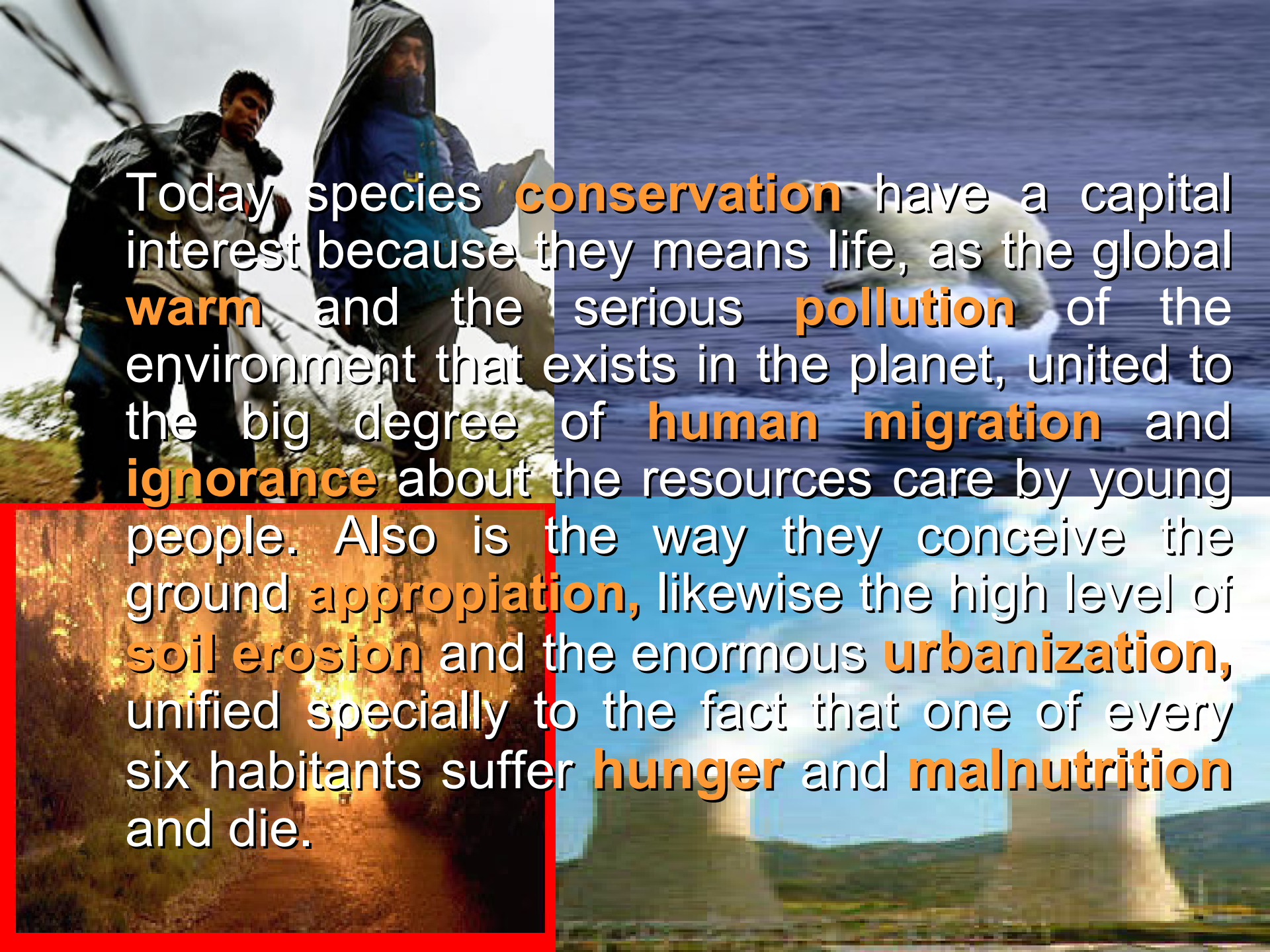




# Anthropoentomophagy in Mexico and in the World

Dra. Julieta Ramos-Elorduy B.  
Lineville, AL, USA, April, 2010.



