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Introduction to Entomophagy Anthropology

As a lifelong picky eater, I never imagined that I would become a promoter of the benefits of insects in our modern diet. My study of edible insects started out as a purely scholarly pursuit. I came into the field of paleoanthropology with a desire to study the evolution of tool use. To me, the transition to more sophisticated and complex ways of exploiting the environment represented a critical stage in human evolution. Our ancestors that used tools had access to increased resources, and they could support the nutritional demands of their increasing brain sizes. As brain size grew, more innovation could occur and more resources could be procured. I wanted to find a project that would enable me to investigate the relationship between tools, diet, and brain size. Ultimately, and unexpectedly, I found my research focus not on tools but instead on the insects that became available through tool use.

My research has focused primarily on the dietary contributions of termites. Our closest living primate cousins, the chimpanzees, are notable termite foragers; they make tools from sticks, leaves, or grass to penetrate open passageways of termite mounds and "fish" out termites. People today also consume termites in tropical regions across the continents, using more sophisticated technology than chimpanzees but still relying on nonmechanical means. Because both humans and chimpanzees eat termites, it seems likely that our last common ancestor and its descendants on both sides also ate termites.

The descendants along the human lineage are collectively known as hominins and include humans, our direct ancestors, and closely related extinct taxa.[1] Many paleoanthropologists have noted that early hominins

would have been capable of using simple tools to extract social insects from their nests in ways similar to chimpanzees today (e.g., Bartholomew and Birdsell 1953; Mann 1972). Panger and colleagues (2002) describe the rationale:

> Because most early hominins are associated with nonarid environments such as riparian forests, densely wooded habitats, and mosaic habitats with some grasslands, we assume that such high-energy, difficult-to-access foods such as nuts, social insects, and honey were available. We further assume that raw materials for making tools, among them sticks, grasses, leaves, and appropriate stones, were also available to all early hominins. There is little doubt that hominins, given a body mass comparable to or greater than that of chimpanzees, had the strength to perform a variety of tool-using activities, including the manufacture and use of stone tools. (Capuchins, which, at 2 to 3 kg, are about the size of a house cat, are able to make stone tools.) Thus, we assume that the ecological impetus, raw materials, and necessary strength for tool use were available to early hominins from the time of the split between hominins and panins [chimpanzees and bonobos]. (236)

Working from these same assumptions, my research goals are to reconstruct the dietary and behavioral components of insect foods for hominin life. I have concluded that termites and other insects were a reliable and valuable resource that hominins likely benefited from. What is particularly notable about insects is that they are nutrient dense and that it is much simpler to acquire them than it is to obtain other similarly nutritious resources. Insects are an animal food; they provide many of the same benefits as meat, eggs, and milk. In our society, these products come from domesticated animals, but in nature, these resources are difficult to obtain. Yet insects are abundant; although difficult to calculate, it is suspected that they make up the largest proportion of the earth's terrestrial fauna biomass.[2] Although many insects are secretive, social insects such as termites, ants, and bees are especially easy to find because they live in groups of thousands or even millions. Relying on the capture of large game is a risky way to meet dietary demands, especially when many of the same benefits can be received by visiting a termite nest for a short period of time. Insects thus provide an appealing resource option for individuals

who cannot afford to take risks in how they procure food. Although some hominin individuals may not have been affected when they had to endure short periods without game, female hominins, who for much of their adult lives were responsible for meeting their own nutritional demands plus the needs of a gestating fetus or nursing infant, would have benefited the most from the dependability of insect foods.

After detailing the numerous benefits of edible insects in my research, the lack of this food in my own culture became glaringly obvious. I began to wonder why we don't eat insects in the United States. Because I believe insects provided an important food source over the course of human evolution, I decided that the question could best be addressed by reframing it: Why did people in some cultures stop eating insects? As I began to investigate this new line of research I was introduced to an ever-growing community of edible insect enthusiasts who promote the normalization of this vastly underutilized resource. Some of these advocates are even promoting insects as part of the paleo diet craze because they fit the grain- and dairy-free requirements of this trend. As a researcher of insects in real paleo diets, I now aim to apply my work to real-life problems of food security and sustainability. In this book, I will demonstrate how theory from the field of biological anthropology adds to the written record on the benefits of edible insects and how the academic pursuit of the true paleo diet provides convincing evidence of the importance of insects as a food source.

Entomophagy and Other Terms for Eating Insects

Carnivores (meat eaters), herbivores (plant eaters), and omnivores (those who have a mixed diet): these definitions are familiar to most people thanks in part to abundant educational media directed at children who are captivated by dinosaurs. However, in biology, there are numerous variations on these themes. These include obligate diets, which means the entire diet comes from a resource, and facultative forms, where the resource makes up the majority of the diet, but it is supplemented with other food items. As a species, humans are omnivores. Our bodies require nutrients that in nature come from both plant and animal foods. However, the human condition enables people to be successful with highly variable proportions of these resources. It is possible for people to be facultative

carnivores or facultative herbivores as long as all dietary nutrients are provided in some way. In modern society, these nutrients may come from supplements or enriched foods, but in nature, people have found ingenious ways of extracting essential nutrients from diverse habitats.

