

More Feared than Revered: Insects and their Impact on Human Societies (with some Specific Data on the Importance of Entomophagy in a Laotian Setting)

Mehr verabscheut als geschätzt: Insekten und ihr Einfluss auf die menschliche Gesellschaft (mit spezifischen Daten zur Rolle der Entomophagie in einem Teil von Laos)

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Summary: The general public does not hold insects in high regard and sees them mainly as a nuisance and transmitters of disease. Yet, the services insects render to us humans as pollinators, entomophages, producers of honey, wax, silk, shellac, dyes, etc. have been estimated to be worth 20 billion dollars annually to the USA alone. The role holy scarabs played to ancient Egyptians is legendary, but other religions, too, appreciated insects: the Bible mentions honey 55 times. Insects as ornaments and decoration have been common throughout the ages and nowadays adorn stamps, postcards, T-shirts, and even the human skin as tattoos. In many parts of the world, insects serve as objects of entertainment and represent a considerable value: large, single, live stag beetles are known to have sold for approximately 3,000 US dollars in Japan. In New Zealand and Malaysia luminescent insect displays have become lucrative tourist attractions. In forensic investigations insects have gained more and more in importance as incidences of homicide and smuggle of contraband rise. Insects as parts of comic strips, horror movies, video games, etc. have also become very popular. Insects appear in sarcastic and science fiction novels, but are also frequently the subjects of romantic or humorous poems. Folk music of virtually all countries of the world knows certain insect songs and in probably all languages of the world idioms exist that make reference to insects. Very often such idioms, just like the many insect-based folk medicines of the different ethnic groups of the world, disappear, before they have even been scientifically analyzed. There is some hope, however, with regard to insects as human food. Insects contain easily digestible fats, valuable protein, fibre, minerals, and vitamins. Under threat through “westernization” in many parts of the world, entomophagy has seen some resurgence in certain areas. In southern Africa mopame worms are now being canned and exported to many countries and in Laos a veritable crickets-as-food industry has evolved over the last 18 years. Children and women collect wild (not farmed) crickets, sell them to middlemen (which are mostly ladies), who take the insects to the towns and sell them there for a profit to customers like snack bar and restaurant owners. Crickets are, of course, not the only edible insects (there are hundreds of species belonging to virtually all insect orders), but in Laos they are considerably more valuable than rice and even meat. We conclude that any investigation dealing with humankind in nature, be it from the viewpoint of sociology, ecology, economy, or philosophy, will remain incomplete unless the substantial role of the insects is included in such investigations.

Keywords: ethnobiology, ethnoentomology, ethnomedicine, entomophagy, cultural entomology, cultural geography

Zusammenfassung: Die Allgemeinheit hält Insekten zumeist für Plagegeister und Krankheitsüberträger und meidet sie. Doch wirtschaftlich gesehen leisten uns manche Insekten immens wertvolle Dienste als Bestäuber, als Vertilger und Zerstörer von Schädlingen und als Produzen-

ten von Honig, Wachs, Seide, Lacken usw. Der Wert dieser Leistungen wird allein für die USA auf 20 Milliarden Dollar im Jahr geschätzt. Die Rolle der Mistkäfer bei den alten Ägyptern ist legendär, doch auch andere Religionen und Weltanschauungen haben Insekten in ihrem „Programm“: 55 Mal wird in der Bibel das Wort Honig erwähnt. Insekten als Ornamente und Teil von Schmuckstücken sind seit alters her beliebt und finden ihre modernen Versionen z.B. als Broschen und Haarspangen, Abbildungen auf Briefmarken und Postkarten, T-Shirt-Aufdrucken und Tätowierungen der Haut. Insekten sind in vielen Gegenden der Welt auch Gegenstand der Unterhaltung von z.T. erheblichem Wert: Einzelne große, lebendige Lucaniden erzielten in Japan einen Verkaufspreis von rund 3000 Dollar. Sammler von Schmetterlingen greifen ebenfalls manchmal tief in die Tasche, um ein seltenes Exemplar zu ergattern. In Neuseeland und Malaysia stellen leuchtende Insekten als Touristenattraktion eine erhebliche Einnahmequelle dar. Insekten in der Forensik haben in den letzten Jahren dank des zunehmenden Trends an Gewaltverbrechen und Drogenschmuggel an Bedeutung gewonnen, ebenso wie es Horrorgeschichten, Comicstrips, Zeichentrickfilme und andere Streifen mit Insekteninhalt taten. In der klassischen Literatur tauchen Insekten relativ häufig in romantischen oder humorvollen Gedichten auf, fehlen aber auch nicht aus satirischen Romanen. Und aus der Musik kennen wir zahlreiche Volkslieder und andere Weisen, die sich mit Insekten befassen. Häufig sind Insekten ein Teil von Redewendungen und Vergleiche von derlei Redewendungen aus verschiedenen Sprachen führen manchmal zu verblüffenden Ergebnissen hinsichtlich ihrer Bedeutung. Leider verschwinden mehr und mehr solcher Redewendungen aus dem Sprachgebrauch, und ebenso wie die einst zahlreichen volksmedizinischen Rezepte, in denen Insekten zur Behandlung von Krankheiten Verwendung fanden, ist es heute oft zu spät, sich wissenschaftlich mit diesen Gebräuchen auseinanderzusetzen, weil keiner sie mehr kennt. Einen Lichtblick stellen Insekten als Nahrungsmittel – zumindest in einigen Gegenden der Erde – dar. Insekten enthalten gut verdauliche, langkettige Fettsäuren, in der Regel viel Protein und Mineralien sowie Vitamine. Sie sind also gesund und wurden einst weltweit von vielen Menschen konsumiert, doch sind sie mit zunehmender „Verwestlichung“ häufig aufgegeben worden. In jüngster Zeit erfahren einige Insekten als Nahrungsmittel allerdings eine Art „Renaissance“: Mopane-Raupen werden heute in Dosen gepackt und aus Südafrika in andere Länder exportiert. Aus Laos wissen wir, dass seit den letzten 18 Jahren ein regelrechter Handel mit Grillen als Nahrungsmittel getrieben wird. Hauptsächlich von Frauen und Kindern gesammelte wilde (nicht kultivierte) Grillen werden an „Mittelsmänner“ (in der Regel ältere Frauen) verkauft, die dann ihrerseits die Insekten in die Städte transportieren und sie dort an Hausfrauen, Restaurants, Hotels, etc. mit einem Gewinn weiterverkaufen. Natürlich sind Grillen nicht die einzigen essbaren Insekten (derer gibt es Hunderte von Arten fast aller Ordnungen), aber sie stellen zumindest in Laos einen Wert dar, der weit über dem von Reis und sogar dem von Fleisch liegt. Unsere Schlussfolgerung ist, dass jegliche Untersuchungen, die sich zum Ziel setzen, die Rolle des Menschen in der Natur zu verstehen, sei es aus soziologischer, ökologischer, wirtschaftlicher oder philosophischer Sicht, ohne die substanzielle Rolle der Insekten zu berücksichtigen, zwangsläufig unvollständig bleiben.