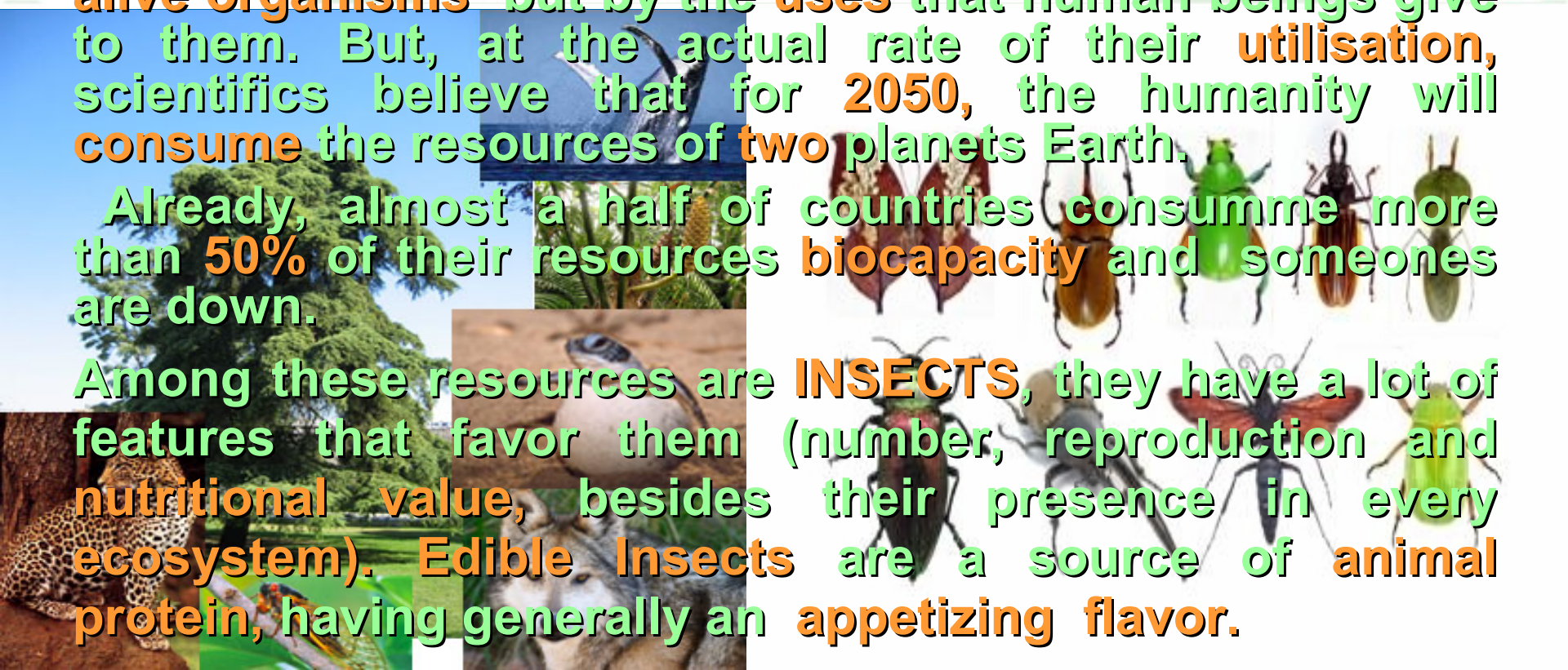
Today species **conservation** have a capital interest because they means life, as the global **warm** and the serious **pollution** of the environment that exists in the planet, united to the big degree of **human migration** and **ignorance** about the resources care by young people. Also is the way they conceive the ground **appropriation**, likewise the high level of **soil erosion** and the enormous **urbanization**, unified specially to the fact that one of every six habitants suffer **hunger** and **malnutrition** and die.



So, **NATURAL RESOURCES** acquire values that never had, not only in their role into the **multistructural net of alive organisms** but by the **uses** that human beings give to them. But, at the actual rate of their **utilisation**, scientifics believe that for **2050**, the humanity will **consume** the resources of **two** planets Earth.

Already, almost a half of countries consumme more than **50%** of their resources **biocapacity** and someones are down.

