



European Conference 2014

Hosted by Martin and Béatrice Bueche of
Jardin des Papillons in Hunawihr. Alsace, France

"Lepidoptera as food.
A possible story for
our exhibitions"

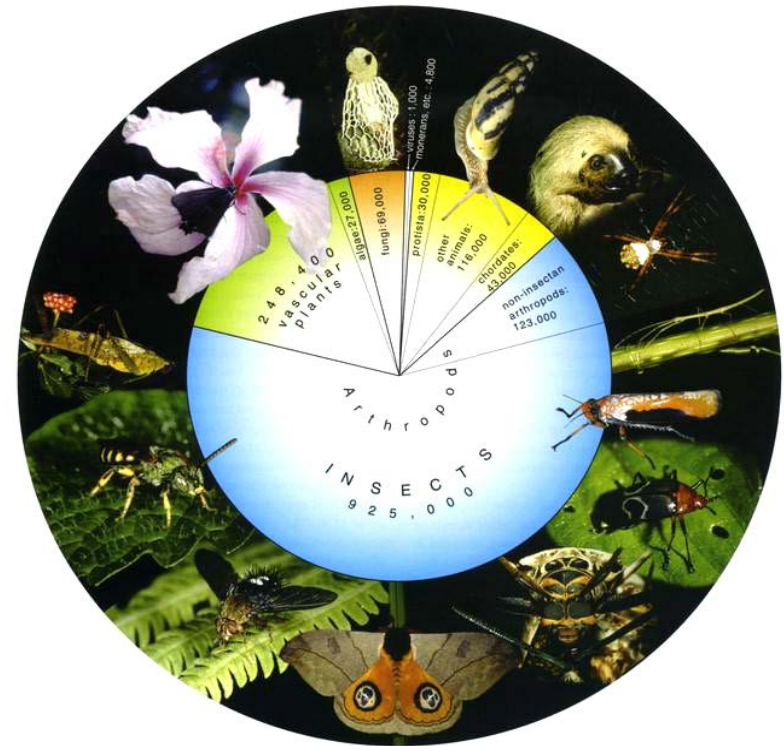
*Dr. Enzo Moretto
Direttore ESAPOLIS
Museo del MicroMegaMondo
Provincia di Padova*



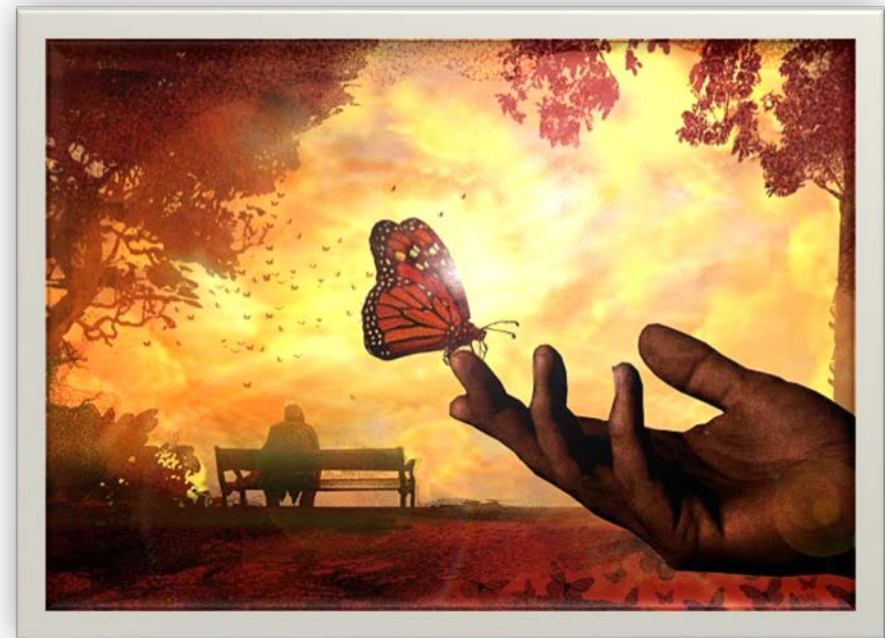
In our Butterflies Houses, we tell visitors **how** insect and especially butterflies are **important** for the functioning of **ecosystems** and for **science**.

