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Hélène Pagezy

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Seasonal variation of food supply in the Lake Tumba region of Zaire

by H el ene PAGEZY

The Ntomba are settled near the equator in the flooded forest surrounding Lake Tumba in Zaire. The population is made up of two groups that are genetically distinct: the Oto, descended from cultivator-fishermen, and the Twa who are Pygmies descended from hunter-gatherers. Their villages and fields are located in the only lands that remain unflooded during the rainy seasons. The remaining forest is characterized by a well-developed drainage network made up of the lake, connecting rivers and their affluents, plus marshes and creeks.

While the Ntomba's supply of staple food, cassava, remains constant the year over, in contrast, the accompanying animal food (fish, caterpillars and game meat) is strongly seasonal, and depending upon human activities. In fact, hunting, fishing and caterpillar collecting are synchronized by the bimodal distribution of the rains. Even though from one year to the next, the seasons may be more or less contrasted, the onset of activities is dependent upon an "average" seasonal rhythm as perceived by the Ntomba .

PRODUCTION AND SEASONALITY

Among the Ntomba, both dry seasons are devoted to fishing. As water levels begin to drop, hoop-nets, which are adapted to local water levels and currents, are placed within the flooded

forest. They cover large segments of rivers, creeks and marshes. Some of them resemble long funnels open at one end through which currents propel the fish. They are turned over each time the current changes direction, that is to say before the major periods of flooding and water level decline.

As soon as the water level stabilizes and the forest floor allows walking on it, the Ntomba leave for their fishing camps located on the larger rivers and affluents. In the village of Nzalekenga—the focus of our research (1)—the men were distributed among five main camp-sites where they remained during the major dry season (June to September), whereas during the minor dry season (January to March) they occupied only three camp-sites. They draw their nets across rivers, use permanently fixed fishing rods, and place hoop-nets under water. Their wives join them as soon as they finish their planting, to dam creeks and bail out the water, leaving the small fry to be collected from the mud.

From the start of the major rainy season, fishermen begin to return to the village: this is also the caterpillar collecting season, and Nzalekenga continues to be deserted during day time until the month of October. Only a residual population of fishermen remains in the most accessible encampments on the Lolo river. At this time, solely the hoop-nets and lines, in which crocodiles may be caught produce anything.

Facing page: At the Malebela encampment, near Nzalekenga village, a Ntomba fisherman places a hoop-net (euku) on the riverbed. The special basket (ekaloli) in the front of the pirogue is used to gather shrimps among the aquatic plants. The stick buried in the substrate behind is a fixed rod for fishing (photo by H. Pagezy).



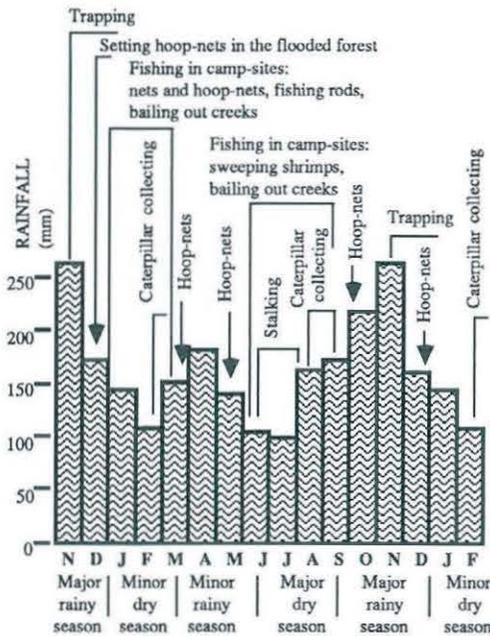
The Malebela fishing encampment, along an affluent of the Lolo River, during the dry season (photo by H. Pagezy).

Taking advantage of the rising waters that drive the game into unflooded areas, the hunters set out traps. Some of them stalk game several days running, in a forest where noise is dulled by humidity.