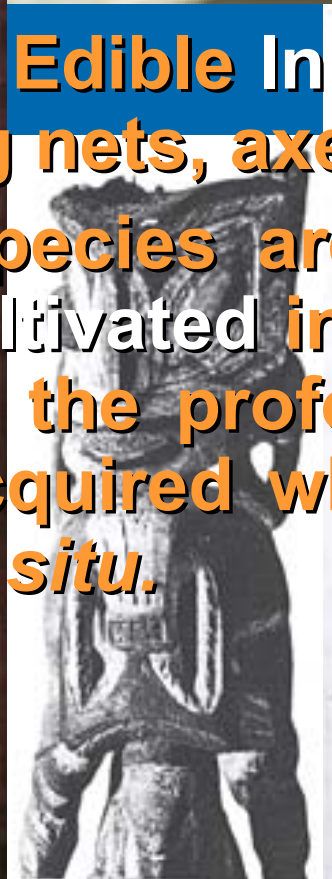
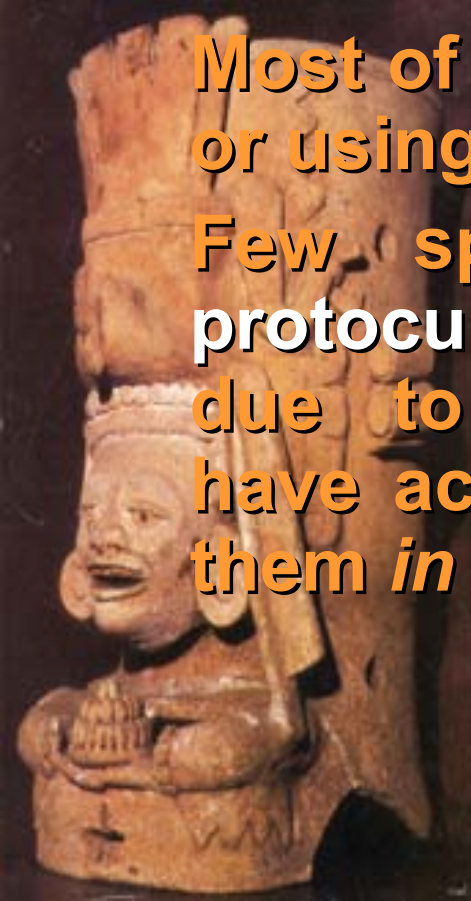
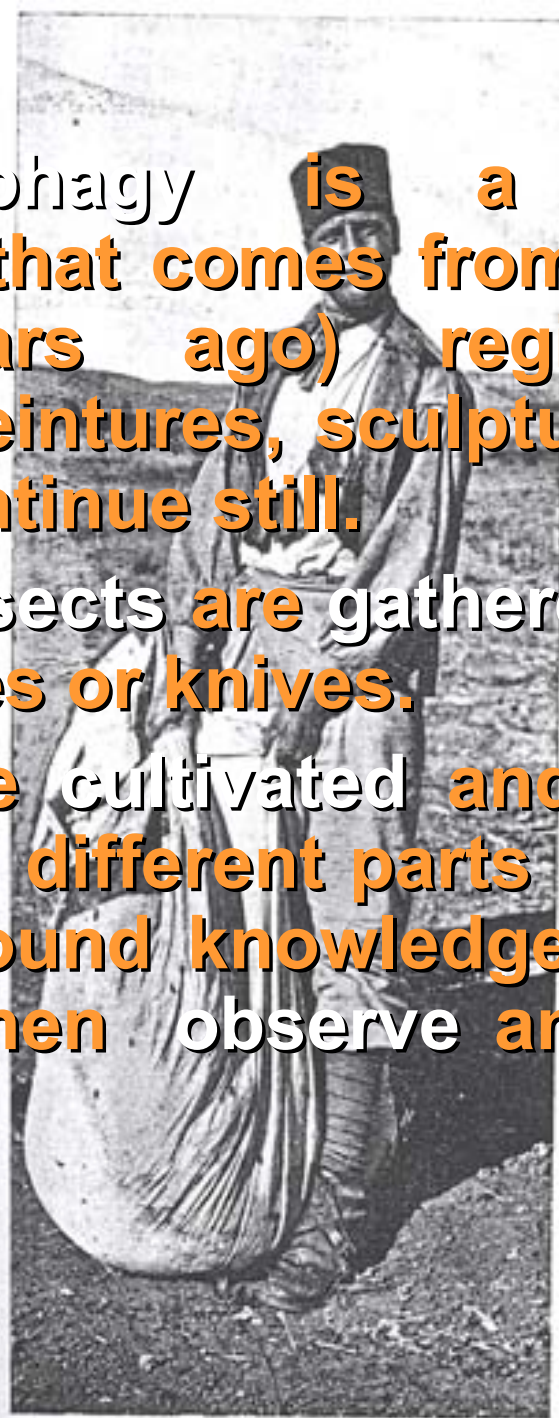
Among these resources are **INSECTS**, they have a lot of features that favor them (number, reproduction and **nutritional value**, besides their presence in every ecosystem). **Edible Insects** are a source of **animal protein**, having generally an **appetizing flavor**.




