 1.9 days, and in week IV, 3.2 days. In all, the adults of the Dobe camp worked about two and a half days a week. Since the average working day was about six hours long, the fact emerges that !Kung Bushmen of Dobe, despite their harsh environment, devote from twelve to nineteen hours a week to getting food. Even the hardest working individual in the camp, a man named *o*ma who went out hunting on sixteen of the 28 days, spent a maximum of 32 hours a week in the food quest.

Because the Bushmen do not amass a surplus of foods, there are no seasons of exceptionally intensive activities such as planting and harvesting, and no seasons of unemployment. The level of work observed is an accurate reflection of the effort required to meet the immediate caloric needs of the group. This work diary covers the mid-winter dry season, a period when food is neither at its most plentiful nor at its scarcest levels, and the diary documents the transition from better to worse conditions (see Table 2). During the fourth week the gatherers were making overnight trips to camps in the mongongo nut forests seven to ten miles distant from the waterhole. These longer trips account for the rise in the level of work, from twelve or thirteen to nineteen hours per week.

If food getting occupies such a small proportion of a Bushman's waking hours, then how do people allocate their time? A woman gathers on one day enough food to feed her

family for three days, and spends the rest of her time resting in camp, doing embroidery, visiting other camps, or entertaining visitors from other camps. For each day at home, kitchen routines, such as cooking, nut cracking, collecting firewood, and fetching water, occupy one to three hours of her time. This rhythm of steady work and steady leisure is maintained throughout the year.

The hunters tend to work more frequently than the women, but their schedule is uneven. It is not unusual for a man to hunt avidly for a week and then do no hunting at all for two or three weeks. Since hunting is an unpredictable business and subject to magical control, hunters sometimes experience a run of bad luck and stop hunting for a month or longer. During these periods, visiting, entertaining, and especially dancing are the primary activities of men. (Unlike the Hadza, gambling is only a minor leisure activity.)

The trance-dance is the focus of Bushman ritual life; over 40 per cent of the men have trained as trance-performers and regularly enter trance during the course of the all-night dances. At some camps, trance-dances occur as frequently as two or three times a week and those who have entered trances the night before rarely go out hunting the following day. Accounts of Bushman trance performances have been published in Lorna Marshall (1962) and Lee (1968). In a camp with five or more hunters, there are usually two or three who are actively hunting and several others who are inactive. The net effect is to phase the hunting and non-hunting so that a fairly steady supply of meat is brought into a camp.

#### *Caloric Returns*

Is the modest work effort of the Bushmen sufficient to provide the calories necessary to maintain the health of the population? Or have the !Kung, in common with some agricultural peoples (see Richards, 1939), adjusted to a permanently substandard nutritional level?

During my field work I did not encounter any cases of kwashiorkor, the most common nutritional disease in the children of African agricultural societies. However, without medical examinations, it is impossible to exclude

Table 4 Summary of Dobe Work Diary

Week	(1) mean group size	(2) adult-days	(3) child-days	(4) total man-days of consumption	(5) man-days of work	(6) meat (lbs.)	(7) average work/ adult	(8) Index of Subsistence Effort
I (July 6-12)	25.6 (23-29)	114	65	179	37	104	2.3	.21
II (July 13-19)	28.3 (23-27)	125	73	198	22	80	1.2	.11
III (July 20-26)	34.3 (29-40)	156	84	240	42	177	1.9	.18
IV (July 27-Aug. 2)	35.6 (32-40)	167	82	249	77	129	3.2	.31
4-wk. Total	30.9	562	304	866	178	490	2.2	.21
Adjusted Total*	31.8	437	231	668	156	410	2.5	.23

\* See text.

KEY: Column 1: Mean group size =  $\frac{\text{total man-days of consumption}}{7}$ .

Column 7: Work week = the number of work days per adult per week.

Column 8: Index of Subsistence Effort =  $\frac{\text{man-days of work}}{\text{man-days of consumption}}$  (e.g., in Week I, the value of "S" = .21, i.e., 21 days of work/100 days of consumption or 1 work day produces food for 5 consumption days).