If fishing—the dominant activity during the dry season—seems sufficient to nourish the whole village, trapping—an activity confined mostly to the rainy season—seems insufficient. At that time, the Ntomba suffer from a specific type of hunger, “*nzala*”, defined as the shortage of meat. As soon as production fails to satisfy cultural norms pertaining to food consumption, the perceived deficit has both biological and psychological effects during a lean period which can last for several months.

Thus one finds among the Ntomba the same “seasonal hunger” phenomenon which Miracle discusses (2) and Ogbu mentions as being common in other regions of tropical Africa (3). This concept of seasonal hunger is defined differently in each culture. Hunger can be specifically attributed to the lack of the staple food normally providing the bulk of the energy intake, or to the absence of a culturally valued item such as game or fish.

Oto Ntomba girls using baskets to empty out water from a creek which has been dammed with branches and mud in order to gather fry and shrimps. Although this task requires a very high energy expenditure (chapter 4), it is not perceived to be as exhausting as work in the fields because it takes place in shaded areas within an enthusiastic cooperative context (Photo by H. Pagezy).



Seasonal activities of the Ntomba relative to the rainfall regime: on this graph, which shows the monthly rainfall averages, attention is drawn to the various fishing techniques employed during both dry seasons, whereas the trapping of game is confined to both rainy seasons. The transition between seasons allows the use of hoop-nets. The emergence of caterpillars during short periods announces the arrival of the first rains (source: Pagezy, 1988).



The various fishing techniques employed at Nzalekenga during a seasonal cycle (reconstructed scene designed by Gilles Kerzhero using the documents of H. Pagezy, for the 1981 exhibit at the Muséum National d'Histoire Naturelle, Paris).

1. As the water level drops at the start of the minor dry season (January), hoop-nets are placed in rivers and marshes.
2. During the minor dry season (February/March), the Oto install their fishing encampments in the forest. They are accompanied by the Twa who help them to smoke the fish and set up traps. Oto and Twa women and girls practise fishing by scooping out and completely emptying a pool of water to capture all the small fry.
3. During the minor rainy season that follows (April/May) the Oto activate the hoop-nets.
4. The major dry season (June/July/August) is the moment, for most of the inhabitants of Nzalekenga, to rejoin the encampment in order to participate in different fishing activities, and especially to raise a huge rigid net (*emenu*) kept under watch from the scaffold visible at the back of this picture.
5. In September, when the water rises again, the hoop-nets are used before returning to the village.
6. The field study, including the weighing of the catch, is also illustrated.

SEASONAL CYCLES AND FOOD CONSUMPTION

Food consumption, simultaneously measured among adult men at Nzalekenga village and in the fishing camps, using standard techniques (see chapter 3), is related to seasonal variations in human productive activities.

Seasonal fluctuations concern primarily animal products and are more noticeable in the village than in the camps (see table below).

Whereas the consumption of cassava tubers as a staple food is stable and nearly the same in the village and in the camps, the consumption

of leaves and oil palm fruits is much less important in the encampment where these food items are rarely available because they are brought from the village already cooked and are therefore perishable.

At all times fresh fish and shrimps are regularly included in the diet of fishermen. In contrast, the small fry from marshes is consumed exclusively at the village during the dry season.

Caterpillars, which are most abundant in the transition period between two seasons, only appear in the results of the food surveys in small quantity because the data were collected at the height of the major rainy and dry seasons.

Seasonal variation in daily individual food intake of adult Oto men, given in grammes (fresh weight) and in total calories, at Nzalekenga village and at the encampment (source: Pagezy, 1988-a).