**Anthropoentomophagy is a traditional alimentary habit that comes from Paleolithic era (7,000 years ago) registered on testimonies as peintures, sculptures, totems or deities that continue still.**

**Most of Edible Insects are gathered manually or using nets, axes or knives.**

**Few species are cultivated and someones protocultivated in different parts of the world due to the profound knowledge that rurals have acquired when observe and conserve them *in situ*.**





According to Possey (1990) indigenous people conserve 90% of the planet's **germplasm**. This indicates to us the appreciation that they have towards them. So, their **primitive methods** permit their sustainable **exploitation**, that leads to the **survival** of species.

There is a **convergence** in the use of some genera, families or species in the whole world. When an ethnos was more isolated, so **species** are **elected**, appreciated, cared for and even revered.

We have recorded **2,000** species of edible insects in the world. In Mexico we have now recorded **549** species.



It exists an **overexploitation** of some species, arriving to **risk of extinction** united to enormous **fight** make by the **insecticides** companies.

Concomitantly, some of these species because of their high **demand** and **market**, are appreciated in five forks restaurants and also are those that peasants can **sell**, **are those in the greatest danger**.

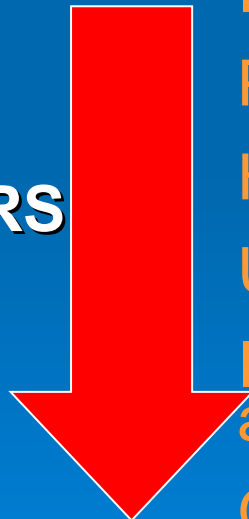


Fuente:  
Elaboración propia con datos de  
INEGI. Carta de uso actual del suelo y vegetación Serie III, México.