Table 5 *Caloric and Protein Levels in the !Kung Bushman Dietary, July-August, 1964*

Class of Food	Percentage Contribution to Diet by Weight	Per Capita Consumption			Percentage Caloric Contribution of Meat and Vegetables
		Weight in grams	Protein in grams	Calories per person per day	
Meat	37	230	34.5	690	33
Mongongo Nuts	33	210	56.7	1,260	
Other Vegetable Foods	30	190	1.9	190	
Total All Sources	100	630	93.1	2,140	100

the possibility that subclinical signs of malnutrition existed.<sup>7</sup>

Another measure of nutritional adequacy is the average consumption of calories and proteins per person per day. The estimate for the Bushmen is based on observations of the weights of foods of known composition that were brought into Dobe camp on each day of the study period. The per-capita figure is obtained by dividing the total weight of foodstuffs by the total number of persons in the camp. These results are set out in detail elsewhere (Lee, 1969) and can only be summarized here. During the study period 410 pounds of meat were brought in by the hunters of the Dobe camp, for a daily share of nine ounces of meat per person. About 700 pounds of vegetable foods were gathered and consumed during the same period. Table 5 sets out the calories and proteins available per capita in the !Kung Bushman dietary from meat, mongongo nuts, and other vegetable sources.

This output of 2,140 calories and 93.1 grams of protein per person per day may be compared with the Recommended Daily Allowances (RDA) for persons of the small size and stature but vigorous activity regime of the !Kung Bushmen. The RDA for Bushmen can be estimated at 1,975 calories and 60 grams of

protein per person per day. (Taylor and Pye, 1965, pp. 45-48, 463). Thus it is apparent that food output exceeds energy requirements by 165 calories and 33 grams of protein. One can tentatively conclude that even a modest subsistence effort of two or three days work per week is enough to provide an adequate diet for the !Kung Bushmen.

#### THE SECURITY OF BUSHMAN LIFE

I have attempted to evaluate the subsistence base of one contemporary hunter-gatherer society living in a marginal environment. The !Kung Bushmen have available to them some relatively abundant high-quality foods, and they do not have to walk very far or work very hard to get them. Furthermore this modest work effort provides sufficient calories to support not only the active adults, but also a large number of middle-aged and elderly people. The Bushmen do not have to press their youngsters into the service of the food quest, nor do they have to dispose of the oldsters after they have ceased to be productive.

The evidence presented assumes an added significance because this security of life was observed during the third year of one of the most severe droughts in South Africa's history. Most of the 576,000 people of Botswana are pastoralists and agriculturalists. After the crops had failed three years in succession and over 250,000 head of cattle had died on the range for lack of water, the World Food Program of

7. During future field work with the !Kung Bushmen, a professional pediatrician and nutritionist are planning to examine children and adults as part of a general study of hunter-gatherer health and nutrition sponsored by the U.S. National Institutes of Health and the Wenner-Gren Foundation for Anthropological Research.

the United Nations instituted a famine relief program which has grown to include 180,000 people, over 30 per cent of the population (Government of Botswana, 1966). This program barely touched the Dobe area in the isolated northwest corner of the country and the Herero and Tswana women there were able to feed their families only by joining the Bushman women to forage for wild foods. Thus the natural plant resources of the Dobe area were carrying a higher proportion of population than would be the case in years when the Bantu harvested crops. Yet this added pressure on the land did not seem to adversely affect the Bushmen.

In one sense it was unfortunate that the period of my field work happened to coincide with the drought, since I was unable to witness a "typical" annual subsistence cycle. However, in another sense, the coincidence was a lucky one, for the drought put the Bushmen and their subsistence system to the acid test and, in terms of adaptation to scarce resources, they passed with flying colors. One can postulate that their subsistence base would be even more substantial during years of higher rainfall.

What are the crucial factors that make this way of life possible? I suggest that the primary factor is the Bushmen's strong emphasis on vegetable food sources. Although hunting involves a great deal of effort and prestige, plant foods provide from 60-80 per cent of the annual diet by weight. Meat has come to be regarded as a special treat; when available, it is welcomed as a break from the routine of vegetable foods, but it is never depended upon as a staple. No one ever goes hungry when hunting fails.

The reason for this emphasis is not hard to find. Vegetable foods are abundant, sedentary, and predictable. They grow in the same place year after year, and the gatherer is guaranteed a day's return of food for a day's expenditure of energy. Game animals, by contrast, are scarce, mobile, unpredictable, and difficult to catch. A hunter has no guarantee of success and may in fact go for days or weeks without killing a large mammal. During the study period, there were eleven men in the Dobe camp, of whom four did no hunting at all. The seven active men spent a total of 78 man-days hunting, and this work input yielded eighteen

animals killed, or one kill for every four man-days of hunting. The probability of any one hunter making a kill on a given day was 0.23. By contrast, the probability of a woman finding plant food on a given day was 1.00. In other words, hunting and gathering are not equally felicitous subsistence alternatives.

