UNDOMESTICATED FOOD ANIMALS HUNTED AND USED FOR FOOD

Herbert W. Ockerman and **Lopamudra Basu**
The Ohio State University, Columbus Ohio, USA

Keywords: Undomesticated**,** Animals Hunted, Animals Used For Food

Contents

1. Introduction

Many undomesticated, exotic and wild animals are hunted, harvested, and captured by fishing. For those who engage in hunting and/or fishing for pleasure or for trophies, these animals make up only a modest protein or food supply. However, these animals can make up a significant protein supply for indigenous people or aborigines who have little or no access to domesticated animals. The line between these animals and those of the same specie that are farmed in captivity is sometimes gray since with proper handling and an adequate feed supply, most of these animals could be farmed. This section will concentrate on these animals (with the exclusion of fish) that in general, are not farmed.

The large variety of animals consumed in Africa (south of the Sahara), can be found in Tables 1, 2, 3 and 4 (includes chemical composition), and those popular in aborigine diets in Australia can be found in Table 5 (including lipid content). Table 6 gives a more worldwide perspective of the undomesticated animals used for food in various parts of the world, along with chemical composition, mineral composition, and selected vitamin content. Table 7 tabulates chemical composition and mineral content of cooked tissue from exotic animals utilized in various locations around the globe.

Species available
Grasscutter (*Thryonomys swinderianus*)
Grey Duiker (*Sylvicapra grimmia*)
Bushbuck (*Tragelaphus scriptus*)
Royal Antelope (*Neotragus pygmaeus*)
Black Duiker (*Cephalophus niger*)
Green Monkey (*Cercopithecus aethiops*)
Bay Duiker (*Cephalophus dorsalis*)
Red River-hog (Bush-pig) (*Potamochoerus porcus*)
Brush-tailed Porcupine (*Atherurus africanus*)
Pouched Rat (Giant Rat) (*Cricetomys gambianus*)
Monitor lizards (*Varanus* spp.)
Two-spotted Palm-civet (*Nandinia binotata*)
Togo Hare (*Lepus capensis*)

Source: Asibey, 1974

Table 1. Bushmeat available in the Kantamanto Market, Accra, Ghana

Species	**Remarks**
Rodents	Besides large rodents such as hares (*Lepus* spp.), giant rats (*Cricetomys* spp.), cane rats or grasscutters (*Thryonomys* spp.), and porcupines (*Hystrix* spp. and *Atherurus* spp.), which are generally eaten by the total population, a number of small rodents are also eaten by children. These may include common house rats (*Rattus* spp.), which are given to children who are suffering from whooping cough as they are believed to have medicinal value to such patients. All squirrels (*Anomalurus* spp., *Funisciurus* spp., *Protoxerus* spp., *Heliosciurus* spp., *Idiurus* spp., etc.) are eaten.
Bats	Most fruit-bats (*Eidolon* spp.) are eaten. They may even be smoked and packed in large quantities for markets
Anteaters	All species of pangolins (*Manis* spp.) and ardvark (*Orycteropus capensis*) are considered to be a delicacy and their meat is expensive.
Primates	All monkeys (*Procolobus* spp., *Cercopithecus* spp., and *Papio* spp.) as well as Chimpanzees (*Pan troglodytes*) are included in the diet where they are available.
Birds	Most birds, including birds of prey, sunbirds, and all herons, including Cattle Egrets (*Bubulcus ibis*), are consumed
Reptiles	All tortoises, turtles, both monitor lizards (*Varanus* spp.), African Python (*Python sebae*), Gaboon Viper (*Bitis gabonica*), Puff Adder (*Bitis arietans*), and the Night Adder (*Causus maculatus*), are consumed. Children may eat Agama Lizards (*Agama agama)*
Others	Insects such as brown ants are consumed, while the maggot of Palm

	Beetle (*Phyncophorus phoenicals*) is highly prized. African giant snails (*Archachatina* sp.) are eaten in large quantities, and in some areas they are the major source of protein.