We **care** to **protect** them and **let know** their

- **biology**
- **environment**
- **influence on art and culture**



1.3. The diversity of life shown as proportions of named species.



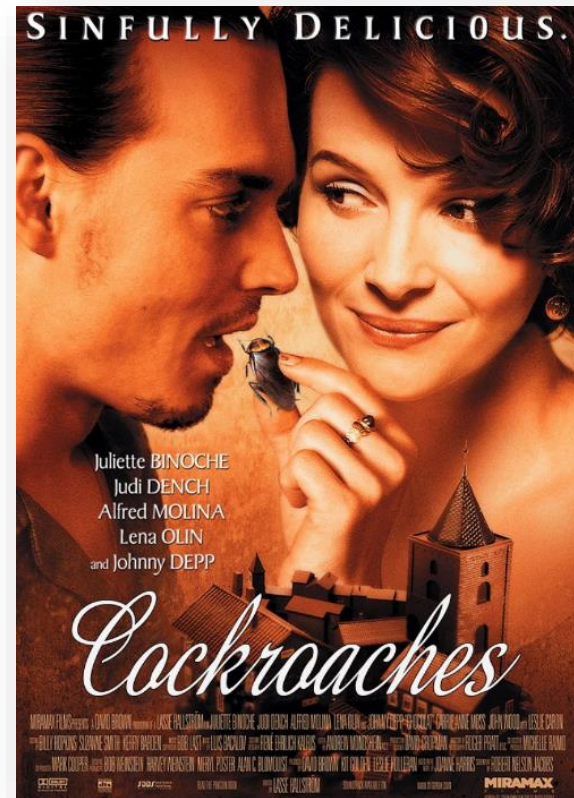


Certainly one would not be awarded to talk about eat butterflies and thus kill them to a seemingly eccentric and speculative purpose.



The topic, however, may arouse curiosity, and thus deserves a better investigation.

For example, think about the creation of an exhibition on butterfly entomophagy.





What's human entomofagy?

The term derives from the greek ἔντομος éntomos, "bugs", and φάγεῖν phagein, "eat"), but also refers to the consumption of other arthropods (spiders, centipedes, etc.) with the exception of shellfish.





History of entomophagy

- The paintings in the caves of Altamira and in other caves in northern Spain, dated about 30,000 to 9,000 BC, show collections of nests of wild bees.
- In some remains of buildings in the Chinese province of Shanxi, dated 2000 and 2500 years BC, were found cocoons of the wild silkworm *Theophila religiosae*. These had large holes that suggest that the pupae were eaten.



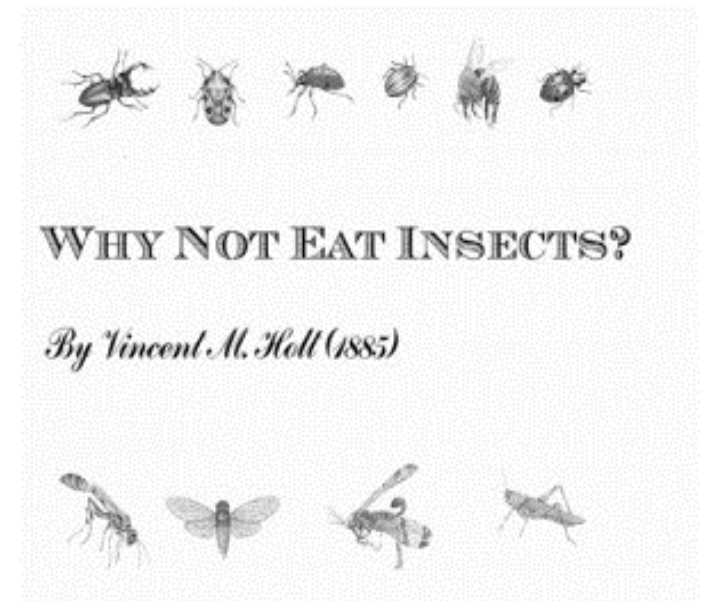


History of entomophagy

- The Bible - Leviticus - expressly provides that we can feed on locusts, grasshoppers, cockroaches. "From each according their own species ..."
- In Greek and Roman culture larvae were considered refined food Pliny speaks of the **caterpillar** "Cossus"
- Victorian England Vincent M. Holt: "Why Not Eat Insects?", Released in 1885



Chilecomadia moorei





History of entomophagy

The entomophagy is widespread among non-human primates, and also in many human communities with very different models.