Schlüsselwörter: Ethnobiologie, Ethnoentomologie, Ethnomedizin, Entomophagie, kulturelle Entomologie, kulturelle Geographie

1. Introductory Remarks

There can be no doubt that insects were ever-present companions during the cultural evolution of humankind (TOMMASEO-PANZETTA 2005) and, for this reason, have infiltrated our history, philosophy, religion, language, food, and the arts. Insects as a nuisance and

irritant, as vectors of serious disease, as harbingers of evil and signs of filth and unhygienic conditions impacted enormously on the development and fate of human societies throughout the world and, indeed, there is no denying the fact that a great many species of insects do inflict harm on humans either directly or indirectly, be it as transmitters of

pathogens, through the damage they cause to crops and human habitation, or through rendering food stuffs unpalatable or even inedible (GORHAM 1979). Little wonder then that urbanized folk have become fearful of insects and in extreme cases, can develop phobias that require psychiatric attention (WEINSTEIN 1994). Yet, insects have also had a wide range of positive effects on human societies and their cultural evolution. This positive aspect is frequently downplayed vis-à-vis the much more publicized negative image of insects (championed by makers of horror movies and science fiction stories) as the declared enemies of our civilization. The aim of this article is to redress this imbalance and to show that the positive side of human-insect interactions has been -and still is- of immense importance in our world. A similar approach, but restricted to Heteroptera, has been taken by HOFFMANN (2006) in his excellent and beautifully illustrated review on this order of insects and by NONAKA (1996) in his ethno-entomological overview of insect use generally, but restricted to the Kalahari San people.

2. Worth a lot and revered since ancient times

Starting with the pollinating services that insects render to humans, it has been estimated by BORROR et al. (1989) that such services are worth 19 billion US dollars annually for the USA alone. Commercial products derived from insects like honey, wax, silk, cochineal dye (from *Dactylopius coccus*) and shellac (from *Laccifer lacca*) would be worth an additional 300 million dollars annually. And if finally we added the value that insects play as entomophagous biological control agents in farms, gardens, and plantations we would probably arrive at an annual value of at least 20 billion US dollars for the USA alone. The global value of insects is, thus, sheer inestimable.

Some of the insect products used by humans and mentioned above have very old histories:

The word honey is mentioned in the Bible 55 times and the Israeli archaeologist Dr Amichai Mazar has recently reported that bee-keeping near Tel Rehov probably began 3000 years ago (Newsletter der Botschaft des Staates Israel vom 4. September 2007). Nowadays the honeybee, after cattle and swine, is the third most important domesticated animal (TAUTZ 2007). The use of wax by the Egyptians for mummification purposes is well known and the harvesting of silk from the pupae of wild silkworm moths may have started possibly as far back as 6000 years ago (CLOUDSLEY-THOMPSON 1976) in the region that is now known as Assam (North-East India). An equally long or perhaps even longer history is likely to be associated with entomophagy, i. e. the use of insects as food for humans. However, we shall return to the topic of entomophagy a little later and will then deal with it in greater detail.

Little needs to be said about the extraordinary regard the ancient Egyptians held for dung beetles, chiefly the genera *Kheper*, *Scarabaeus*, *Gymnopleurus*, *Copris*, and *Catharsius* and RATCLIFFE (2006) in his recent review of scarab beetles in human culture gives possible reasons for this attitude. He, furthermore, explains that rhinoceros beetles (probably *Oryctes* spp.) and related species were equally esteemed by the ancient Greeks and Romans, who credited scarabs with considerable power, using them as good-luck charms in combat. It has been suggested that one of the holy scarabs, the pock-marked species (either *S. variolosus* or *S. cicatricosus*), made it into the Judeo-Christian religion and became the heavenly 'Cherubim' (SCHIMITSCHEK 1968). Almost certainly scarabs and other beetles also played some role in religions and mythologies in regions that had no contact with ancient Egypt. In Australia, for example, some scarabs and other beetles are tribal totems and seen as the ancestors of humans during the era of the dreamtime (SPENCER & GILLEN 1899), but unfortunately it is nowadays often too late to investigate this aspect of in-

teractions between insects and human cultures as younger, urbanized people know little or nothing about the ancient beliefs and traditions of their ancestors.

In Hinduism with its belief in re-incarnation, insects are given the same protection and appreciation that other living organisms enjoy and in Japan, even today, there are still temples dedicated to insects. The so-called ‘Suzumushi Temple’ in Kyoto contains a memorial dedicated to all insects. Annually 50,000 crickets of the species *Homeogryllus japonicus* are raised in the temple (hence the name ‘suzumushi temple’, which translates into ‘cricket temple’). In another region of Japan the jewel beetle *Chrysobroa fulgidissima* is being used for a so-called ‘tamamushi no zushi’ (a receptacle for Buddhist scriptures that, on the outside, features the elytra of Buprestid beetles: <http://skino49.web.infoseek.co.jp/tamamushi/tamamushi/slide2.html>) and in several other places, including Korea, wings of *Chrysobroa* spp. are being used in connection with grave and tomb decorations. Incidentally, although rare, some cave drawings of insects and other arthropods made by stone-age people are known from a variety of settings (southern Africa, Europe, Australia) and signify to the archaic roots of insect appreciation be it for spiritual or other reasons. An exceptionally well-researched review, although actually not dealing with insects, but rituals, ceremonies, and customs related to sacred trees, has very recently been published by DAFNI (2007) and readers with a wider interest in ethno-biome-taphysics may find this review useful.

3. Insects as a form of decoration and entertainment

Whole insects, dead or alive, can be worn as ornaments and it has been reported that young girls of some tribal South American Indians placed luminescent beetles (*Pyrophorus* sp., trapped in tiny straw containers) into their hair to increase the wearer’s attractive-

ness (KLOTS & KLOTS 1959). Shiny tenebrionid beetles (*Lomapteria jorkiana*), crafted into headbands or necklaces (Fig. 1), have been shown to be worn by married Wahgi Valley highland women in Papua New Guinea (MEYER-ROCHOW 1975a, 1982a) and tattoos, including those on the skins of persons with a background of western civilizations, now often feature insects and related arthropods. The use of the weevil *Rhynchophorus ferrugineus* or, to be precise, its buzz as a musical instrument (Fig. 2), amongst the men folk of the Onabasulu cannibals of the southern highlands of Papua New Guinea has been documented by MEYER-ROCHOW (1973a, 1982b) and is also known from tribals in the Telefomin area of New Guinea.

The modern use of insects for decorating an almost endless variety of items, ranging from pencil cases via coffee cups and T-Shirts (Fig. 3) to company logos and involving chiefly butterflies and beetles, clearly has mostly economic reasons: if it sells, why not decorate it with colourful images of beautiful insects? Modern jewelry, broaches and fancy hairclips in particular, are often modeled after butterflies and beetles and a few insect sculptures in parks and other public places can also be found. Catalogues featuring stamps of the world contain thousands of stamps depicting almost any insect. HOFFMANN (2007) devoted an entire review to the topic of “Wanzen (Hemiptera – Heteroptera) in der Philatelie”. Insects on coins or paper money, on the other hand, are considerably rarer, the best examples perhaps being the 5 Pula coin of Botswana and the 1,000 Franken bill of Switzerland, the former featuring a mop(h)ane worm (the caterpillar of the moth *Gonimbrasia belina*) and the latter featuring a number of ants and the face of the entomologist August Forel. An older example would be the Greek silver coin of Ephesus milled at around 400 B.C. A very nice article devoted to beetles on postcards and stamps has been published in Hungarian and English by SZENTKIRALYI (2003).