Source: Asibey, 1974

Table 2. Wild Animals Eaten in Ghana

Center	**Remarks**
Damongo	Rural: 16 months of recording. 20 species of animals
Techiman	Urban: 11 months of recording. 30 species of animals, including snakes
Accra	Capital city: 17 months of recording. 13 species of animals, including mongoose, bats, monkeys, hyraxes, and monitor lizards

Source: Asiby, 1974

Table 3. Summary of Bushmeat Found in Some Centers in Ghana

Analysis	*Macrotermes subhyalinus*, termite, fried in oil	*Imbrasia ertli*, moth cooked in water (salt is added)	*Usta trepsichore*, moth cooked in water (salt is added)	*Rhyncophorus phoenicis*, weevil, fried in oil
Moisture, %	0.94	9.02	9.24	10.75
Protein, %	38.42	48.66	44.10	20.34
Fat, %	46.10	11.08	8.60	41.73
Carbohydrate,%	7.98	16.88	26.29	24.79
Ash, %	6.56	14.36	11.77	2.39
Chemical score, compared to whole egg	58	52	47.5	14.4
Chemical score, compared to FAO reference protein, 1973	63	69	46	54
Biological value	77	20	64	33

Source: Oliveira, *et al.* 1976.

Table 4. Nutritive Value of Insects Consumed in Angola

	Animal species	**% lipid content**	**Saturates**	**Mono-unsaturates**	**Poly-unsaturates**	
					n-6 Series	**n-3 Series**
Mammals	Anelope Kangaroo	1.2-2.5	30.0-34.8	26.9-35.1	19.6-31.5	10.5-11.6
	Black-footed rock wallaby	2.0	31.8	37.7	24.1	6.4
	Black tailed wallaby	Not determined	25.2	14.8	53.9	6.1
	Bushtail (O)possum	1.1	35.8	15.3	35.3	13.6
	Common	Not	36.8	12.9	43.1	7.2

	wombat	determined				
	Dugong	1.2	36.6	43.2	11.9	8.3
	Eastern gray kangaroo	Not determined	31.7	29.4	Not determined	11.0
	Eastern walloroo	Not determined	28.8	23.5	43.2	4.5
	Koala	0.8	31.0	11.9	50.8	6.3
	Long nosed potoroo	Not determined	31.5	25.9	37.9	4,8
	Platypus	1.8	29.6	18.7	26.9	24.8
	Red kangaroo	Not determined	35.1	32.4	25.8	6.7
	Ringtail possum	Not determined	30.6	34.7	30.2	4.5
Birds	Emu	2.6	27.6	31.5	36.0	4.9
	Pacific black duck	1.9	31.0	21.1	36.9	11.0
Reptiles	Freshwater crocodile	0.8	30.8	13.0	37.9	18.3
	Gould's goanna	1.3-2.1	27.2-29.1	28.4-48.5	21.3-35.4	1.5-7.1
	Northern snake neck turtle	0.6	33.2	18.0	34.8	14.0
	Pacific black duck	1.9	31.0	21.1	36.9	11.0
	Red bellied black snake	1.0	29.4	15.5	46.9	8.2
	Perente	1.5	32.7	23.8	31.1	12.4
Fish and crustaceans	Black bream	2.4	40.2	30.4	17.8	11.6
	Bluebone	0.6	28.9	13.2	28.2	29.7
	Freshwater barramundi	1.0	37.9	28.1	12.7	21.3
	Mangrove ray	1.1	34.2	38.2	11.9	15.7
	Yabbie	0.7-1.4	22.8-32.2	25.6-31.3	25.0-27.1	9.4-26.6
Insects	Witchetty grub	38.0	32.5	67.1	0.4	0
Molluscs	Land snails	4.3	24.7	31.1	43.3	0.9
	Mussel	1.7	26.6	19.4	6.0	48.0

Source: Naughton *et al.* 1986.