Consider the productivity per man-hour of the two kinds of subsistence activities. One man-hour of hunting produces about 800 edible calories, and of gathering, 2,000 calories. Gathering is thus seen to be 2.4 times more productive than hunting. In short, hunting is a *high-risk, low-return* subsistence activity, while gathering is a *low-risk, high-return* subsistence activity.

It is not at all contradictory that the hunting complex holds a central place in the Bushman ethos and that meat is valued more highly than vegetable foods (Marshall, 1960). Analogously, steak is valued more highly than potatoes in the food preferences of our own society. In both situations the meat is more "costly" than the vegetable food. In the Bushman case, the cost of food can be measured in terms of time and energy expended. By this standard, 1,000 calories of meat "costs" 1.2 man-hours, while the "cost" of 1,000 calories of vegetable foods is only 0.5 man-hours. Further, it is to be expected that the less predictable, more expensive food source would have a greater accretion of myth and ritual built up around it than would the routine staples of life, which rarely if ever fail.

#### *Eskimo-Bushman Comparisons*

Were the Bushmen to be deprived of their vegetable food sources, their life would become much more arduous and precarious. This lack of plant foods, in fact, is precisely the situation among the Netsilik Eskimo, reported by Balikci (Chapter 8, this volume). The Netsilik and other Central Arctic peoples are perhaps unique in the almost total absence of vegetable foods in their diet. This factor, in combination with the great cyclical variation in the numbers and distribution of Arctic fauna, makes Eskimo life the most precarious human adaptation on earth. In effect, *the kinds of animals that are "luxury goods" to many hunters and gatherers are to the Eskimos the absolute necessities*

of life. However, even this view should not be exaggerated, since most of the Eskimos in historic times have lived south of the Arctic Circle (Laughlin, Chapter 25a this volume) and many of the Eskimos at all latitudes have depended primarily on fishing, which is a much more reliable source of food than is the hunting of land and sea mammals.

#### WHAT HUNTERS DO FOR A LIVING: A COMPARATIVE STUDY

I have discussed how the !Kung Bushmen are able to manage on the scarce resources of their inhospitable environment. The essence of their successful strategy seems to be that while they depend primarily on the more stable and abundant food sources (vegetables in their case), they are nevertheless willing to devote considerable energy to the less reliable and more highly valued food sources such as medium and large mammals. The steady but modest input of work by the women provides the former, and the more intensive labors of the men provide the latter. It would be theoretically possible for the Bushmen to survive entirely on vegetable foods, but life would be boring indeed without the excitement of meat feasts. The totality of their subsistence activities thus represents an outcome of two individual goals; the first is the desire to live well with adequate leisure time, and the second is the desire to enjoy the rewards, both social and nutritional, afforded by the killing of game. In short, *the Bushmen of the Dobe area eat as much vegetable food as they need, and as much meat as they can.*

It seems reasonable that a similar kind of subsistence strategy would be characteristic of hunters and gatherers in general. Wherever two or more kinds of natural foods are available, one would predict that the population exploiting them would emphasize the more reliable source. We would also expect, however, that the people would not neglect the alternative means of subsistence. The general view offered here is that gathering activities, for plants and shellfish, should be the most productive of food for hunting and gathering man, followed by fishing, where this source is available. The hunting of mammals is the least re-

liable source of food and should be generally less important than either gathering or fishing.

In order to test this hypothesis, a sample of 58 societies was drawn from the *Ethnographic Atlas* (Murdock, 1967). The basis for inclusion in the sample was a 100 per cent dependence on hunting, gathering and fishing for subsistence as rated in Column 7-11 of the Atlas (Murdock, 1967, pp. 154-55). These 58 societies are plotted in Figures 1 and 2 and are listed in Tables 7 and 8 of the Appendix to this Article.<sup>8,9</sup>

The *Ethnographic Atlas* coding discusses "Subsistence Economy" as follows:

A set of five digits indicates the estimated relative dependence of the society on each of the five major types of subsistence activity. The first digit refers to the gathering of wild plants and small land fauna; the second, to hunting, including trapping and fowling; the third, to fishing, including shell fishing and the pursuit of large aquatic animals; the fourth, to animal husbandry; the fifth, to agriculture (Murdock, 1967, pp. 154-55).