Original

Today

Presence



Absence

Indiscriminate use

Poorly planned development

Habitat Modified

Urbanization

Introduction of varieties of plants and animals, domestic or foreign

Change of soil use and climate

Biocides

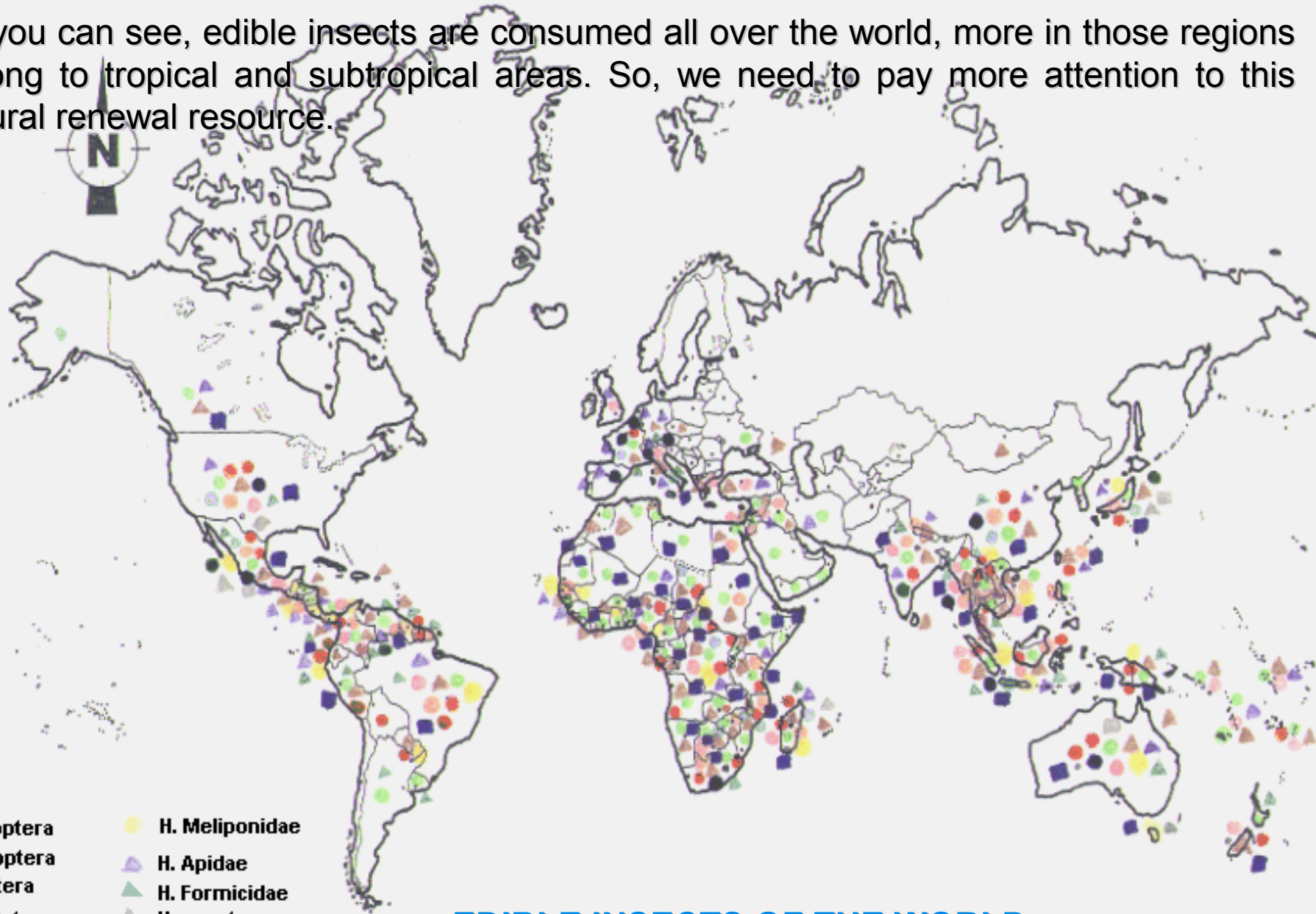


ECOLOGICAL  
IMPACT

PARAMETERS



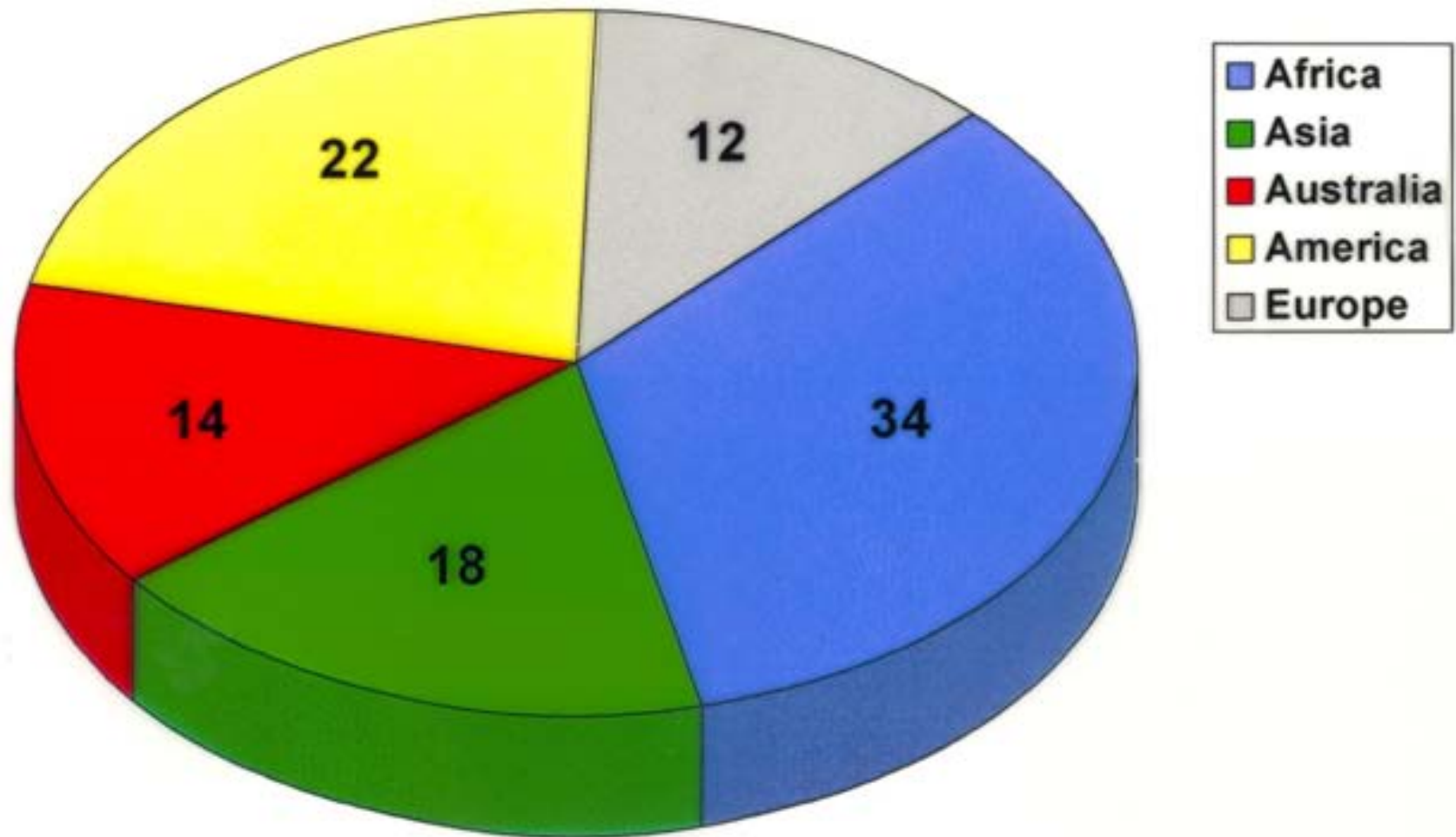
As you can see, edible insects are consumed all over the world, more in those regions belong to tropical and