In order to witness that it is nowadays not entirely unpopular to keep certain species of insects like, for example, walking sticks and hissing cockroaches as pets, one need only visit the pet shops (“Zoologische Fachhandlungen”) in our big cities. To maintain crickets and other insects was once widespread in the port cities of Bremen and Hamburg (SCHIMMITSCHKEK 1968). According to V.B. MEYER-ROCHOW’s own grandfather (F. MEYER-ROCHOW, pers. comm.) vendors went from house to house to sell insect cages and their singing (and sometimes silent) inhabitants. Why this custom died out at around World War I is anybody’s guess, but it was probably not the price of the little critters. However, in today’s Japan insect pet owners are prepared to pay enormous sums for their six-legged friends: very large stag beetles, e.g. *Dorcus curvidens*, are known to have fetched 300,000 Yen (about 3,000 US dollars) or more (BROCK 2006). Interestingly, live specimens are much more expensive than dead ones, a pinned specimen of *Dynastes hercules* costing only 45,000 Yen. The cheaper rhinoceros beetles (e.g. *Trypoxylus dichotomus*) are sold by the thousands together with small plastic vivariums in the summer to eager young beetle owners, boys and girls alike, for little more than 1,000 Yen. Beetle fights and the accompanying gambling have been reported from Thailand and annual spider fight meetings, carried out by mature gentlemen with their pet spiders, are known from Kyushu in Japan. Abstract forms of insect entertainments for children come in a variety of games, ranging from puzzles and ‘memory games’ for the little ones (Fig. 4) to insect quizzes and video games like ‘Mushi King’ for the older children.

Some insects have become tourist attractions: approximately 2 million visitors annually admire the subterranean “sky” in the Waitomo cave of New Zealand, a spectacle created by the thousands of bluegreen lights of the larvae of the mycetophilid dipteran, known as the glow-worm-fly *Arachnocampa luminosa*, inhabiting the ceiling of the cave (MEYER-ROCHOW 2007). In

other regions where such glowworms occur (for example, Australia) a similar touristic use of this attractive insect resource is envisaged. To see the synchronously flashing fireflies of Malaysia has recently also become the aim of an ever-increasing number of tourists and the annual butterfly exposition of Hampyeong (South Korea) has already become legendary since its inception approximately 20 years ago (MEYER-ROCHOW 2008). Finally, one ought not to forget the many museums, zoological gardens and even a few oriental hotels that nowadays display insects in so-called ‘butterfly houses’ and insectariums to attract the public.

4. Insects in scientific research and forensic investigations

As entomologists we do not require any convincing arguments to accept that insects are important as subjects of scientific explorations. Any attempt to understand food-webs and eco-systems in a terrestrial or freshwater setting almost inevitably has to include insects, of which roughly 1 million species have been described to date, but perhaps ten times as many remain undescribed. The field of ‘applied entomology’ deals with insects that are either harmful or of other particular interests to humans. For example, to assess the quality of a natural water body, be that a pond, brook, stream or bog, or to characterize a habitat, one frequently refers to the insects present in them. However, insect species that are selected to become part of a comparative physiological study are normally not chosen because of their economic or medical importance, but because they possess interesting, sometimes unusual features worthy of closer investigation. The easy way flies can be kept in captivity and their short generation times combined with anatomical features (the giant chromosomes in the salivary glands come to mind) have helped *Drosophila melanogaster* become an early “work-horse” for the geneticists. Of particular interest to curators of insect collections are abnormally-coloured specimens (Fig. 5) and the so-



Fig. 1: This woman from the Wahgi Valley of the Papua New Guinea Highlands uses the dried bodies of the tenebrionid beetle *Lomapteria jorkiana* to adorn herself with.

Abb. 1: Eine Frau aus dem Wahgi Valley (Hochland von Papua Neuguinea) benutzt getrocknete Tenebrioniden (*Lomaptera jorkiana*) als Schmuck.

called ‘gynanders’, i.e., insect individuals that on one side of the body possess male and on the other female features. Cockroaches, too, feature prominently as laboratory insects and so do numerous other forms like mealworms, stick insects, crickets, etc. that one regularly encounters in the biology departments of our universities.

While the ability of insects like, for instance, ants to free bones from adhering tissue and to clean up skeletons has long been used by anatomists to obtain undamaged specimens, the superior capacities of the senses of insects like being able to perceive ultraviolet radiation as a separate colour or using the e-vector of the sky for orientational purposes or detecting the infrared waves emitted by burned wood as well as the ‘wonders’ of the social fabric of ants, wasps, bees, and termites have provided powerful incentives to scientists of a variety of disciplines to occupy themselves with these hexapods. In one research field, however, more than in any other, an understanding and correct interpretation of an insect’s life cycle and behaviour can actually influence a person’s fate: namely forensic medicine.

Homicide investigations frequently rely upon an expert’s interpretation of insect abundance and species composition on a corpse, because the colonization of a corpse by insects representing a variety of species follows a well-defined sequence. Carnivorous beetles and their larvae can not occur on a dead body unless first a thriving population of fly maggots has developed and dermestid beetle and tineid moth species

will not be present until the corpse has fully dried out. Not only are there nowadays numerous textbooks dealing with forensic entomological questions (cf. SMITH 1986), insects have indeed helped solving several murder cases and obtaining evidence to convict drug smugglers.

5. Insects in the arts and literature

Since it is impossible to give even a partially complete overview of insect depictions in the arts, we shall restrict ourselves in this essay to a few representative examples. Insect paintings of the antiquity, whose principle motives were insects are not terribly common. And this, to some extent, holds true even for the Far East, where traditionally insects were held in greater esteem than in the West. Although numerous works of art in the western world do exist, in which insects represent an added element (for example, the bees around the head of the honeycomb-stealing child Amor in LUCAS CRANACH’S (1472-1553) “Amor as a honey thief” or the butterflies in DOSSO DOSSI’S (1480/90-1542) “Jupiter and Mercury”, the painting of a single “Hirschkäfer” by ALBRECHT DÜRER (1471-1528) stands out and is undoubtedly one of the most famous masterpieces of that period. LEONARDO DA VINCI (1452-1519), on the other hand, judging by the number of sketches made by or attributed to him and in spite of his enormously wide interests generally and his fascination with flight in particular, could not have found insects very inspiring, for they almost never feature in his works. But some of the most beautiful (and accurate) insect paintings of the

Fig. 2: The adult of the sago palm weevil, pricked on a stick, is being used by this Onabasulu man from Papua New Guinea as a musical instrument.

Abb. 2: Ein Onabasulu Mann aus Papua Neuguinea benutzt einen auf einen Stock gespießten Sago Palmen Rüsselkäfer als Musikinstrument.

Fig. 3: Modern T-shirt manufacturers frequently use pictures of insects on their products, here the Harlequin longhorn beetle.

Abb. 3: T-Shirt Hersteller bilden häufig Insekten auf ihren Produkte ab, hier einen Harlekin-Langhornbock.

Fig. 4: Numerous games and educational aids, here an example from Finland, feature insects and other arthropods.