Two changes have been made in the definitions of subsistence. First, the participants at the symposium on Man the Hunter agreed that the "pursuit of large aquatic animals" is more properly classified under hunting than under fishing. Similarly, it was recommended that shellfishing should be classified under gathering, not fishing. These suggestions have been followed and the definitions now read: *Gathering*—collecting of wild plants, small land

8. Two societies, the Gwi Bushmen and the Walbiri of Australia, were not coded by the *Ethnographic Atlas*. Their subsistence base was scored after consulting the original ethnographies (for the Gwi, Silberbauer, 1965; for the Walbiri, Meggitt, 1962, 1964).

9. In order to make more valid comparisons, I have excluded from the sample mounted hunters with guns such as the Plains Indians, and casual agriculturalists such as the Gê and Siriono. Twenty-four societies are drawn from Africa, Asia, Australia and South America. This number includes practically all of the cases that fit the definition. North America alone, with 137 hunting societies, contains over 80 per cent of the 165 hunting societies listed in the *Ethnographic Atlas*. The sampling procedure used here was to choose randomly one case from each of the 34 "clusters" of North American hunter-gatherers.



fauna and shellfish; *Hunting*—pursuit of land and sea mammals; *Fishing*—obtaining of fish by any technique. In 25 cases, the subsistence scores have been changed in light of these definitions and after consulting ethnographic sources.<sup>10</sup>

In Tables 9 and 10 of the Appendix to this article, the percentage dependence on gathering, hunting, and fishing, and the most important single source of food for each society are presented. Such scores can be at best only rough approximations; however, the results are so striking that the use of these scores seems justified. In the Old World and South American sample of 24 societies, sixteen depend on gathering, five on fishing, while only three depend primarily on mammal hunting: the Yukaghir of northeast Asia, and the Ona and Shifiana of South America. In the North American sample, thirteen societies have primary dependence on gathering, thirteen on fishing, and eight on hunting. Thus for the world as a whole, half of the societies (29 cases) emphasize gathering, one-third (18 cases) fishing, and the remaining one-sixth (11 cases) hunting.

On this evidence, the "hunting" way of life appears to be in the minority. The result serves to underline the point made earlier that mammal hunting is the least reliable of the subsistence sources, and one would expect few societies to place primary dependence on it. As will be shown, most of the societies that rely primarily on mammals do so because their particular habitats offer no viable alternative subsistence strategy.

#### *The Relation of Latitude to Subsistence*

The peoples we have classified as "hunters" apparently depend for most of their subsistence on sources *other* than meat, namely, wild plants, shellfish and fish. In fact the present sample over-emphasizes the incidence of hunting and fishing since some three-fifths of the cases (34/58) are drawn from North America (north of the Rio Grande) a region which lies entirely within the temperate and arctic zones. Since the abundance and species variety of edible plants decreases as one moves out of the tropical and temperate zones, and approaches zero in the arctic, it is essential that

the incidence of hunting, gathering, and fishing be related to latitude.

Table 6 shows the relative importance of gathering, hunting, and fishing within each of seven latitude divisions. Hunting appears as the dominant mode of subsistence *only* in the highest latitudes (60 or more degrees from the equator). In the arctic, hunting is primary in six of the eight societies. In the cool to cold temperate latitudes, 40 to 59 degrees from the equator, fishing is the dominant mode, appearing as primary in 14 out of 22 cases. In the warm-temperate, subtropical, and tropical latitudes, zero to 39 degrees from the equator, gathering is by far the dominant mode of subsistence, appearing as primary in 25 of the 28 cases.

