# NEGLECTED AND UNDERUTILIZED INSECT SPECIES FOR NUTRITION AND HEALTH

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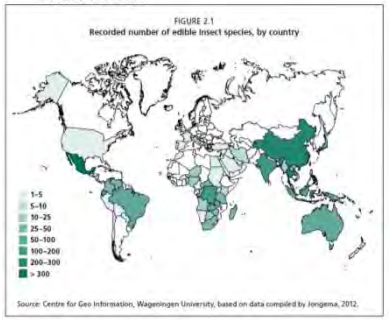
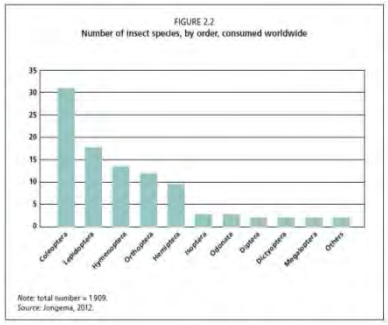
**Abstract**

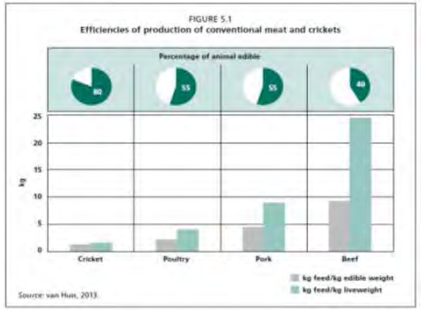
This paper reviews the potential of neglected and underutilized insects species for nutrition and health. Estimates of the number of insect species that are consumed by humans vary, but worldwide at least 2000 species have been recorded as human food. Recent worldwide volatility in food prices, anxiety over rising food insecurity and increasing concerns related to climate change and the large contributions of the agriculture sector to greenhouse gas emissions are motivating many experts to reassess diets and various approaches for food production, especially protein production. The objective of this project is to elevate Neglected and Underutilized edible insects into gourmet food status thereby promoting food security.

INTRODUCTION

- Insects are the most diverse group of animals on earth with over one million different species. They have served man in diverse ways for several millennia; as food, medicine and in other cases as his competitors for resources (Durst and Shono, 2010). At least 1900 species have been recorded as human food (FAO, 2013).
- Entomophagy has declined in many societies, and has often been shunned as old-fashioned, dirty or unhealthy. However, insects still remain a vital and preferred food and an essential source of protein, fat, minerals and vitamins. Insects are about twice as efficient as chicken and pigs and more than 5 times as efficient as beef in converting what they eat into edible tissue (Durst and Shono, 2010). Moreover, insects feed on a far wider range of plants than conventional livestock.
- One hundred grams of dried caterpillars contain 52.9 grams of protein, 15.4 grams of fat, and 16.9 grams of carbohydrates and have an energy value of 430 kcal. Insects are highly nutritious(Johnson, 2010). Many insect species contain as much or more protein as meat and fish. Some insects, especially in the larval stage, are also rich in fat and most insects contain significant percentages of amino acids and essential vitamins and minerals (Van Huis, 2013).




1. Hence the need for research on the nutritional potential of edible insect species as alternative food and feed to mitigate food insecurity and malnutrition.