Table 5. Lipid Content of the Muscle of Some Food Animals Used in Aboriginal Diets in Australia

Meat	Moisture %	Fat %	Ash %	Protein %	Na mg	Mg mg	P mg	K mg	Ca mg	Mn mg	Fe mg	Cu mg	Zn mg	Sr mg	Nanogram/g of αToco pherol	Micrograms/ g Ribo-flavin	Micrograms /g Thiamine
Alligator	73-80	0.8-1	0.5-1	16-18	47	27	231	367	9	.077	0.9	.02	1	.017	1.88	0.45	0.07
Ant	65.3	5	1.3	9-17	72	29	224	232	20	3	15	.47	4	.115			
Ant, flying female	60.0	9.5		3.0													
Ant, flying male	60.0	1.3		10.1													
Ant, red		3.5		13.9					48		16						
Antelope	60.2-74.1	2.0-2.2	1.1	22.4-30.4			302		6.5		2.1					0.28-0.58	0.07-0.32
Bear	71.2	8.3	0.7	20.1												0.68	0.16
Bee maggot	42.6	7.9-19.8	9.5	15-20.3	4.4	27	83-210		.5-8		1.9	.04	1			0.20-0.62	0.02-0.40
Beetles	56.2	1.8	3.7	27.1													
Bison	71-75.4	1.2-2.4	0.9	19-22	47-59				4-7		3-3.2				0.74	0.72	1.35
Boar, wild	72-77	1-8.3	.7-.9	16.8-21	54	27	120-255	418	5-12	.013	9	.09	4	.001		0.11	0.39
Caiman	71.4	0.9	0.4	22.6											1.19	0.17	0.33
Caribou	71.5	3.4	1.1	22.6												0.72	0.32
Caterpillar	81.1	2.7	1.4	6.7-10.6			139		19		0.5-13					0.20	0.50
Cricket	76.0	5.3-5.5	2.1	12.9-13.7					18-76		10-13						
Deer	73-77	1-2	1.2	18-23	32	28	236	391	4	.012	2	.11	2	.005		0.46	0.22
Duck, wild	66.5	2-4	1.2	17.4-20	73	30	252	366	12	.121	9	.17	2	.039		0.27	0.35
Dung beetle		4.3		17.2					31		8						
Elk	74.4	1.4	1.0	22.9													

Emu	74	1.7-8.1	1.1-1.2	20.6-21.9													
Frog legs	83.6	0.3-0.35	0.8	15.3-16.4			176	243	23		1.3					0.14	0.06
Grassopper	62.7	3.3-6.1	1.2	14.3-26.8					27-40		3-11						
Grubs	55-80	9-19	0.5-2	20.2	7-8	35	135	238	15	.063	3	.45	3	.011			
Bandicoot	76.0	1.1	1.3	21.4	83	31	280	467	6	.088	3	.15	2	.019			
June beetle		1.4		13.4					23		6						
Lizard	73.0	0.6	2.5	24.0	45	22	210	319	5	.053	2	.02	2	.011			
Locust	57.1	21.5		18.2													
Monitor, iguana	73.2	1.2	1.6	24.0			258		26		3.7					0.20	0.05
Moose	75.6	0.7	1.1	22.2												0.27	0.06
Moth				28		54			035		35	2.4	23			0.02	0.04
Ostrich	75-77	0.5-4.9	1.1-1.2	20-22	43	21	208	351									
Pheasant	68-70	3.6-9.3	1.3-1.4	22.7-24.8			287		10		0.4					0.13-0.14	0.07-0.10
Quail	69.7-71.3	1.2-12.1	0.9-1.5	19.6-26.0	149		308	352	17-36		7.5					0.26-0.38	0.24-0.46
Rabbit, wild	74.3-74.5	2.3-7.8	1.0-1.1	16.9-21.7			350		7							0.06	0.03
Silkworm	60.7	5.6-14.2	1.5	9.6-23.1			252		6-42		1.2-1.8						
Snake	75.0-85.4	1.5-3.3	1.0	11.8-14.4	79	19	160	293	9	.057	1	.00	2	0.15			
Squirrel	71.8-77.9	0.4-3.2	1.1-1.4	21.2-26.3	186		200	558	23		1.9					0.21	0.07
Swiflet nest, dried	12.6	0.4	4.3	53.4	210		18	55	470		4.3						
Tail	72.7	4.4	1.0	21.9			260		15							0.20	0.30
Termites	44.5	28.0	2.9	14.2-							35						