Humans
consume
insects
high in
nutrients



Non-human
primates prefer
high ratio
protein/fat.

Mostly the so-
called "Big
Five":

Coleoptera,
Hymenoptera,
Isoptera,
Lepidoptera
and Orthoptera.

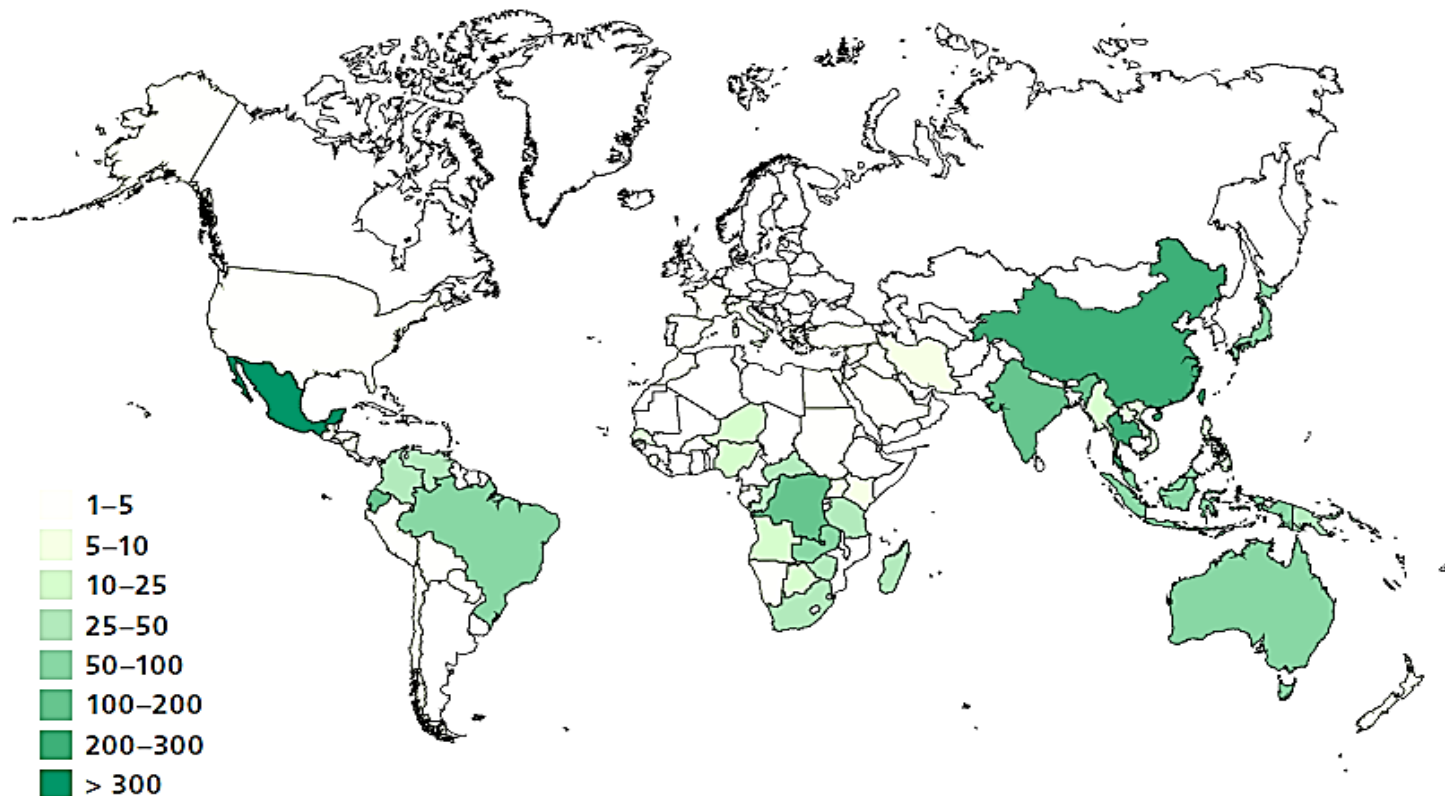




Where is practiced?