Abb. 4: Zahlreiche Spiel- und Ausbildungsgegenstände, hier ein Beispiel aus Finnland, zeigen Insekten und andere Arthropoden.

18th century, made by August JOHANN RÖSEL VON ROSENHOF (1705-1759) and published 1746 in his monthly "Insecten Belustigung" (ORGELDINGER 2006), make up for that. Special mention should also be made of the beautiful 19th century paintings on glass by EMILE GALLÉ (1846-1904), as they often involve a variety of insects, e.g., grasshoppers, dragonflies, praying mantises, etc.

Serious (and not so serious) literature as well as poetry focusing on insects, as with insect paintings, increase in frequency from the past to the present. It is perhaps odd that DANIEL DEFOE (1660-1731) in his "Robinson Crusoe" story mentions all sorts of plants and animals, but totally ignores the insects that must have been present on the uninhabited island his hero got stranded on. However, one of the earliest love poem, which hinges around an insect, namely the flea, is a sonnet first published in 1633, titled

EIN GANZES LEBEN

„Weißt du noch“, so frug die Eintagsfliege
Abends, „wie ich auf der Stiege
Damals dir den Käsekrümel stahl?“
Mit der Abgeklärtheit eines Greises
Sprach der Fliegenmann: „Gewiß, ich weiß es!“
Und er lächelte: „Es war einmal -“
„Weißt Du noch“, so fragte weiter sie,
„Wie ich damals unterm sechsten Knie
Jene schwere Blutvergiftung hatte?“
„Leider“, sagte halb verträumt der Gatte.
„Weißt du noch, wie ich, weil ich dir grollte,
Fliegenleim-Selbstmord verüben wollte?-
Und wie ich das erste Ei gebar?-
Weißt du noch, wie es halb sechs Uhr war?-
Und wie ich in die Milch gefallen bin?“
Fliegenmann gab keine Antwort mehr,
Summte leise, müde vor sich hin:
„Lang, lang ist's her - „

Joachim Ringelnatz

led "The Flea" by JOHN DONNE (1572-1631), in which this poet declares his love through the fusion of his and his adored lady's blood inside the insect that has bitten the both of them. Other poems in English that refer to or directly address insects are WILLIAM WORDSWORTH'S (1770-1850) 1801 "To a Butterfly", the contemporary CHRISTOPHER SMART'S (1722-1771) "The Bald Man and the Fly" and the incredibly influential parabola of BERNARD MANDEVILLE'S (1670-1733) "The Fable of the Bees" of 1705, in which the author critically examines human greed and concludes that this and other 'negative traits' actually help a society to progress. German insect poetry finds some masterly and funny pieces by WILHELM BUSCH (1832-1908) and especially JOACHIM RINGELNATZ (1883-1934). Two of their respective poems and their free translations into English by V.B. MEYER-ROCHOW are found below:

A LIFETIME

"Do you recall" an ageing lady mayfly reminisced one night
"when just above that willow tree we had that fight,
because you chased me much too hard?"
And with the wisdom of a saint
Old mayfly gent -his voice quite faint-
Replied "I do recall, I do recall, my love.
That was our start..."
"And you remember" she went on
"leg number six of mine was gone
as I felt something wrong with my anatomy?"
"It dawns on me, it dawns on me"
the mayfly husband nodded dreamily.
"And do you know when I was cross with you
and close to kill myself in sticky glue,
and how at six past eight a.m. this morn, o dear,
I nearly fell into that jug of beer
and how I later laid my little eggs all in a row?"
The mayfly man no longer listened clearly;
Too old and weak to talk he uttered merely,
"This morn - oh, what a long, long time ago!"

V.B. Meyer-Rochow

BALDUIN BÄHLAMM - Der verhinderte Dichter

In freier Luft, in frischem Grün,
 Da, wo die bunten Blümlein blühn,
 In Wiesen, Wäldern, auf der Heide,
 Entfernt von jedem Wohngebäude,
 Auf rein botanischem Gebiet
 Weilt jeder gern, der voll Gemüt.
 Hier legt sich Bähllamm auf den Rücken
 Und fühlt es tief und mit Entzücken,
 Nachdem er Bein und Blick erhoben:
 Groß ist die Welt, besonders oben!
 Wie klein dagegen und beschränkt
 Zeigt sich der Ohrwurm, wenn er denkt.
 Engherzig schleicht er durch das Moos,
 Beseelt von dem Gedanken bloß,
 Wo's dunkel sei und hohl,
 Denn da nur ist ihm pudelwohl.
 Grad wie er wünscht und sehr gelegen
 Blinkt ihm des Dichters Ohr entgegen.
 In diesen wohlerwärmten Räumen,
 So denkt er, kann ich selig träumen.
 Doch wenn er glaubt, dass ihm hienieden
 Noch weitre Wirksamkeit beschieden,
 So irrt er sich. - Ein Winkelzug
 Von Bähllamms Bein, der fest genug,
 Zerstört die Form, das heißt so ziemlich,
 Die diesem Wurme eigentümlich,
 Und seinem Dasein als Subjekt
 Ist vorderhand ein Ziel gesteckt.

Wilhelm Busch

BALDUIN BÄHLAMM – The would-be poet

Fresh air and nature's green
 A multitude of shades and colours to be seen
 And not a word, but birdsong to be heard -
 This is the poet's paradise. A sheer delight
 That's found in groves and meadows, heath-
 land and the like.
 When overhead white puffs of clouds pass by
 There is no better way to muse and think
 Than lying on one's back submerged in
 waves of grass
 With eyes directed to the sky.
 It's then that intuition fills the poet's head
 To formulate most wonderfully rhymes it's said.
 An earwig has a smaller brain
 And being less accomplished in its thinking
 Its only goal and greatest gain:
 That is to find a tiny hole to slink in.
 It's crawling narrow-mindedly
 Through moss and foliage and grass, too,
 With one decision dominating poignantly
 One of them poet's earholes on the ground
 will do
 As comfortable resting place
 To dream that earwig's dream of ideal living
 space.
 Yet, the earwig's dream is just a dream and
 not reality.
 The poet's mood is now disturbed by this
 banality
 And up he gets to end the pesky creature's life
 By squeezing it to death and cutting it with
 his sharp knife.
 Poetic thoughts got, thus, curtailed
 And earwig as well poet, reaching higher
 goals, have failed.

V.B. Meyer-Rochow



Fig. 5: Colour mutants, like this *Aglais urtica* specimen, which lacks the usual blue UV-reflecting spots along the margin of the wings, are given special attention by collectors and scientists alike (YANG et al. 2004).

Abb. 5: Farbmutanten, wie diese *Aglais urtica*, die keine UV-reflektierenden Flecken längs der Flügelkanten mehr hat, sind bei Sammlern und Wissenschaftlern beliebt (YANG et al. 2004).

Fig. 6: Delousing not only serves to strengthen social contacts. Amongst the Kiriwina people of the Trobriand Islands the presence of head lice indicates that the child is a healthy child.

Abb. 6: Das Entlausen dient nicht nur der Intensivierung sozialer Kontakte. Beim Volk der Kiriwina (Trobriand Islands) zeigen Läuse bei einem Kind an, dass es gesund ist.