				20.4													
Turkey, Bush	74,5	1.3	1.3	20.5	57	34	295	437	5	.032	4	.14	1	.015			
Turtle, snapping	83.0	0.2	1.0	15.8			220				2					0.47	0.22
Turtle, Soft shell	80.9	0.8	0.8	17.5			146	235	107		1.5					0.50	0.25
Wallaby	75-78	0.5-1	1.2	22.2	70	22	200	295	6	.062	14	.13	3	.009			
Water beetle giant		8.6		18.9					43		14						
Weevil				6.7-7		30	0.3		.19		13	1.4	24			0.02	0.03
Whale	79.2	2.8	0.6	17.4	30		147		7		3.2					0.08	0.10

Source: http://www.ent.iastate.edu/misc/insectnutrition.html; Lakritz *et al.* 1998; Leung *et al.* 1968, 1972; Ohtsuka *et al.* 1984; Sabry and Rizek, 1982; USDA 1999; USDA. 1989; USDA, 1979; + other scattered sources

Table 6. Hunted Animal Raw Proximate Analysis

Food	Method of cooking	Moisture, %	Protein, %	Fat, %	Na, mg	K, mg	Ca, mg	Mg, mg	Fe, mg	Cu, mg	P, mg	S, mg	Cl, mg
Bear	Simmered, flesh		32.5	13.5									
Bison	Roast, flesh		28-35	1-3									
Boar, wild	Roast, flesh		25-28.4	4.4									
Caribou	Roast, flesh		28.9	4.5									
Deer	Roast, flesh		25-30.2	3-3.3									
Elk	Roast, flesh		30.2	1.9									
Grouse	Roast, flesh	61.6	30.1	5.3	96	466	29.8	40.6	7.6		338	340	134
Hippopotamus	Smoked	20.3	63.1	12.8									
Hare	Roast, flesh	59.0	31.2	7.0	53	403	28.2	30.0	9.8	0.24	337	347	108
	Stewed, flesh	60.7	29.2	8.0	40	211	20.7	22.2	10.8		248	320	74
Moose	Roast, flesh		29.3	0.9									
Partridge	Roast, flesh	54.5	35.2	7.2	100	407	45.8	36.0	7.7		313	399	99
Pheasant	Roast, flesh	56.9	30.8	9.3	104	411	49.3	35.0	8.4		308	306	108
Crab	Boiled, flesh	72.5	19.2	5.2	366	271	29.4	47.9	1.3		350	465	570

Eels, elvers	Raw, whole	81.8	12.6	2.2	67	230	515	31.0	4.0	Tr.	440	441	55
Eels, silver	Raw, flesh	57.1	14.4	27.8	77	215	12.6	14.3	0.8	0.03	192	162	69
Eels, yellow	Raw, flesh	71.3	16.6	11.3	89	267	18.5	19.0	0.7	0.05	223	187	57
Lobster	Boiled, flesh	72.4	21.2	3.4	325	258	61.9	34.3	0.8		283	514	525
Mussels	Raw, flesh	84.1	11.7	1.9	289	315	88.0	22.7	5.8		236	367	463
	Boiled, flesh	79.0	16.8	2.0	210	92	197	25.0	13.5		331	348	315
Ostrich	Cooked, flesh	66-71	24-34	1.4-3.5	62-85		1.5-2		2.8-3				
Oysters	Raw, flesh	85.7	10.2	0.9	505	258	186	41.8	6.0		267	249	815
Scallops	Steamed, flesh	71.3	22.4	1.4	265	476	115	38.3	3.0		338	570	410
Caterpillars	Smoked	20.4	62.3	4.6			513		6.9		471		
	Dehydrated		63										
House flies	Dried		61-63	9-16									
Locust	Fried	48.0	30.0	10			150		5.0				
	Dried		51-75	7-18									
Silkworn	Dried		60										
	Dried, De-oiled		76										
Termites	Dried	1.7	35.7	54.3			142		52.0		780		
	Fried	14.7	31.8	42.6			80		17.4		520		

Source: Leung *et al.* (1968); McCance and Widdowson (1960); and other scattered sources.