For modern hunters, at any rate, it seems legitimate to predict a hunting emphasis only in the arctic, a fishing emphasis in the mid-high latitudes, and a gathering emphasis in the rest of the world.<sup>11</sup>

#### *The Importance of Hunting*

Although hunting is rarely the primary source of food, it does make a remarkably stable contribution to the diet. Fishing appears to be dispensable in the tropics, and a number of northern peoples manage to do without gathered foods, but, with a single exception, *all* societies at all latitudes derive at least 20 per cent of their diet from the hunting of mammals. Latitude appears to make little difference in the amount of hunting that people do. Except for the highest latitudes, where hunting contributes over half of the diet in many cases, hunted foods almost everywhere else constitute 20 to 45 per cent of the diet. In fact, the mean, the median, and the mode for hunting all converge on a figure of 35 per cent for hunter-gatherers at all latitudes. This percentage of

10. For their useful suggestions, my thanks go to Donald Lathrap, Robin Ridington, George Silberbauer, Hitoshi Watanabe, and James Woodburn. Special thanks are due to Wayne Suttles for his advice on Pacific coast subsistence.

11. When severity of winter is plotted against subsistence choices, a similar picture emerges. Hunting is primary in three of the five societies in very cold climates (annual temperature less than 32° F.); fishing is primary in 10 of the 17 societies in cold climates (32°–50° F.); and gathering is primary in 27 of the 36 societies in mild to hot climates (over 50° F.).

Table 6 *Primary Subsistence Source by Latitude*

<i>Degrees from the Equator</i>	<i>Primary Subsistence Source</i>			
	<i>Gathering</i>	<i>Hunting</i>	<i>Fishing</i>	<i>Total</i>
More than 60°	—	6	2	8
50°-59°	—	1	9	10
40°-49°	4	3	5	12
30°-39°	9	—	—	9
20°-29°	7	—	1	8
10°-19°	5	—	1	6
0°-9°	4	1	—	5
World	29	11	18	58

meat corresponds closely to the 37 per cent noted in the diet of the !Kung Bushmen of the Dobe area. It is evident that the !Kung, far from being an aberrant case, are entirely typical of the hunters in general in the amount of meat they consume.

#### CONCLUSIONS

Three points ought to be stressed. First, life in the state of nature is not necessarily nasty, brutish, and short. The Dobe-area Bushmen live well today on wild plants and meat, in spite of the fact that they are confined to the least productive portion of the range in which Bushman peoples were formerly found. It is likely that an even more substantial subsistence base would have been characteristic of these hunters and gatherers in the past, when they had the pick of African habitats to choose from.

Second, the basis of Bushman diet is derived from sources other than meat. This emphasis makes good ecological sense to the !Kung Bushmen and appears to be a common feature among hunters and gatherers in general. Since a 30 to 40 per cent input of meat is such a con-

sistent target for modern hunters in a variety of habitats, is it not reasonable to postulate a similar percentage for prehistoric hunters? Certainly the absence of plant remains on archeological sites is by itself not sufficient evidence for the absence of gathering. Recently-abandoned Bushman campsites show a similar absence of vegetable remains, although this paper has clearly shown that plant foods comprise over 60 per cent of the actual diet.

Finally, one gets the impression that hunting societies have been chosen by ethnologists to illustrate a dominant theme, such as the extreme importance of environment in the molding of certain cultures. Such a theme can be best exemplified by cases in which the technology is simple and/or the environment is harsh. This emphasis on the dramatic may have been pedagogically useful, but unfortunately it has led to the assumption that a precarious hunting subsistence base was characteristic of all cultures in the Pleistocene. This view of both modern and ancient hunters ought to be reconsidered. Specifically I am suggesting a shift in focus away from the dramatic and unusual cases, and toward a consideration of hunting and gathering as a persistent and well-adapted way of life.

## APPENDIX

Table 7 *The Sample of Hunter-Gatherers  
(excluding North America)*

People (Atlas No.)	Latitude and Longitude (Degrees)
AFRICA N = 5	
1. !Kung Bushmen (Aa1) ...	20S, 21E
2. Dorobo (Aa2) ...	2S, 36E
3. Mbuti Pygmies (Aa5) ...	2N, 28E
4. Hadza (Aa9) ...	4S, 35E
5. Gwi Bushmen (1) ...	22S, 23E
ASIA N = 5	
6. Gilyak (Ec1) ...	53N, 142E
7. Yukaghir (Ec6) ...	70N, 145E
8. Ainu (Ec7) ...	44N, 144E
9. Andamanese (Eh1) ...	12N, 93E
10. Semang (Ej3) ...	6N, 101E
AUSTRALIA N = 6	
11. Aranda (Id1) ...	24S, 134E
12. Murngin (Id2) ...	12S, 136E
13. Tiwi (Id3) ...	12S, 131E
14. Dieri (Id4) ...	28S, 138E
15. Wikmunkan (Id6) ...	14S, 142E
16. Walbiri (2) ...	22S, 133E
SOUTH AMERICA N = 8	
17. Paraujano (Sb5) ...	11N, 72W
18. Shiriana (Sd6) ...	4N, 63W
19. Yahgan (Sg1) ...	55S, 69W
20. Ona (Sg3) ...	54S, 69W
21. Alacaluf (Sg5) ...	52S, 74W
22. Chamacoco (Sh6) ...	20S, 59W
23. Aweikoma (Sj3) ...	28S, 50W
24. Botocudo (Sj5) ...	18S, 42W

