A late summer camp of 25 persons, south of /Xai

Foraging with the !Kung

Preparing food

Filling ostrich shells with water

Preparing to move camp

Hunting

• Bushmen are excellent hunters
  – Although they do a fair amount of trapping, the most esteemed method of hunting is with bow and arrow
• The Bushman’s arrow does not kill the animal straight away
  – It is the deadly poison which eventually causes the death
  – In the case of small buck such as duiker or steenbok a couple of hours may elapse before death
  – For larger antelopes this could be seven to twelve hours
  – For large game, such as giraffe it could take as long as three days
Poison

• Today the Bushmen make the poison from the larvae of a small beetle but will also use poison from plants, especially the euphorbia, and snake venom
  – A caterpillar, reddish yellow in colour and about three-quarters of an inch long, called ka or ngwa was also used
  – It is common in the Kalahari and buries itself into a cocoon, from which emerges a beetle
  – The poison was repeatedly boiled until it looked like a red currant jelly
  – It was then allowed to cool and was ready to be smeared on the arrows

More on Poison

• The poison is very dangerous and is greatly feared by the Bushmen themselves
  – The bone points are reversed so that the poison is safely contained within the reed collar
  – It is also never smeared on the point but just below it - this prevents fatal accidents
• The poison is cardiotoxic and does not contaminate the whole animal
  – The spot where the arrow struck is cut out and thrown away, but the rest of the meat is fit to eat

Other Techniques

• The Bushmen also dug pitfalls near the larger rivers where the game came to drink
  – The pitfalls were large and deep, narrowing like a funnel towards the bottom, in the centre of which was planted a sharp-pointed stake
  – These pitfalls were covered with branches which resulted in the animals walking over the pit and falling onto the stake
• For catching small animals such as hares, guinea fowls, steinbok or duiker, snares made of twisted gut or fibre from plants were used
  – These had a running noose that strangled the animal when it stepped into the snare to collect the food that had been placed inside it.

More Hunting Techniques

• Another way of capturing animals was to wait at ant-bear holes
  – These holes are used by small buck as a resting place during the mid-day sun
  – The hunter will wait patiently behind the hole until the animal exits
  – When this happens it will be firmly pinned and hit on the head with a knobby stick
• The Bushmen are great stalkers and know about the habits of the game
  – Having found where a herd has gathered, they immediately test the direction and force of the wind by throwing a handful of dust into the air
  – If the ground is bare and open, he will crawl on his belly, sometimes holding a small bush in front of him
Technology

• The only animal that the Bushmen possess is the dog
  – They assist in the capture of animals such as hyena, duiker, warthogs and hares.
• Hunters carry a skin bag slung around one shoulder, containing personal belongings, poison, medicine, fly whisks and additional arrows
• They may also carry a club to throw at, stun and dispatch small game; a long probing stick to extract hares from their burrows or a stick to dig out ant-bears or warthogs

The Mongongo

• A highly nutritious fruit and nut
  – Main staple in the diet of the !Kung Bushmen
    • Nuts represent over 1/3 of their total calories, and are available almost all year long
  – Fruit of the mongongo is composed of five layers:
    • The fruit skin, which is removed and discarded
    • The green or red fruit flesh, which has a dry and spongy texture
      – Taste of the flesh is similar to a date, although it is not as sweet
    • The outer shell of the nut, which is very hard and difficult to crack
    • A thin inner shell (1 mm, or 0.04 inch).
    • The nut kernel looks like a small skinless hazelnut which breaks easily into halves
      – The taste is similar to that of cashews or almonds that have been dry-roasted
      – With long roasting, the nut develops a flavor similar to an aged cheese.

Mongongo gathering

• Under normal climatic conditions, the mongongo season begins when the fruit first ripens and falls to the ground in April
  • After the fruit flesh has been consumed, the nuts are roasted, cracked, and eaten

• By August, and lasting until approximately November, the fruit flesh has dried, and has been partially eaten by insects (the nut kernel is still okay at this point)
  • Despite the insect predation, some (dried) fruits are edible after soaking and cooking; the insect-damaged fruits are roasted to burn off the damaged fruit flesh, and the nuts are cracked

• From November to March, the fruit flesh is gone--eaten by insects--and only clean nuts are available.
Roasting and cracking mongongo nuts

• The flesh of the mongongo fruit was eaten whole and raw in the past, but now it is cooked in an iron cooking pot for 20 minutes.
• The nuts are roasted about 5 minutes in a mixture of coals and a small pile of dry, loose sand; then they are cracked.
  – They can be eaten whole, or pounded in a mortar, or mixed with a variety of vegetable or animal foods.
• The mongongo nut is an excellent source of protein (28% by weight) and energy (654 calories per 100 grams), as well as magnesium.