Table 7. Analysis of food value of various animals, cooked or raw (as indicated)

-
-
-

Bibliography

Asibey, E. O. A. 1974. Wildlife as a source of protein in Africa south of the Sahara. Biological Conservation 6(1)32-39.

DeFoliart, G. R. 1979. Is there a greater role for insects as food? Iowa Science Teachers Journal. 16(3)30-31.

http://www.ent.iastate.edu/misc/insectnutrition.html;

http://www.flmnh.ufl.edu/natsci/herpetology/brittoncrocs/csl.html

Lakritz, L., Fox, J. B., and Thayer, D. W. 1998. Thiamin, riboflavin and α-tocopherol content of exotic meats and loss due to gamma radiation. J. Food Protection, 61(12) 1681-1683.

Leung, W. T. W., Butram, R. R., and Chang, F. H. 1972. Food composition table for use in East Asia. U.S. Dept. of Health, Education and Welfare and FAO of UN.

McCance, R. A., and Widdowson, E. M. 1960. The composition of foods. Her Majesty's Stationery Office, London.

Naughton, J. N., O'Dea, K., and Sinclair, A. J. 1986. Animal Foods in Traditional Australian Aboriginal Diets. Lipids 21(11)684-690.

Ohtsuka, R., Kawabe, T., Indaoka, T., Suzuki, T., Hongo, T. Akimichi, T. and Sugahara, T. 1984. Composition of local and purchased foods consumed by the Gidra in Lowland Papua. Ecology of Food and Nutrition 15(2)159-169.

Oliveira, J. F. S., de Carvalho, J. P., de Sousa, R. F. X. B, and Simao, M. M. 1976. Ecology of Food and Nutrition. 5, 91-97.

Ramos-Elorduy, J., Moreno, J. M. P., Parado, E. E., Perez, M. A., Otero, J. L. and Guevara O. L. 1997. Nutritional Value of Edible Insects from the State of Oaxaca, Mexico. J of Food Composition and Analysis 10, 142-157.

Sabry, Z. I. And Rizek, R. L. 1982. Food composition tables for the Near East. FAO of UN and. U.S. Dept. of Agric. Human Nutrition Information Div. Consumer Nutrition Center.

Scott, T. and Foster, B. G. 1997. *Salmonella* spp. in free-ranging and famed alligators (*Alligator mississippiensis*) from Texas and Louisiana, USA. Aquaculture 156:179-181.

USDA. 1999. USDA, food composition data. http://www.nal.usda.gov/fnic/foodcomp/Data/index.html

USDA. 1989. Composition of foods: lamb, veal and game products.

USDA. 1979. Composition of foods: poultry products.

Biographical Sketches

Dr. Herbert W. Ockerman is a Professor at The Ohio State University in the Meat Science Area of the Department of Animal Sciences, Columbus, Ohio, USA. He is involved in both food teaching and research and his areas of specialty include, Food Biochemistry, Food Microbiology, Statistics, and International Education. Prof. has received 26 local and national honors as well as 67 international honors

from 6 continents. His publications exceed 1,650 scientific and industry focused articles, including 80+ books or chapters in books. He belongs to 24 professional societies and is listed in 56 biographical listings. He has established five International University Endowments and his hobby is shipping textbooks to his alumni around the word who are currently Secretary of Agriculture, numerous University's Deans of Agriculture, numerous Departmental Chairmans, and numerous Faculty members both at Universities, National Research Originations, and Private Businesses. He currently has advised 98 international students from 32 countries and supervised 61 visiting professors from 24 courtiers. He has been invited to give 100+ international presentations, keynote speeches, short courses, and seminars in his discipline.

Lopamudra Basu is a Ph. D. Student from India in The Department of Animal Sciences, also specializing in Meat Science and International Education at the Ohio State University.