Table 8 *The North American Sample*

People (Atlas No.)	Latitude and Longitude (Degrees)
1. Copper Eskimo (Na3) ...	69N, 110W
2. Kaska (Na4) ...	59N, 128W
3. Ingalik (Na8) ...	62N, 160W
4. Chugach (Na10) ...	60N, 166W
5. Nunamiut (Na12) ...	68N, 152W
6. Kutchin (Na20) ...	66N, 135W
7. Chipewyan (Na30) ...	60N, 105W
8. Montagnais (Na32) ...	48N, 72W
9. Northern Saulteaux (Na33) ...	52N, 98W
10. Eyak (Nb5) ...	60N, 145W
11. Tsimshian (Nb7) ...	55N, 130W
12. Quileute (Nb18) ...	48N, 125W
13. Chinook (Nb19) ...	46N, 124W
14. Tlingit (Nb22) ...	58N, 134W
15. Bellabella (Nb23) ...	52N, 128W
16. Cowichan (Nb26) ...	49N, 123W
17. Tututni (Nb31) ...	42N, 124W
18. Chimariko (Nb33) ...	41N, 123W
19. Tubatulabal (Nc2) ...	36N, 118W
20. Diegueno (Nc6) ...	32N, 116W
21. Modoc (Nc9) ...	43N, 122W
22. Achomawi (Nc10) ...	41N, 121W
23. Wintu (Nc14) ...	41N, 122W
24. Coast Yuki (Nc15) ...	39N, 124W
25. Lake Yokuts (Nc24) ...	36N, 120W
26. Cahuilla (Nc31) ...	33N, 116W
27. Washo (Nd6) ...	39N, 120W
28. Chilcotin (Nd8) ...	52N, 122W
29. Flathead (Nd12) ...	46N, 113W
30. Umatilla (Nd19) ...	46N, 119W
31. Panamint (Nd32) ...	36N, 117W
32. Kaibab (Nd53) ...	36N, 113W
33. Yavapai (Nd66) ...	35N, 112W
34. Seri (Ni4) ...	29N, 112W