- It is estimated that at least 2 billion people normally feed on insects
- Until now the species "eaten" are more than 2000

FIGURE 2.1
Recorded number of edible insect species, by country



Source:
Centre for
Geo
Information,
Wageningen
University,
based on
data
compiled by
Jongema,
2012.



Why entomophagy?

In the 21st century, eating insects is a response to a food emergency (food and feed) that is due to the increase:

- the cost of the proteins from vertebrate
- insecurity of food and feed
- environmental pressures
- increase in population
- increased demand for protein in the middle classes





What are the cultural difficulties?

Many people in developed countries look at insects with disgust and when there are exceptions, make the news.

Are considered more for their novelty than for their nutritional value. E.G. Covered with chocolate or ice cream or as useful to survival in adventures in nature when something goes wrong.





What are the environmental benefits?

- They can be raised on organic streams. Therefore contribute to the reduction of pollution.
- Emit much less greenhouse gas and ammonia of pigs and cattle.
- Require less agricultural land and less water.
- Constitute a lower risk for transmission of zoonotic diseases to humans, livestock and wildlife.
- They can be bred with resources can not be used directly. E.G. Silkworm that feeds on the leaves of the mulberry tree, unfit for human consumption.
- Flavours and nutrients produced in nearby places



The more efficient insect farming

- Insects are cold-blooded. They consume less energy and produce more of the animals for meat classics.
- 1 kg of beef consume up to 5-20 thousand litres of water. For insects is much, much less.
- Chicken meat has the highest rate of conversion of ingested food (10: 5), compared to 10: 1 in cattle and 10: 6 of insects;
- The edible part produced is much higher (about 80%) in insects and 55% in cattle, 65% in chicken compared with 80% of the insects.
- E.G. Crickets require 2 kg of feed per kg of body weight gain.