Fig. 7: In Korea and China numerous insects and other arthropods, especially centipedes, play an important role in folk medicinal recipes.

Numerous short stories with an insect-content also exist and FRANZ KAFKA'S (1883-1924) famous 1915 story "Die Verwandlung" (The Metamorphosis) has even been turned into a movie. Other noteworthy short stories must, of course, include the haunting "Tell-Tale Heart" by EDGAR ALLAN POE (1809-1849), in which only the sound, and not the actual insect, of the death-watch beetle drives the hero of the story to insanity, and "The Gold Bug", published by the same author in the same year (1843). T.C. BOYLE'S (*1948) "The Human Fly", A.S. BYATT'S (*1936) novella "Angels and Insects", and ROALD DAHL'S (1916-1990) "Royal Jelly" are further great examples of insects in literature.

There are probably few cultures and ethnic groups that do not at least possess some songs about insects. In German PAUL LINKE'S (1866-1946) "Glühwürmchen" or the "Mäikäfer flieg, Dein Vater ist im Krieg" song of an unknown composer or the "Auf der Mauer, auf der Lauer sitzt 'ne kleine Wanze" immediately spring to mind, while in Japan everyone would start to hum or sing "Aka tomo" (the song of the red dragonfly) when asked to come up with a song of an insect. English children learn "Fiddle dee dee, the fly wants to marry the bumblebee" and even the Australian aborigines of Alice Springs have songs (we might call them 'ditties') about wijuti grubs and bushflies. The existence of Hungarian insect folk songs mentioning mayflies has been put on record by SZENT-IVANY & UJHAZY (1973) and finally, RIMSKY-KORSAKOV'S famous "Flight of the Bumblebee" stands out as one of finest examples of classical music to portray an insect's most characteristic and typical behaviour.

6. Insects in idioms and proverbs

It can be assumed that insect appreciation (or at least the awareness of the insects' presence) finds its precipitation in the vocabulary (and perhaps even the choice of vowels: MEYER-ROCHOW 1982c) of a language and in particular in its use of idioms. Towards this end Japanese and English idioms (i.e., common sayings and proverbs) were compared with each other by MEYER-ROCHOW et al. (2000) and in the future are to be supplemented by investigations of other languages as well.

Of particular interest in this line of ethno-entomological research is how different linguistic groups interpret insect-containing idioms and how idioms and proverbs making reference to insects came about in the first place, i.e., were "invented". Why do Germans, for example, say "Eine Laus ist ihm über die Leber gelaufen", if someone is a bit upset or "Er hat einen Floh im Ohr", if someone is a bit whimsical and perhaps obsessed with something? Sometimes it must have been the rhyme that led to the idiom, as in "Mit Tücke fängt man eine Mücke" and sometimes it must have been the nature of the insect itself as in the German "Sie/er ist bienenfleißig" (= S/he is as busy as a bee) or the English "S/he's jumping about like a flea on a griddle" or the Maori "Me te tarakihi e papa ana ite waru" (= chatting like the cicadas).

However, how can idioms of different languages that in content are apparently nearly identical, mean some totally different things? To witness: when Finns say "Ei sääskien laulu taivaaseen kuulu" (the voice of a mosquito is not heard in heaven), they mean that the complaint of 'the little man in the street' is not heard by the powers above and nothing

Abb. 7: In Korea und China spielen viele Insekten und andere Arthropoden, vor allem Hundertfüßer, eine wichtige Rolle in Rezepturen der Volksmedizin.

Fig. 8: At this market in Kohima (Nagaland) live, tied-up spiders, which can be cooked or roasted, are offered for human consumption.

Abb. 8: Auf diesem Markt in Kohima (Nagaland) werden lebende, zusammengebundene Spinnen, die gekocht oder geröstet werden, zum Kauf angeboten.

will ever change. However, when the Japanese say “Ari no omoi mo tenni todoku” (even an ant’s wish reaches heaven), they mean that even the voice of ‘the little man in the street’ will be heard by the powers above and can achieve change. Does that reflect a more pessimistic attitude of Finns? This aspect would clearly be worth a separate investigation.

It has become apparent that the urbanized citizen refers less frequently to insects in idioms that s/he uses than folk that live in the countryside. It is also apparent from a collection of Finnish idioms (MEYER-ROCHOW & KEJONEN, in preparation) that soldiers in the army refer to insects in their idioms more frequently than persons of other occupations. What does this mean? One interpretation, fancied by MEYER-ROCHOW et al. (2000) is that throughout the world humans increasingly alienate themselves from nature and are simply less and less aware of insects and their ways of life. They simply encounter insects less often than persons living in the country. In places where people are still being confronted regularly with insects, idiomatic use of insect references is more common. Quantity and quality of references to insects in idioms and proverbs do vary, of course, between cultures and societies. Perhaps the reason why Japanese and Finns still possess so many more insect-containing idioms than the British and Germans is that large-scale industrialization (and with it the alienation from insects) occurred later.

7. Insects as drugs and components of traditional medicines

Since ancient times healers have looked towards insects for remedies to reduce a person’s suffering from illness. In fact, according to TAYLOR (1975) the word ‘medicine’ itself owes its origin to insects, namely the alcoholic beverage, known as ‘mead’, made from the honeycombs of bees and believed to possess healing powers. Amongst the Trobriand Islanders the presence of head lice in a child

(Fig. 6) indicates ‘good health’, whereas an absence of the parasite sets off the ‘alarm’ that something might be wrong with the child (MEYER-ROCHOW 1979). Amongst Australian Aborigines, large caterpillars have been used as ‘pacifiers’ and put into the mouths of crying babies. There are beyond doubt innumerable other uses of insects in traditional societies that have never been described and in all likelihood never will be, because the younger generation no longer knows of them.

However, for certain areas we possess very good and detailed accounts not only with regard to the species of insects used as medicines, but also the diseases and disorders they were prescribed for. Often the use of a species follows ‘folk logic’: In the arsenal of traditional medicines in Korea (PEMBERTON 1999) an arthropod with many moving legs like a centipede (Fig. 7), when ingested, simply has to be good for the restoration of limb function in humans; consuming the fearless scorpion or spiders (Fig. 8) ought to work as an efficient pain killer and able to remove fear symptoms in children; treatment with blister beetles should heal boils and horse flies are said to counteract amenorrhoea (*Tabanus* spp.). UMEMURA (1945, cited in SCHIMITSCHEK 1968) assembled a list of at least 100 species of insects belonging to many different orders (chiefly Orthoptera, Hemiptera, Lepidoptera, Coleoptera, Hymenoptera, and Diptera), and described their uses for the treatment of diseases and ailments in Japan. A list featuring 58 species of insects, representing 11 orders, has also been prepared by DING et al. (2005) with regard to Chinese folk medicinal practices and details when and how to take them for whatever complaint are to be found in the tome “Chinese Materia Medica” by READ (1982).

According to HOFFMANN (2006) bed bugs (*Cimex lectularius*) were traditionally used for a variety of reason, of which the most curious was probably the introduction of live bugs into the urethra to induce urination!