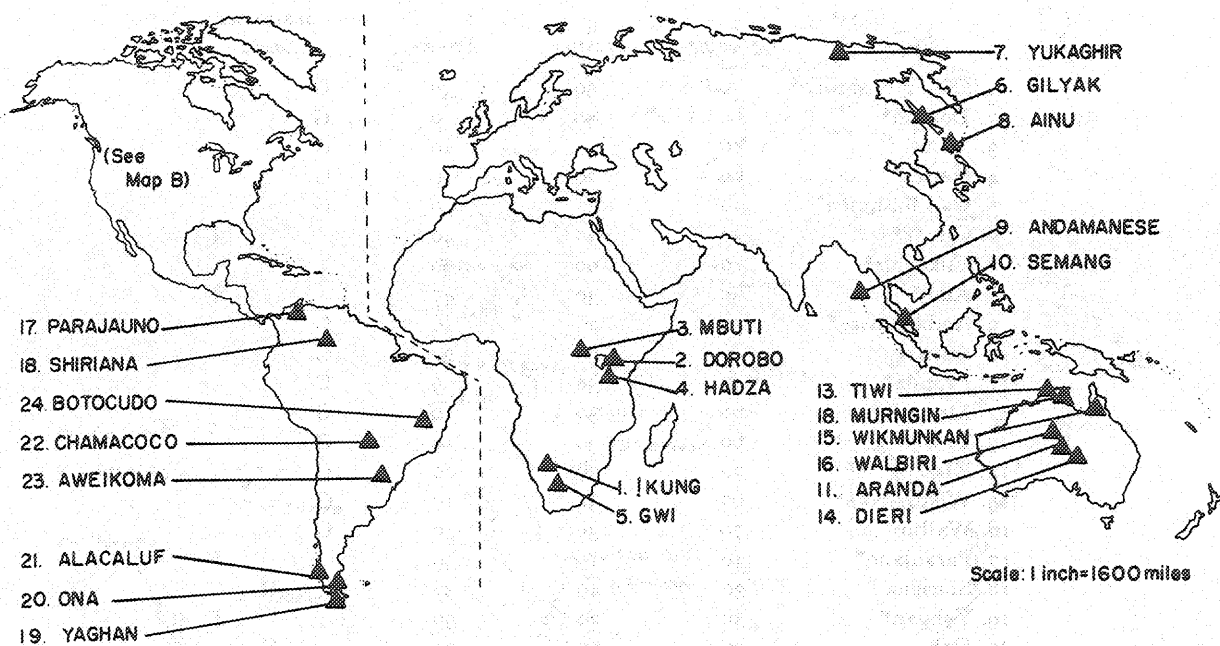


FIGURE 1. OLD WORLD AND SOUTH AMERICAN HUNTER-GATHERERS

Table 9 Subsistence Base of Hunter-Gatherers  
(Old World and South America)

People	Percentage Dependence on:			Primary Subsistence Source	
	Gathering	Hunting	Fishing		
1. !Kung Bushman*	70	30	0	G	
2. Dorobo*	60	40	0	G	
3. Mbuti	60	30	10	G	
4. Hadza*	80	20	0	G	
5. Gwi Bushmen	70	30	0	G	
6. Gilyak*	30	30	40		F
7. Yukaghir*	10	60	30	H	
8. Ainu*	30	30	40		F
9. Andamanese*	50	20	30	G	
10. Semang	40	30	30	G	
11. Aranda*	70	30	0	G	
12. Murngin*	60	30	10	G	
13. Tiwi*	60	30	10	G	
14. Dieri	70	30	0	G	
15. Wikmunkan*	60	30	10	G	
16. Walbiri	70	30	0	G	
17. Paraujano*	40	10	50		F
18. Shiriana	30	40	30	H	
19. Yahgan*	30	20	50		F
20. Ona	20	60	20	H	
21. Alacaluf*	30	20	50		F
22. Chamacoco	60	40	0	G	
23. Aweikoma*	60	40	0	G	
24. Botocudo	50	40	10	G	
Total				16	3 5

\* In some of the cases marked, the subsistence percentages have been changed from those published in the *Ethnographic Atlas*. The categories have been redefined so that shell fishing is included under "Gathering," and pursuit of sea-mammals under "Hunting." In the *Atlas*, both are included under "Fishing."