	MAJOR RAINY SEASON 1979		MAJOR DRY SEASON 1980	
	village	camp	village	camp
ANIMAL FOOD				
Game meat (a)	37 g	39 g	19 g	3 g
Fresh fish and shrimps	17 g	221 g	36 g	287 g
Small fry from marshes	8 g	0 g	59 g	0 g
Smoked fish	7 g	21 g	18 g	28 g
Caterpillars	2 g	0 g	4 g	0 g
Meat of domestic animals (b)	10 g	0 g	2 g	0 g
PLANT FOOD				
Cassava tubers	806 g	884 g	844 g	861 g
Other starchy foods (c)	23 g	2 g	30 g	23 g
Leaves (d)	195 g	44 g	175 g	25 g
Pulp of the oil palm (e)	56 g	16 g	66 g	15 g
TOTAL CALORIES	1970 kcal	2086 kcal	2101 kcal	2159 kcal

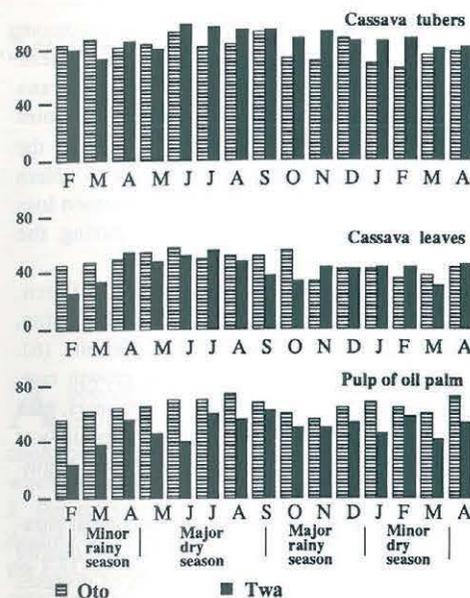
(a) Game meat eaten in camps is mostly that of aquatic animals (crocodiles, turtles, water-snakes) caught in hoop-nets or on fixed fishing lines.

(b) Meat of domestic animals is essentially that of chickens and, occasionally, goats.

(c) Other starchy foods are: plantains, sweet potatoes, yams, breadfruit, maize and, occasionally, rice (indicated weights correspond in these cases to cooked foods).

(d) This category essentially includes cassava leaves and the leaves of a few other species, as well as mushrooms.

(e) Pulp of the oil palm is prepared as a sauce (mosaka) to be eaten with various dishes, or eaten as a snack of roasted fruits, or used in the form of oil (the weight indicated is the pulp equivalent).



Monthly variation of the occurrence of meals including various plants, for 100 observed daily preparations, among the Oto and the Twa (source: Pagezy, 1988-b).

The results of another food survey (4), carried out among 40 Oto and 40 Twa families, reveal a lack of seasonality in the intake of cassava tubers which are eaten daily and prepared on 80 out of 100 days.

Cassava leaves, although less frequently eaten since they are prepared on only one day out of two on the average, never disappear entirely from the weekly menu.

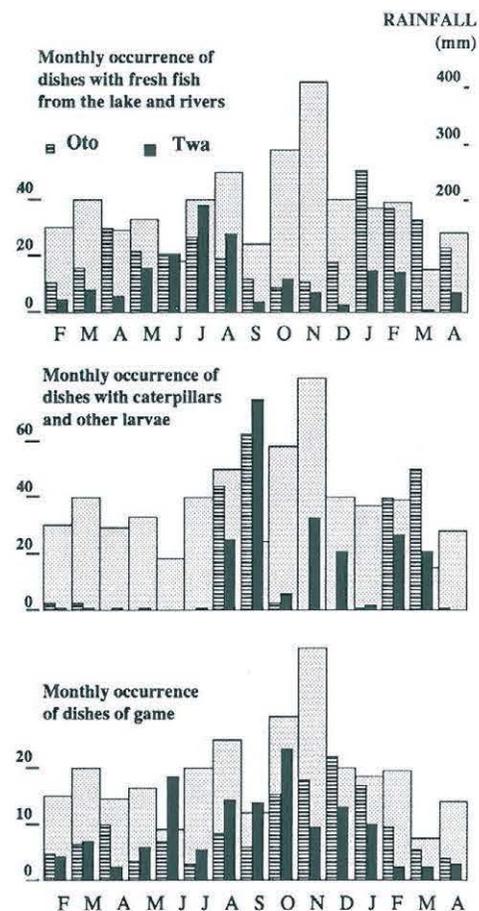
The pulp of oil palm fruits is eaten as a sauce (see page 54) accompanying leaf and meat dishes. Its consumption reflects fruit production, which, as is the case of most fruits, undergoes a noticeable seasonal variation with a maximum in the dry season.