However, many insects do contain biologically-active compounds and cantharidin and its derivatives are probably some of the most thoroughly investigated insect chemicals (DETTNER & PETERS 2003). In fact, the importance of animal-based medicines, including those obtained from insects, is discussed for the South American region with a view on sustainable development by COSTA-NETO & OLIVEIRA (2000). Providing the scientific names of the insects, the use they are put to, and the way they are supposed to be taken, these authors report that in northeastern Brazil whole cockroaches *Periplaneta americana* and whole houseflies are being used against asthma and baldness, respectively.

In order to record medicinal uses of insects certain procedures have to be followed. According to YANG & HOU (2002) the correct protocol should include four major points: 1. Valid and available name as well as taxonomic position of each species needs to be confirmed before any applied study can commence; 2. Ecological data (e.g., proper description of locality, season, etc.) should be included; 3. Geographic distribution has to be given; 4. The condition of the resource(s) of the insect material ought to be stated. Moreover, CITES regulations should be consulted before applying insect materials to Chinese medicines and insect identification methods should include traditional morphology as well as general and molecular biological data.

8. Insects as human food

The use of insects as human food was once widespread and undoubtedly goes back to the dawn of mankind. Even monkeys extensively consume locally abundant insect species (NICKLE & HEYMANN 1996) and locusts as permitted kosher food items are specifically mentioned in the Bible: Leviticus, Chapter 11:21. Hundreds of insect species, representatives of virtually all orders, found - and to some extent still find - acceptance as

part of the human diet (Fig. 9). It was BODENHEIMER (1951), who for the first time presented a global review of insects as food. Since that seminal publication more than half a century ago, a number of books (MITSUHASHI 1984; PAOLETTI 2005; NONAKA 2007), as well as book chapters and articles in scientific journals (too many to list) have appeared, which deal with the topic of insects as human food or the nutritive value of insects (MEYER-ROCHOW 1976; MEYER-ROCHOW & CHANGKIJA 1997; RAMOS-ELORDUY DE CONCONI et al. 1982; BUKKENS 2005; CERDA et al. 2005; MITSUHASHI 2005a; YHOUNG-AREE & VIWATPANICH 2005), and the trend to forego traditional insect eating practices in favour of western diets, even in places as remote as the jungle of Papua New Guinea (MEYER-ROCHOW 1975b, 2005; TOMMASEO-PONZETTA & PAOLETTI 1997) and the Amazonian jungle (PAOLETTI & DUFOUR 2005).

Yet, there is considerable value in maintaining some of the traditional insect food items, for frequently they are more than just an item of food (Fig. 10). First of all, they are often typical and characteristic of a particular culture (Fig. 11) and do not simply represent an 'emergency food item', consumed mainly by the poorest of the poor. By 'removing' the insects from the menu, such cultures can lose part of their identities and such losses are always sad and usually not reversible. Remnants of insect-eating practices may be found in the popularity of candies shaped to resemble insects, spiders made out of sugary jelly and beetles or bugs made out of chocolate (Fig. 12). Secondly, as SZENT-IVANY (1958) had already noticed many years ago, often the insects regarded as crop-pests, represent a higher nutritional value than the crop one wishes to save. Why then spend huge sums of money on insecticides and risk polluting land and people, if insects could be made use of either directly (as human food) or indirectly (as fodder for domestic animals). Adult insects, after all, are rich in protein, minerals and vitamins, while immature larvae and

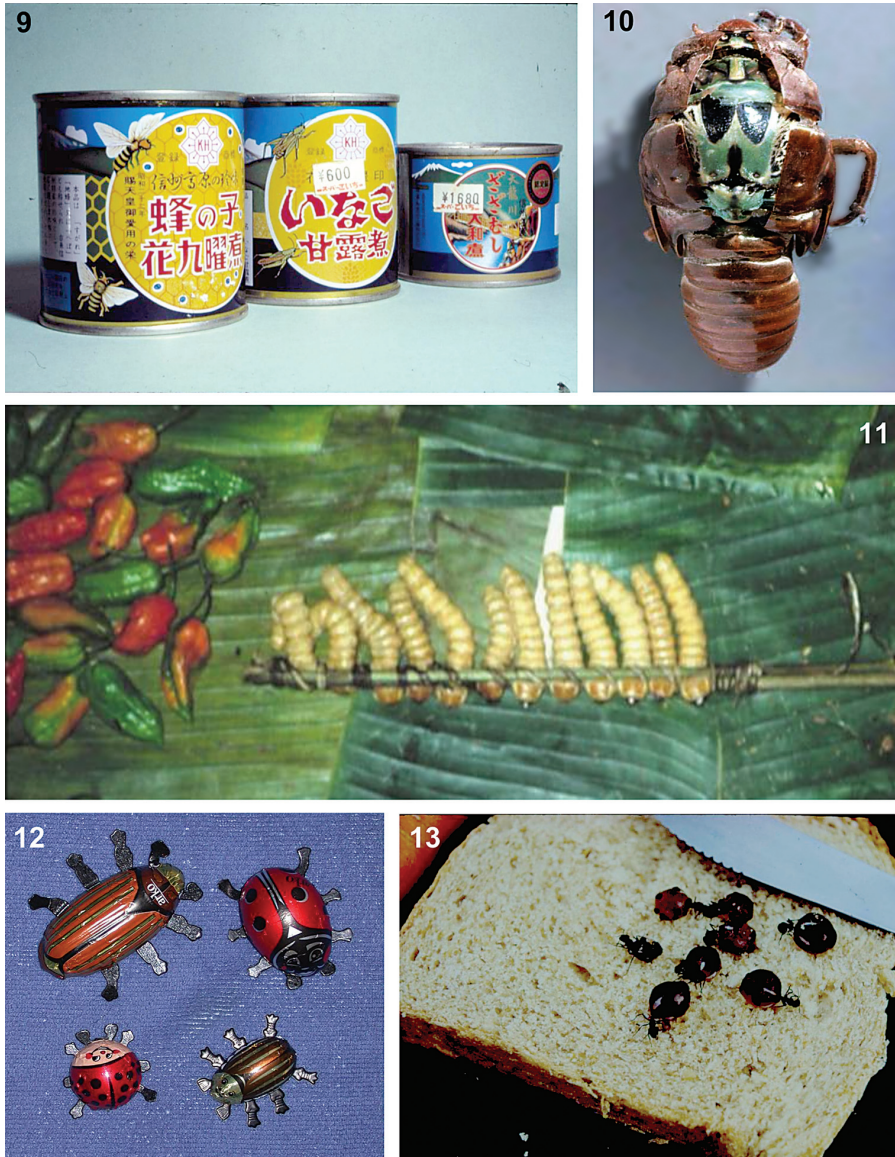


Fig. 9: Canned insects like (from left to right) bee and wasp larvae, grasshoppers, and a variety of aquatic insect larvae are available in Japan.

Abb. 9: In Japan sind eingelegte Insekten wie (von links nach rechts) Larven von Bienen und Wespen, Heuschrecken, und verschiedene aquatische Insekten erhältlich.

Fig. 10: Some insects like cicada nymphs are not only consumed, but may also be used as medicines or serve as models for masks and facial decorations.

Abb. 10: Einige Insekten wie die Nymphen von Zikaden werden nicht nur verzehrt, sondern werden als Medizin genutzt oder dienen als Vorlage für Masken und Gesichtsschmuck.

Fig. 11: Grubs, collected from rotting wood and presented in groups of one dozen each, are offered for sale in Nagaland at a Kohima market.