!xwa

• !Xwa is an important source of water.
• The pulp may be eaten.
  – The liquid may be squeezed out to eliminate the bulk.
  – The technique of squeezing !xwa to get water is only 63% efficient.
• The !xwa has a sweet, pleasant flavor.
• !Xwa is a starchy food and may be eaten with mongongo nuts.
• Its juice is used as a water source when water is scarce.
Grewia Berries

- Grewia berries are about the size of a pea
  - They consist of a thin, edible skin
  - An edible orange pulp
  - A tiny, inedible seed
- If ripe and fresh, they are eaten raw
  - Later in the season, after they dry and become stringy, they are pounded with water in the mortar, and the seeds removed
  - The pulp may then be eaten as a pudding, or a drink may be made from the mixture
- There can be side-effects to eating these berries
  - The !Kung consume large quantities of the berries, including the pits which are passed intact through the gut and expelled in massive wads in the feces
    - One of the hazards of eating Grewia in large quantities is the danger of fecal impaction
    - According to the !Kung, people have died from this condition!

Marula

- Season lasts from March to October
- The oval seed, about 2.5 cm long, consists of a skin, a juicy pulp, and a hard shell enclosing a small kernel
  - The juicy pulp has a wonderful flavor
  - However, the nutmeat is the most important part of the food.
- It is said to taste better than the mongongo
  - But it is much smaller, and the nutmeats are harder to extract, using a long thorn
- The nuts are often eaten as-is, but they can be used as a substitute for mongongo nuts in recipes

Baobab

- The seedpod of a very large tree
  - The seedpods are 10-15 cm long, 80-200 gm in weight, and have a dry pulp with 20-30 seeds
  - The composition of pods (by weight) is: 22% pulp, 31% seeds, 47% waste
  - The pods are in season from May to September
  - In immature pods, the seeds and pulp are eaten together
  - With mature pods, the pulp is pounded to remove the seeds
    - After removing the seeds, the dried pod pulp is pounded to produce a flour
    - The flour is then used to make pudding or drinks
    - The fruit has a pleasant flavor but is acidic
    - The seeds are roasted and consumed
  - The baobab (nut and fruit) contains 14% protein (by weight), and is an excellent source of magnesium, calcium, potassium, phosphorus, thiamine, and vitamin C (213 mg per 100 grams of pulp)
Vegetable ivory palm (ǃHani)

- The spherical seed of a palm tree
  - Consists of four layers
    - An outer skin (inedible)
    - Edible fruit pulp
    - Nutshell (inedible)
    - An extremely hard nut approximately
  - Early in the season, in June, about 1/3 of the weight consists of the fruit pulp
  - Later in the season (October), the seeds dry out and the fruit pulp proportion falls to 1/4
- The skin is peeled off and the fruit is pounded to remove it from the nutshell
  - The fruit pulp may be eaten raw or ground into a coarse meal
    - It is always eaten raw, unsalted, and never mixed with water
    - It may be eaten with baobab fruit (flour)
    - The flavor of the fruit pulp is similar to dates.

Tsama Melon

- Grows abundantly in the central and southern Kalahari desert
  - They are a major food and a water source
  - The melons are round, pale green or yellow in color, and weigh around 1 kg
  - They are easy to find and collect
  - The seeds are edible and are eaten roasted
    - The melon flesh is white, hard, and is more bitter than the domesticated watermelon
    - A large melon might be sweet in the center, although the degree of sweetness depends on the pollination parent

Tsin Bean

- The tsin bean is the second most important food of the ǃKung in the southern part of the Dobe area and in Nyae Nyae
- The seedpod of a vine, it has an inedible shell but contains edible seeds
  - The tuber of this plant, known as “n//n” is also edible
- Immature beans are collected in January, and the beans are peeled and roasted
  - After April, the beans are mature and the shells hard
- Beans are often roasted in-shell by burying batches in hot ashes
  - The beans are cracked and eaten whole; they are said to have a good flavor
  - The shelled beans might be ground up and water added to produce a soup or pudding

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories per 100 grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable Ivory Palm</td>
<td>350 kcal</td>
</tr>
</tbody>
</table>
The Machiguenga

- The Machiguenga are an Arawakan-speaking group located in Southeastern Peru along the Urubamba River and its mountainous tributaries
  - The area is one in which game and wild vegetable products are thinly distributed
    - Agricultural land is rapidly exhausted
  - The Machiguenga exploit the environment by maintaining small settlements distributed in relation to the availability of resources
  - Semi-sedentary residence characterized by small mobile settlements of two to three households
    - Averaging twenty to thirty people or single household units of four to nine occupants