Monthly variation of the occurrence of meals including various animal foods in relation to rainfall (stippled), for 100 observed daily preparations (source: Pagezy, 1988-b).

Conversely, the same food survey, pursued for 15 months, highlights the strong seasonality affecting animal food consumption.

The near disappearance of dishes of fresh fish from the lake or rivers, small fry from the marshes, caterpillars or game for periods of a few months can be correlated with the rainfall regime.

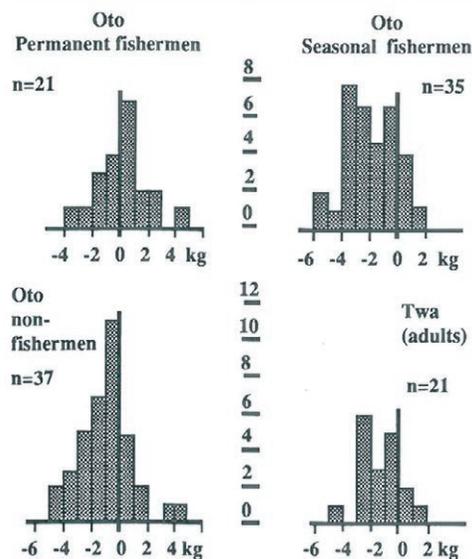
In fact, by determining the levels of the lake, rivers and marshes, rainfall either facilitates or impedes fishing and/or hunting. With respect to caterpillars, the bimodal distribution is a direct result of the phenology of the trees on which they feed (chapter 1).



SEASONAL VARIATION
OF PHYSICAL PARAMETERS

The periodic fluctuation of physical parameters such as body weight and fat reserves observed in the Lake Tumba region is one of the consequences of the seasonal variation in both physical activity and food intake.

Seasonal body weight variations, as measured among adult men at Nzalekenga village, demonstrate differences in susceptibility to external environmental factors due to their different lifestyles. Permanent fishermen, staying at the camp throughout the major rainy season, have a higher "ponderal index" and more muscular development in their forearms than do other categories of adult men in the same



Variation of body weight of the adult men Oto and Twa living at Nzalekenga during the major rainy season (number of subjects in each class of weight, gain or loss, in kg; source: Pagezy, 1982). Although most of the people in the village lose weight during the major rainy season, there are differences related to way of life and activity. Among the Oto, seasonal fishermen who leave the fishing camp during the rainy season are the most affected; in contrast, the fishermen, who stay permanently at the camp, have a relatively stable body weight. The Twa also have a significant body weight loss during the rainy season.

village. Conversely, they have less subcutaneous fat reserves as measured by skinfold thickness. The Nzalekenga study has not shown any fluctuation in the aforementioned variables among the permanent fishermen (5). On the other hand, cultivator/fishermen who return to the village at the end of the dry season lose approximately 2 kg in weight during the rainy season.

The ponderal growth-curves of children, whether they are of school age or still nursing, is also marked by seasonal variations (6). Compared to the average annual growth rate, Oto and Twa infants aged zero to two years, gain less weight during the rainy season, especially at the end of the major rainy season and the beginning of the dry season.

These seasonal variations of biological parameters reflect, not only the quantity and quality of food consumed, but also periods of diseases and parasitic infections whose agents abound in the humid tropics. Interaction between environmental and socio-cultural factors (subsistence strategies and nutrition versus parasite load) are of overwhelming importance. Thus we have tried to systematically relate the results of our food surveys to the biomedical parameters (chapter 4) recorded at the same time in the field.

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Adresse de l'auteur en 2011 :

Hélène Pagezy

USM 104, Muséum national d'Histoire naturelle, 57 rue Cuvier, CP 135, 75005 Paris.

pagezy@mnhn.fr