Abb. 11: Engerlinge aus verrottendem Holz werden auf einem Markt in Kohima (Nagaland) im Dutzend zum Kauf angeboten.

grubs frequently contain high amounts of easily digestible polyunsaturated fatty acids. Nectar-collecting insects are, of course, sweet and may contain honey (Fig. 13). In fact, the nutritive value of insects led to the recommendation by HILDREATH (1974) in a New Zealand survival book to consume insects rather than unknown plants when lost and marooned in the wilderness.

What led to the relatively recent decline in the use of insects as food among non-Western societies stems, in our view, largely from the misguided belief that aping the Western way of life was the fastest way for technologically less advanced societies to be accepted by Europeans. While this may have been the case in colonial times, it no longer holds true and countries in which entomophagy is still being practiced or has been given up only very recently, had better take note of the fact that since the 1970s traditional and ethnic foods have become trendy and shown a remarkable renaissance in Europe (KÖSTLIN 1975) and to some extent in eastern Asia as well (PEMBERTON 1994). In fact, growing self-confidence and assertiveness of people, once falsely regarded as unsophisticated, are the best remedy towards retaining traditional insect foods. And so, to some extent, is the dwindling amount of hunttable and consumable larger animals. Southern African mop(h)ane caterpillars are growing in popularity and can now even be purchased in some food stores in Europe, for example in Brussels.

How does one go about studying insects as human food? Obviously, the first step is to qualitatively record the species that serve as food items. Since certain species (or stages)

may be seasonal, prolonged observations are needed. In which way and by which method for what particular purposes insects are being consumed are other important aspects of entomophagic research. Quantitative data on the amounts and percentages of each insect species in relation to other food items must be collected and in the end the economic impact on family and society of insect consuming peoples need to be assessed. Finally ecologist would wish to know how insect consumption can be an ecologically-acceptable, sustainable practice, not upsetting the delicate balance of an ecosystem.

One approach is geographic, another focuses on certain tribes or ethnic groups. For the first, the researcher picks a region and investigates entomophagic practices therein. For the second the emphasis is on particular ethnic groups and their unique insect food preferences in comparison to other, perhaps neighbouring tribes. Both approaches have yielded considerable information, e.g. for Africa (MALAISSE 2005; VAN HUIS 2005), Papua New Guinea (MEYER-ROCHOW 1973b; TOMMASEO-PONZETTA & PAOLETTI 1997; MEYER-ROCHOW 2005), Australian aborigines (CAMPBELL 1926; MCKEOWN 1936; MEYER-ROCHOW 1975a; YEN 2005), Northeast India (MEYER-ROCHOW 2005), Japan (MITSUHASHI 2005a), China and Southeast Asia (WATANABE 1983; YHOUNG-AREE & VIWATPANICH 2005; LUO 2005), and South America (CERDA et al. 2005; ONORE 2005; PAOLETTI & DUFOUR 2005). It is also possible to take a particular insect taxon or insect community and investigate by whom, where, and how in the world this taxon or insect community is utilized, be that as a food

Fig. 12: Chocolate beetles and candies shaped like insects and spiders may represent a leftover of the now extinct but earlier present insect consumption by local residents in northern Europe.

Abb. 12: Schokoladenkäfer und Süßigkeiten in Form von Insekten und Spinnen erinnern vielleicht an eine ehemalige Nutzung von Insekten als Nahrungsmittel durch die Bevölkerung Nordeuropas.

Fig. 13: Australian honeypot ants: a delicacy in which the swollen ant abdomens, filled with sweet, watery honey, are preferentially consumed by wise old Aboriginal menfolk.

Abb. 13: Australische Honigtöpfeameisen: die von süßem, wässrigem Honig angeschwollenen Hinterleiber der Ameisen werden bei den Aborigines als Delikatesse vor allem von weisen alten Männern gegessen.

item or for some other reason. This approach has formed the basis of reviews by MITSUHASHI (2005b) on sago palm insects, HOFFMANN (2006) on Heteroptera, and RATCLIFFE (2006) on scarab beetles.

9. The Laotian Study of Food Insect Economics

The work we wish to report in this paper deals primarily with the economic importance and impact of insects in the Laotian countryside. Although we investigated a variety of food insect species in that region (Fig. 14), we were particularly concerned with one group: crickets. They not only represent one of the commonest food insects, they also generate

income and even moderate wealth, which is why we emphasize this group of insects over others (YHOUNG-AREE & VIWATPANICH 2005) that are considered edible in Laos.

The study area was the Xaythani District, a region traversed from west to east by the Makhiaw River and covering roughly 32 x 32 km² of the so-called Vientiane Plain (Fig. 15). The major food insects in connection with paddy fields were locusts, stinkbugs (=vegetable bugs), giant waterbugs, dragonfly nymphs, diving beetles, and ants. Edible insects associated with gardens were mainly crickets, while those associated with fields were grasshoppers and dung beetles and those associated with forests were cicadas, stinkbugs, a variety of beetles and grubs, larvae and pupae

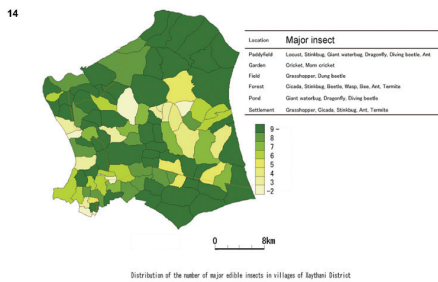


Fig. 14: Map of the Xaythani study district in Laos and number of edible insects species in shades of green.

Abb. 14: Karte des untersuchten Xaythani Distrikes (Laos) und Anzahl der essbaren Insektenarten in verschiedenen Grüntönen.

Fig. 15: Typical landscape around Xaythani villages with rain-fed paddy fields and small stands of forests.

Abb. 15: Typische Landschaft n der Umgebung von Xaythani Dörfern mit Reisfeldern und kleinen Waldstücken.

Fig. 16: Crickets living underground are best collected with the help of a digging stick.

Abb.16: Im Boden lebende Grillen werden am Besten mit Hilfe eines Grabstockes erbeutet.

Fig. 17: Grasshoppers and other field insects are collected with the help of a fine net.

Abb. 17: Heuschrecken und andere Insekten werden mit Hilfe eines feinmaschigen Netzes gefangen.

of wasps and bees, ant pupae and adults, and termites of all developmental stages. Ponds with stagnant water were used to obtain giant waterbugs as well as diving beetles, and in and around settlements mature or immature grasshoppers, cicadas, stinkbugs, ants, and termites were the most commonly collected food insects.

The habitats most frequently visited by humans to collect insects were forest edges, gardens, and paddy fields, the latter not only being a place to grow rice, but a habitat for a variety of easily collectable, edible species of insects. Since paddy fields very often existed at the edge of forests, people found it easy to collect insects in both habitats when walking from their homes to work in the fields in the

morning and returning home in the afternoon or evening. Edible insects were more abundant in plains rather than mountainous regions and in more than half of the area of the district more than 10 different species of insects were regularly consumed.