Another term is insectivore, which indicates a specialization in eating insects. Across the animal kingdom, species of invertebrates, fish, amphibians, birds, lizards, and mammals make a living by eating insects. In mammals, the word insectivore often indicated placement within the now-defunct taxonomic order Insectivora. This category was a catch-all taxon that included primitive-looking, small, insectivorous fossil mammals because they were thought to resemble the ancestral stock from which all placental mammals arose. Extant taxa of the order included shrews, moles, and hedgehogs, but advances in genetics have determined that these species do not share a recent common origin. This has rendered the order Insectivora taxonomically meaningless, and its former constituents have been placed into other orders (Stanhope et al. 1998).

Additional confusion regarding the term insectivore arises when its derived form, insectivory, is used. Unlike insectivore, which indicates either obligate or facultative specialization on the resource, insectivory is used more broadly to indicate consumption of insects in any quantity. For instance, there are few insectivorous species in the order Primates, but primatologists often record the rates of insectivory for species that specialize on other foods such as fruit and supplement their diets with only small amounts of insects.

A synonym for insectivory is entomophagy, but this word also has a complicated meaning and usage. One benefit of the word entomophagy is that unlike insectivory, it does not imply specialization (phagus = eating; vore = one that feeds). Even people who eat insects every day are not facultative insectivores, since the majority of their diets is composed of other resources. Thus, entomophagy is a more accurate term for describing occasional or supplemental insect eating. This term is more commonly used than insectivory in scholarly literature pertaining to insects as human food. However, the "phagy" part of the term implies an infrequency that can suggest that the occasional use of the food is an exceptional or even an abhorrent behavior. There is no comparable terminology for eating other sources of animal protein—for instance, bovinaphagy is not a word to indicate beef consumption, even though the meat portions of diets vary

greatly by culture and some animals are used only occasionally or not at all. Examples of commonly used terms that include "phagy" are geophagy, the consumption of soil, and coprophagy, the consumption of feces, both of which, when applied to people, indicate feeding on resources that are essentially nonnutritive to humans and thus behavior that demands an explanation such as a severe mineral deficiency or an eating disorder. Thus, the term entomophagy may incorrectly imply that insects are not a high-quality food for people (Evans et al. 2015).

A problem with these terms that is unique to this book is using the words commonly used in academic disciplines to talk about insect consumption over the course of human evolution. If entomophagy is the term that is used most often when describing the consumption of insects in the present-day human diet and insectivory is the term most commonly used to describe the insect portion of the nonhuman primate diet, what word should be used for the insect eating our hominin ancestors did? The two words are technically synonyms, but in this case, choosing one word over the other may imply further meaning regarding the human condition. Thus, for most of my writing, you will find that I avoid specialized vocabulary and discuss the acts of foraging for and consuming insects just as I would write about any food source, whether it was meat or mushrooms.

The Biggest Champions of Insect Consumption

Academic interest in edible insects reflects trends in our society. In recent years, there has been an increase in research about the use and benefits of insects, but before 2010, the topic was largely understudied. While the main goal of this book is to focus on the evolutionary and anthropological elements that are important for understanding the use of edible insects, a brief history of how this topic has become increasingly pertinent to food culture in our society is a good way to begin.

In 1885, Vincent Holt published a small pamphlet in London that touted the benefits of entomophagy titled *Why Not Eat Insects*? It is still in print after all these years, but unfortunately it is probably seen as an eccentric novelty item and is probably not taken seriously as thought-provoking discourse. Holt provided evidence of how other cultures prepared and ate insects in the late nineteenth century and claimed that the nutritional offerings of insects could aid the Victorian working man. However, he knew

the difficulty he faced in convincing his readers of the benefits of insects as food:

> In entering upon this work I am fully conscious of the difficulty of battling against a long-existing and deep-rooted public prejudice. I only ask of my readers a fair hearing, an impartial consideration of my arguments, and an unbiased judgment. If these be granted, I feel sure that many will be persuaded to make practical proof of the expediency of using insects as food. There are insects and insects. My insects are all vegetable feeders, clean, palatable, wholesome, and decidedly more particular in their feeding than ourselves. While I am confident that they will never condescend to eat us, I am equally confident that, on finding out how good they are, we shall some day right gladly cook and eat them. (Holt 1885, 5–6)

Maybe Holt's "some day" is today. Holt's insights hold up after all this time, and with the help of other champions who have come along since the publication of his pamphlet, real momentum may be building toward a more widespread acceptance of the idea of edible insects. In 1951, entomologist F. S. Bodenheimer published a book titled *Insects as Human Food: A Chapter of the Ecology of Man*. It is still the most comprehensive account of different edible-insect practices around the globe, but like Holt, Bodenheimer did not change the public's attitude toward eating insects. The book was written with the goals of investigating a topic that provoked curiosity and discussing the nutritional importance of insects for "primitive" man. By "primitive," Bodenheimer did not mean our human ancestors; he meant it in the stereotypically negative way of implying that nonwestern cultures were uncivilized cultures. These perceptions run deep in European history and are still pervasive today. Even though his descriptions detailed how delightful insects were as food in local cultures, Bodenheimer unwittingly perpetuated the persistence of the stigma by portraying the foods as something only "Others" eat.