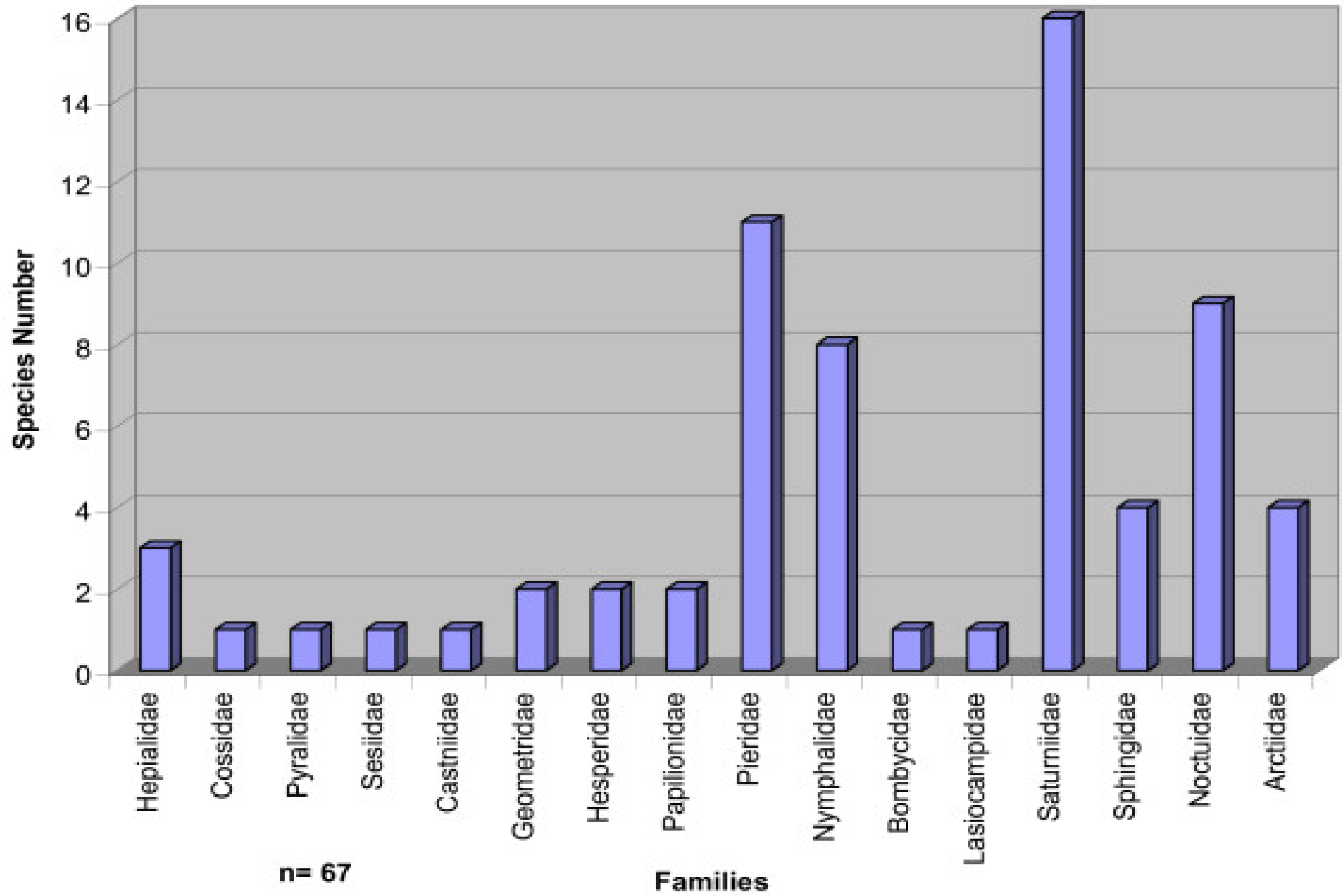


A glance to the world lepidoptera entomophagy

- **Congo and Zambia:** 37 species (*Gonimbrasia*, *Imbrasia*, *Bunaea*, *Bunaeopsis*, *Cirina*, *Pseudantheraea*, *Micragone*, *Olocerina*, and *Melanocera*)
- **Nigeria** 6 species
- **Angola** 4 species
- **China** 66 species, 20 genera and 17 families; 36 species of *Hepialus* genus.
- **Japan:** 5 species.
- **Amazonas:** 67 species. Castniidae, Noctuidae and Sphingidae
- **Mexico:** 76 species.



Genera of Lepidopterae consumed in México



Some of the eaten butterflies also often displayed in the Butterfly Exhibitions



Actias luna



Antherea spp.



Samia cynthia



Imbrasia belina



Protographium p. philolaus



Pterourus m. multicaudata



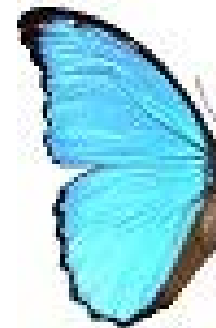
Phoebis a. agarithe



Danaus gilippus thersippus



Danaus p. plexipus



Morpho didius



Particularly eaten *Lepidoptera*

The maguey worm

- *The white maguey worms (meocuiles), is a butterfly commonly named "tequila giant skipper," Aegiale hesperiaris.*
- *Is mostly found in Central Mexico, on plants, such as: Agave tequilana and Agave americana (maguey).*
- *The red maguey worms (chilocuiles, chinicuiles or tecoles) are the larvae of the moth Hypopta agavis.*
- *Along with agave snout weevil larvae (mezcal worm), red maguey worms are put in bottles of mezcal liquor from the Mexican state of Oaxaca.*





Particularly eaten Lepidoptera

- Regulation (EC) no 258/97 states that foods which have not been used for human consumption within the European Union before 15 may 1997 are novel foods.
- Insects are considered novel food
- In spite of this Belgium forced the market of insects for human consumption approving, among others, 3 Lepidoptera:
- Greater wax moth *Galleria mellonella*
- Lesser wax moth *Achroia grisella*
- Silk moth *Bombyx mori*



Galleria mellonella



Achroia grisella



Bombyx mori

Particularly eaten *Lepidoptera*

...others silk moths



Various food recipes use ERI mature larvae, pupae and prepupe in combination with herbs, vegetables and spices

Compared to other insects used in food, the moth ERI is one of those with a higher protein content.



...others silk moths

The Mopane (*Imbrasia belina*)

The caterpillars of dried Mopane are exported from Africa to Europe. Only Belgium, every year, imports three tons of dried caterpillars, France 5 tonnes, mainly from Dem. Rep of Congo.

Grassi (% materia secca) 24%
Acido palmitico (8%) SFA
Acido oleico (9%) MUFA
Acido linoleico (7%) PUFA
Aiso α -linolenico (38%) PUFA

SFA – saturated fatty acids; MUFA and PUFA – mono and poly unsaturated fatty acids.