These insects were not consumed because of a lack of other food stuffs (the locals had access to fish and livestock), but because they genuinely appreciated the taste of the insects. Preferences with regard to certain species existed and such likes and dislikes seemed to be of a personal nature rather than representing taboos or following religious doctrine, although region and family tradition may have played a role. Preparation methods also varied and depended on the type of insect being



Fig. 18: A large number of plates filled with edible insects, for sale at a market in the Xaythani district.
Abb. 18: Zahlreiche Teller mit essbaren Insekten werden auf dem Markt im Xaythani Distrikt zum Verkauf angeboten.

Fig. 19: Plate with a meal of cicadas, priced 10,000 kip per plate in Laos.

Abb.19: Teller mit einer Mahlzeit von Zikaden für 10.000 Kip pro Teller in Laos.

Fig. 20: Roasted stink bugs on sticks for sale.

Abb. 20: Zum Verkauf bestimmte geröstete Stinkwanzen an Stöcken.

Fig. 21: Live crickets for sale for human consumption, priced 2,500 kip per 10 insects.

Abb. 21: Lebende Grillen zum menschlichen Verzehr bringen pro 10 Stück 2.500 Kip.

used, family traditions, and circumstances. Sometimes, for example, small insects were eaten raw and on the spot, but on other occasions insects were fried, dried, stewed, or boiled. A variety of cooking methods and recipes are given by YHOUNG-AREE & VIWAT-PANICH (2005). Insects were mainly hand-collected, but for flying insects, nets of varying dimensions were used (Fig. 17) and for fossorial (i.e., ground- or timber-dwelling) insects, digging utensils and other mechanical devices were employed (Fig. 16). Outings, specifically for collecting, for example, the edible field cricket *Acheta bimaculatus*, known locally as 'chinai', involved daily walks of 25–30 km along forest paths, gardens, and paddy fields. How selective collectors of edible insects can be, shows the example of the scale insect *Drosicha* sp. (Margarodidae), a giant aphid. Only a single species is eaten. Aphids that do not move are not eaten.

Edible insects, especially those known locally as the already mentioned 'chinai', but also the 'kai motdaen' (the weaver ant *Oecophylla smaragdina*), 'takaten' (grasshoppers and locusts), and 'maen kaen' (a general term for various species of stink bugs), represent a commercial resource and although not exactly plentiful, they can provide an opportunity for especially women and children of the area to earn some cash (Fig. 18). As more and more restrictions are imposed on hunting wild animals, the demand of insects as 'wild food' is increasing and chances to make

money from selling them are also increasing. Not surprisingly, 'middle women' set up businesses to buy the insect product and sell it to shops, snack bars, restaurants and other outlets in the big cities (Fig. 19). Perhaps surprisingly, with 10 crickets costing 2,500 Kip (i.e., Laotian currency: 10,000 Kip = 1.06 US\$) and 1 kg of meat costing 25,000 Kip, crickets are actually more expensive.

An analysis of the income derived from collecting crickets during the most active month of the year that each food item was available (Tab. 1) shows that the sale of edible insects generates a higher income than that obtainable from selling mammalian meat, wild edible plants, and rice. On the basis of 76 answers from 92 persons questioned, it was found that on average 3.6 occasions per week exclusively crickets were collected for over a period of 3.9 hours a day. During that time an average of 109 crickets was collected, which, according to answers received, represents a weekly earning of 37,569 Kip. Usually a considerable proportion of the collected crickets was used for home consumption.

On the basis of information received from 5 middle women, it was learned that marketing of edible insects started 18 years ago. Each middle woman was the recipient of insect products from an average of 8.8 persons. A middle woman would sell an average of 1,700 crickets during market day in the big city. Having bought the crickets for a price of 1,000–1,600 Kip per 10 individuals and selling them

Tab. 1: Einkommen aus natürlichen Ressourcen (basierend auf dem besten Monat des Jahres).

Table 1: Income from natural resources (based on best month of the year).

Product	Household	Income/month (x 1000 Kip)
Aquatic products	84	636.0
Mushrooms/bamboo roots	76	389
Insects	43	315
Mammals	7	306
Wild edible plants	9	302
Firewood	21	569
Salt	18	147
Farmed vegetables	3	1533
Rice	51	53

for 2,500 per 10 individuals, a middle woman returns home with an earning of 1,200 Kip per 10 crickets sold. Although this is not exactly a fortune, it must be remembered that rice and vegetables are quite cheap and, thus, the income from selling crickets can make a difference to a household, especially when all of the crickets taken to market are being sold the same day.

In conclusion, edible insects like stink bugs (Fig. 20) and the crickets of the Laotian Xaythani District (Fig. 21), must be regarded as a cultural and economic bio-resource worth retaining. In order to use this resource in a sustainable way, research into the ecological impact of insect harvests from the wild are required and perhaps to be supplemented with insect rearing under controlled conditions. An early attempt towards this end has apparently been made by Australian Aborigines, who were reported to have not only collected various edible grubs from trees, but who deliberately damaged host plants to facilitate colonization by the cerambycid beetle *Bardistus cibarius*, so that the latter could grow and mature (REIM 1962). Actions approaching cultivation or domestication of another edible insect, the sago-palm grub, were reported by TOWNSEND (1970), cited in OLIVER (1989) and total domestication, maybe as a result of entomophagical practices (NUNOME 1988), was achieved with the silkworm moth, for which, according to Sanskrit literature, an industry existed in India possibly "as early as 4,000 BC" (CLOUDSLEY-THOMPSON 1976).

10. Final Remarks

So much remains to be done, so much is still unknown, and so much will forever remain unknown, because we have badly neglected the interrelationship between humans and insects in the past. What has evolved over millennia with regard to folk medicinal remedies involving insects, could all of that just have been nonsense? We will not know, if we do not investigate such practices. Was, for

example, the dearth of all kinds of large insects from the Moluccan Island of Ceram, which the famous 19th century zoologist ALFRED RUSSEL WALLACE (1823-1913) in 1883 called "a zoological desert" surrounded by smaller islands on which there was no shortage of spectacular insects, the result of over-exploitation of a resource by the Melanesian inhabitants of the sizable land mass of Ceram or were other causes responsible? We still do not have an answer to that puzzle and many other ethnoentomological questions, including those that deal with references to insects in the idioms, songs, myths and legends of different ethnic and linguistic groups. The economic value insects represent to communities, in which insects form part of the diet, and what insect collecting for human consumption means to the ecosystem, in which it is practiced, are aspects that have hardly been studied at all. But let it be noted that avenues for a responsible environmental policy are now earnestly being sought (RALSTON 2000) and that wildlife, which includes insects and other invertebrates, has at last been recognized as valuable in its own right (CHARDONNET et al. 2002). We are now dealing with questions that have begun to receive greater attention and recognition worldwide (the FAO-sponsored conference in Chiang Mai on Edible Forest Insects in February 2008 is testimony of that new attitude). In the words of SAITO (2002) "we need to cultivate an ecologically informed nature aesthetics...to maintain...ecological health and well-being". It seems then that ethnoentomological and cultural entomological studies have finally come of age. Having inspired anthropologists, social scientists, geographers, linguists, zoologists, and historians in the past, may they now be an inspiration for our employers and funding agencies as well! In this context the FAO-sponsored international workshop on "Edible Forest Insects" in Chiang Mai (February 19-21, 2008) signifies a promising development.

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