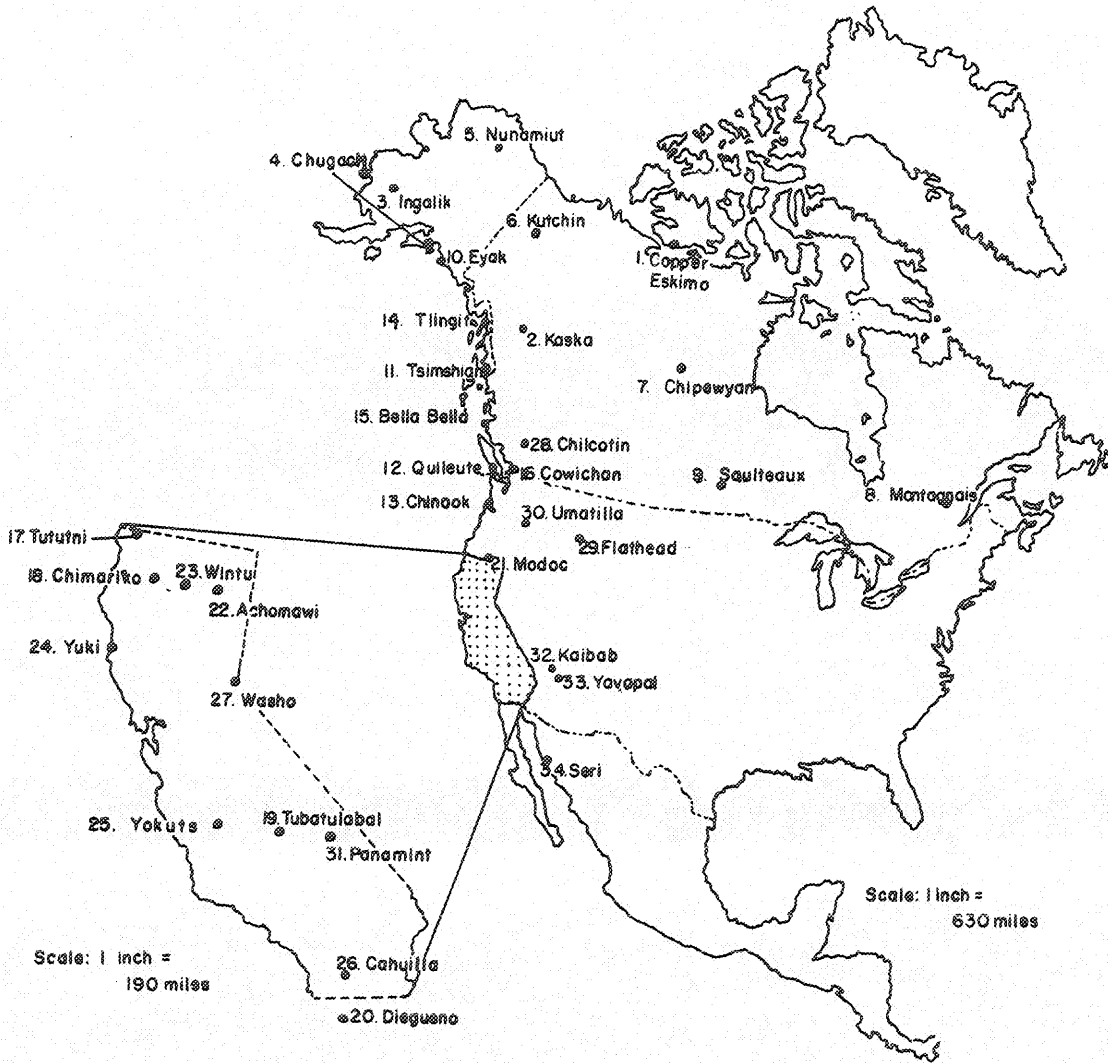


FIGURE 2. NORTH AMERICAN HUNTER-GATHERERS.

Table 10 Subsistence Base of Hunter-Gatherers  
(North America)

People	Percentage Dependence on:			Primary Subsistence Source		
	Gathering	Hunting	Fishing			
1. Copper Eskimo*	0	55	45	H		
2. Kaska	10	40	50			F
3. Ingalik	10	40	50			F
4. Chugach*	10	60	30	H		
5. Nunamiut	10	70	20	H		
6. Kutchin	10	40	50			F
7. Chipewyan	0	60	40	H		
8. Montagnais	20	60	20	H		
9. Sauteaux	20	35	45			F
10. Eyak*	20	45	35	H		
11. Tsimshian*	20	30	50			F
12. Quileute*	30	30	40			F
13. Chinook*	30	20	50			F
14. Tlingit*	10	40	50			F
15. Bellabella	20	30	50			F
16. Cowichan*	40	30	30	G		
17. Tututni*	45	20	35	G		
18. Chimariko	40	30	30	G		
19. Tubatulabal	50	30	20	G		
20. Diegueno	50	40	10	G		
21. Modoc	50	30	20	G		
22. Achomawi	30	40	30		H	
23. Wintu	30	30	40			F
24. Coast Yuki*	60	20	20	G		
25. Lake Yokuts	50	20	30	G		
26. Cahuilla	60	40	0	G		
27. Washo	40	30	30	G		
28. Chilcotin	20	30	50			F
29. Flathead	30	40	30		H	
30. Umatilla	30	30	40			F
31. Panamint	60	40	0	G		
32. Kaibab	70	30	0	G		
33. Yavapai	60	40	0	G		
34. Seri*	30	20	50			F
Total (North America) ...	...	...	...	...	13	8
Total (World) ...	...	...	...	...	29	11

\* In some of the cases marked, the subsistence percentages have been changed from those published in the *Ethnographic Atlas*. The categories have been redefined so that shell fishing is included under "Gathering," and pursuit of sea-mammals under "Hunting." In the *Atlas*, both are included under "Fishing."