...others moths

Witjuti (witchety) grubs (Endoxyla, including the Desert Witchetty Grub (E. leucomochla larvae of the moth family Cossidae)



Bogong moths
Agrotis infusa

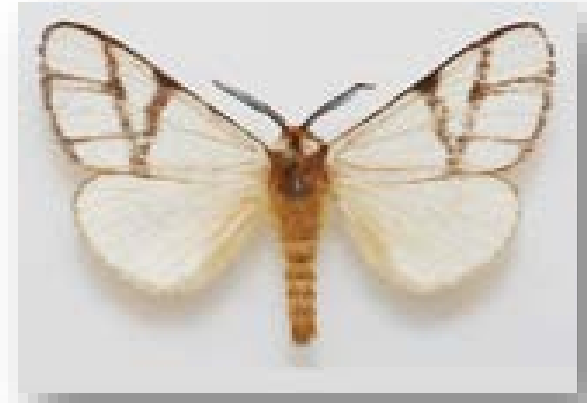




The butterflies that are eaten, are really edible?

In southern Nigeria, the consumption of the silk moth *Anaphe venata*, produced **ataxia**. This is due to a crossover effect with carbohydrates that contain cyanogenic glycosides that bind to the thiamine and the action of thiaminase contained in the moth.

Stinging hairs or less, which can be annoying to be very harmful if not burned.





The strange case of the toxic *Zygaena* moth

Local traditional food habits in northern Italy revealed that children in Carnia have traditionally eaten sweet ingluvies (the crop) from day flying moths of the genus *Zygaena* and its mimic, *Syntomis*.

These moths contain cyanogenic glucosides, which release toxic hydrogen cyanide.





Other 'food' products with butterflies

Chitosan

This product, derived from the carapace of insects, can better maintain the product protecting them from pests and microorganisms.

In particular, chitosan contains antioxidants and has antibacterial activity against moulds and yeasts.

It could become an environmentally friendly product to make polymers for food use (packaging).

The main problem is that it alters with the humidity, which for now makes it unusable in its pure form.



Other 'food' products with butterflies

The fungus Cordyceps

- Since the time of the shamans, more than 50,000 years ago, mankind sought the Cordyceps, a substance venerated to such a point that in ancient China, was reserved exclusively for the royal family .
- There are more than 700 species of Cordyceps.
- The best known is the Cordyceps sinensis (an entomophagus ascomycete located in the Tibetan plateau)



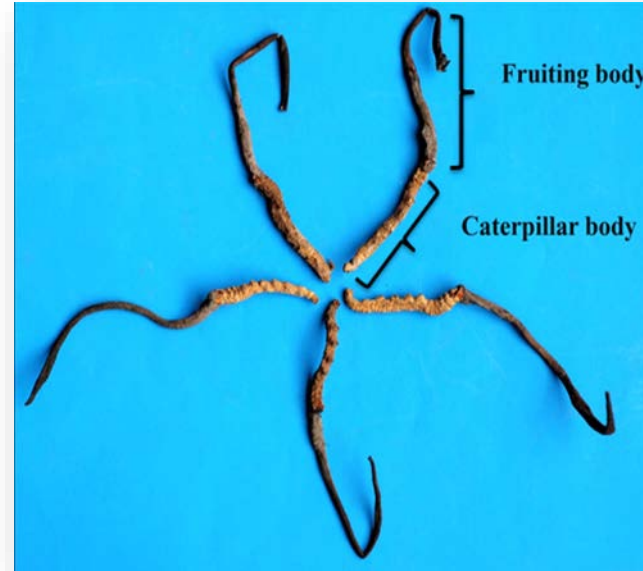
Thitarodes (Hepialus) armoricanus



Altri prodotti «alimentari» con le farfalle

The Fungus Cordyceps

In 1993, a group composed of nine athletes, who had taken the Cordyceps, pulverized nine world records.



Main effects:

- produces oxygen at the cellular level
- ATP increases the activity up 28%
- destroys cancer cells (polysaccharides)
- inhibits some viruses (cordycepin).

冬虫夏草
-Dongchongxiacao-
Cordyceps sinensis

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Made in JAPAN



Are you thinking now about the realization of an exhibition on entomophagy?

Here we are