In 1975, entomologist Gene DeFoliart began compiling references related to insects as food with the goal of publishing an updated version of Bodenheimer's book. His project turned into an outreach effort that included the founding of *The Food Insects Newsletter*, multiple articles that include "Insects as Food: Why the Western Attitude Is Important," and the publication of an extensive bibliography that he offered for free on his personal website. One of DeFoliart's main messages was that the

bias in the "west" against insects was causing a gradual reduction of their use as food worldwide. Elimination of this highly nutritious food source without a suitable replacement is especially problematic in areas where people find it difficult to meet their nutritional needs. Because of his passion, his cultural sensitivity, and his early adoption of open online access, DeFoliart opened many entomologists' minds to the idea of edible insects.

Archaeologists and paleoanthropologists who reconstruct which foods were important in the past have commonly overlooked insects. However, there are some notable exceptions. Mark Sutton is an archaeologist who has worked in the Great Basin area of the United States (Sutton 1988). Through his research, he found that insects were important as food in the culture he was reconstructing, and he recognized that most archaeologists blindly ignore insects during excavation and in their analytical methods. Sutton (1995) suggested that insects found in archaeological contexts could provide valuable information about past ways of life.

Primatologist W. C. McGrew is an expert on chimpanzee tool use and insect foraging. Through his many years of research on the insect portion of the diet of our closest living relatives, he became convinced of the likelihood that our hominin ancestors also ate insects. He has consistently argued that insects are just as valuable as meat and that reconstructions of the hominin diet need to take the nutritional value of insect foods into consideration. He has referred to insect consumption as "the other faunivory" as a way of placing them on an equal footing with meat (McGrew 2001; 2014).

Biological anthropologist Darna Dufour is well known for her extensive research on insects as a food resource for indigenous peoples of the Amazon basin. Her research, which focused on biological and behavioral responses to food shortages, identified the importance of edible insects to the Tukanoan people of Amazonia and detailed their nutritional contributions and cultural value. Although her work could have presented insects as a fallback food that was consumed only when the higher-valued fish was unavailable, she instead demonstrated that insects are an important and valuable resource through a detailed analysis of their rich nutritional content (Dufour 1987). Her methodology set the standard for what data are necessary for capturing the role of edible insects in a local diet.

The biggest break for promoting edible insects came at the 2010 TEDGlobal conference, where Marcel Dicke, an ecological entomologist from the Netherlands, gave a talk with the same title as Holt's manifesto: "Why

Not Eat Insects?" Instead of pointing out that insects are nutritious and are consumed by people all over the world, Dicke added his ecological perspective to demonstrate that insects, more than any traditionally raised livestock, have the potential to be sustainably cultivated. This notion generated excitement and began changing how many people think about insect consumption. Since 2010, farms for raising crickets for human consumption have become a reality in the United States and across Europe and over 100 insect-food startup companies have launched worldwide (Bugsolutely 2018). One of the pioneer companies is Chapul, which makes a protein bar out of cricket powder. Chapul founder and CEO Pat Crowley credits Dicke's TED talk for giving him the idea, and Crowley himself has now given three TEDx talks to continue spreading the message about the value of edible insects in the human diet (Crowley 2014a, 2014b, 2015). Crowley has a background in hydrology and was particularly motivated by the low volume of water it takes to produce a kilogram of crickets compared to the volume it takes to produce a kilogram of any traditionally raised livestock. Estimates suggest it takes 22,000 liters of water to produce a kilogram of beef, 3,500 liters to produce a kilogram of pork, 2,300 liters to produce a kilogram of chicken, and less than 500 liters to produce a kilogram of crickets (Van Huis et al. 2013; Halloran et al. 2017).[3]

Long before cricket protein bars hit the market, David George Gordon, the "Bug Chef," was promoting edible insects with his *Eat-A-Bug Cookbook*, first published in 1998. Gordon's recipes highlight insects instead of hiding them and work with their natural flavors to make delicious dishes (figure 1.1). According to Gordon, "many bugs have subtle flavors, reminiscent of crab or shrimp, [while] a few are surprisingly flavorful. Prime examples are stink bugs, eaten with relish in Mexico, and giant water bugs, popular foods in Thai and Vietnamese homes" (personal communication, September 25, 2017). Gordon's recipe for giant water bugs balances their earthy taste with a subtly sweet ginger sauce. It is important to Gordon that people experience the insects as delicious, since that is the only way they will accept them as food.

In 2013, the Food and Agricultural Organization (FAO) of the United Nations published an extensive statement detailing the benefits of insects as food for people and as feed for livestock (Van Huis et al. 2013). The report provides the nutritional contributions of a few different insects and investigates the environmental impacts of the current food system.