- Subsistence is based on slash and burn agriculture combined with hunting and collecting
  - Sweet manioc and corn are the most important staple crops
  - Wild game is scarce, and meat constitutes only a small portion of the diet
  - Small birds, fish, and various grubs are major sources of protein
  - A variety of wild fruits and palm hearts complement the diet

- Despite the fact that protein is scarce, the Machiguenga are generally healthy and well fed
The Machiguenga

- The subsistence practices of the Machiguenga were analyzed by Keegan
  - He attempted to apply optimal foraging to the transition from hunting and gathering to agriculture
  - He applied a model that evaluated environmental patches
    - Gardens
    - Forest: wild game habitats
    - Rivers: fishing areas

### Table 1
Estimated Machiguenga resource rankings.

| Resource       | E/hr | P/hr | Ezuuresu
|----------------|------|------|----------
| Forest patch   | 65,000 | 3,944 | rare     |
| Collared peccary| (3,217) | 144 | common   |
| Wild fruits (orange)|     | 720 | common   |
| Bed            | 2,746 | 168  | rare     |
| White-lipped peccary| 2,362 | 391 | common |
| Cultivar/plant  | 1,326 | 169  | common   |
| Monkey         | 1,153 | 31   | common   |
| Garden patch   | 3,842 | 45   |          |
| River patch    | 314    | 38   |          |

*Calories per handling hour based on Haver et al. (1982: Table 3) and Johnson (1988).
*Grams of protein per handling hour; estimates are based on food values reported in Wing and Brown (1975: Table 4-3) and Haver et al. (1982). Where food values were not available, approximations were based on similar foods.
*Johnson (1977).
*Oranges and other fruits have similar food values.

### Table 2
Average annual patch productivity.

<table>
<thead>
<tr>
<th>Patch</th>
<th>Harvested g protein/yr</th>
<th>Harvested kcal/yr</th>
<th>Time/patch/y (hrs)</th>
<th>Protein capture/ unit time (g/hr)</th>
<th>Caloric capture/unit time (Kcal/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>10,875</td>
<td>170,800</td>
<td>1.45</td>
<td>7.25</td>
<td>116.49</td>
</tr>
<tr>
<td>River</td>
<td>52,312</td>
<td>330,800</td>
<td>1.50</td>
<td>10.38</td>
<td>214.10</td>
</tr>
<tr>
<td>Cultivar/plant</td>
<td>150,800</td>
<td>13,053,000</td>
<td>3.90</td>
<td>15.24</td>
<td>3,085.03</td>
</tr>
</tbody>
</table>

*All values from Johnson and Berens (1982), except where noted.
*From Johnson (1980).

### Table 3
Estimated average return rates (g protein/hr) from Machiguenga patches.

<table>
<thead>
<tr>
<th>Patch</th>
<th>Protein (g/hr)</th>
<th>Settling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New village</td>
<td>82</td>
<td>Die-hard</td>
</tr>
<tr>
<td>Mature village</td>
<td>8.8</td>
<td>In-Radio</td>
</tr>
<tr>
<td>Old village</td>
<td>7.9</td>
<td>Stream</td>
</tr>
<tr>
<td>Forest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td>83.0</td>
<td>Dry season</td>
</tr>
<tr>
<td>Hunting</td>
<td>36.6</td>
<td></td>
</tr>
<tr>
<td>Hunting + fish</td>
<td>26.6</td>
<td>None</td>
</tr>
<tr>
<td>Fishing + fish</td>
<td>6.6</td>
<td>None</td>
</tr>
<tr>
<td>Average</td>
<td>45.2</td>
<td>None</td>
</tr>
</tbody>
</table>

*Based on proportional change in return from distant (7-9 km), intermediate (2-4 km), and near (0-4 km) hunting areas around Yekonu villages, 1973-80 (Hawes and Vickers 1981: Table 3).
*Converted from actual g of fish per kcal work effort (Montgomery and Johnson 1977; Johnson 1987; Johnson and Berens 1980).
*From Johnson (1988).
*Other is an estimate of protein capture for all crops except maize and with a 30% reduction of maize yields to reflect actual consumption.

The Machiguenga

- Cultigens and prey types were ranked according to their dietary value in the community
- The model was optimized separately on protein and energy intake, finding that protein optimization better fits subsistence activities
  - Maize and manioc provide the bulk of calories consumed by the Machiguenga
  - Fishing produced the highest protein return per time invested
  - Random hunting at long distances away from the village provided the highly desired game animals such as the collared peccary, deer, and paca