| Location | Common name | Scientific name | Energy content (kcal/100 g fresh weight) |
|---|---|---|---|
| Australia | Australian plague locust, raw | *Chortoicetes terminifera* | 499 |
| Australia | Green (weaver) ant, raw | *Oecophylla smaragdina* | 1 272 |
| Canada, Quebec | Red-legged grasshopper, whole, raw | *Melanoplus femurrubrum* | 160 |
| United States, Illinois | Yellow mealworm, larva, raw | *Tenebrio molitor* | 206 |
| United States, Illinois | Yellow mealworm, adult, raw | *Tenebrio molitor* | 138 |
| Ivory Coast | Termite, adult, dewinged, dried, flour | *Macrotermes subhyalinus* | 535 |
| Mexico, Veracruz State | Leaf-cutter ant, adult, raw | *Atta mexicana* | 404 |
| Mexico, Hidalgo State | Honey ant, adult, raw | *Myrmecocystus mimicus* | 116 |
| Thailand | Field cricket, raw | *Gryllus bimaculatus* | 120 |
| Thailand | Giant water bug, raw | *Lethocerus indicus* | 165 |
| Thailand | Rice grasshopper, raw | *Oxya japonica* | 149 |
| Thailand | Grasshopper, raw | *Cyrtacanthacris tatarica* | 89 |
| Thailand | Domesticated silkworm, pupa, raw | *Bombyx mori* | 94 |
| The Netherlands | Migratory locust, adult, raw | *Locusta migratoria* | 179 |

Source: FAO, 2012f.


Developing feed for aquaculture systems from Black soldier fly larvae


Shield bug snacks

Edible species considered as pests of global or local importance in agro-ecosystems, which could be controlled through strategies of alternative management and used widely for human consumption

| Order | Species and common name | Distribution |
|---|---|---|
| Orthoptera | *Locusta migratoria*, migratory locust | Intercontinental |
| | *Locustana pardalina*, South African migratory locust | Africa |
| | *Schistocerca gregaria*, desert locust | Intercontinental |
| | *Zonocerus variegatus*, variegated grasshopper | Africa |
| | *Sphenarium purpurascens*, chapulines | Mexico |
| Coleoptera | *Rhynchophorus phoenicis*, African palm weevil | Africa |
| | *Rhynchophorus ferrugineus*, Indian red date palm weevil | Asia |
| | *Rhynchophorus palmarum*, American palm weevil | America |
| | *Augosoma centaurus*, scarab beetle | Africa |
| | *Apriona germari*, mulberry longhorn stem beetle | Asia |
| | *Oryctes rhinoceros*, coconut rhinoceros beetle | Intercontinental |
| Lepidoptera | *Agrius convolvuli*, sweet potato hawkmoth | Zimbabwe, South Africa |
| | *Anaphe panda*, wild silkmoth | Africa |
| | *Gynanisa maja*, emperor moth | Africa |

Source: Cerritos, 2009.

Comparison of average protein content among insects, reptiles, fish and mammals

| Animal group | Species and common name | Edible product | Protein content (g/100 g fresh weight) |
|---|---|---|---|
| Insects (raw) | Locusts and grasshoppers: *Locusta migratoria, Acridium melanorhodon, Ruspolia differens* | larva | 14–18 |
| | Locusts and grasshoppers: *Locusta migratoria, Acridium melanorhodon, Ruspolia differens* | Adult | 13–28 |
| | *Sphenarium purpurascens* (chapulines – Mexico) | Adult | 35–48 |
| | Silkworm (*Bombyx mori*) | Caterpillar | 10–17 |
| | Palmworm beetles: *Rhynchophorus palmarum, R. phoenicis, Callipogon barbatus* | Larva | 7–36 |
| | Yellow mealworm (*Tenebrio molitor*) | Larva | 14–25 |
| | Crickets | Adult | 8–25 |
| | Termites | Adult | 13–28 |
| Cattle | | Beef (raw) | 19–26 |
| Reptiles (cooked) | Turtles: *Chelodina rugosa, Chelonia depressa* | Flesh | 25–27 |
| | | Intestine | 18 |
| | | Liver | 11 |
| | | Heart | 17–23 |
| | | Liver | 12–27 |
| Fish (raw) | Finfish | Tilapia | 16–19 |
| | | Mackerel | 16–28 |
| | | Catfish | 17–28 |
| | Crustaceans | Lobster | 17–19 |
| | | Prawn (Malaysia) | 16–19 |
| | | Shrimp | 13–27 |
| | Molluscs | Cuttlefish, squid | 15–18 |

Source: FAO, 2012f.

**1.References**

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