subtropical areas. So, we need to pay more attention to this natural renewal resource.



## EDIBLE INSECTS OF THE WORLD



# Countries Number Registered that Eat Insects in the World







































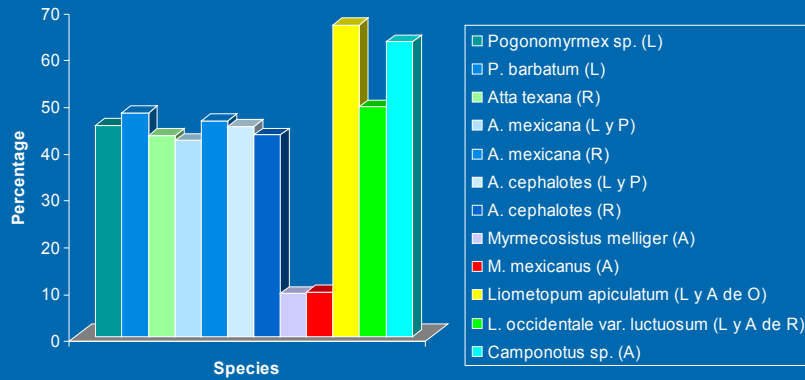
## SOME STATES OF THE MEXICAN REPUBLIC WITH ANTHROPOENTOMOPHAGIC ACTIVITY

Aguascalientes	1	Nayarit	13
Campeche	25	Nuevo León	3
<b>Chiapas</b>	<b>155</b>	<b>Oaxaca</b>	<b>134</b>
Chihuahua	7	Puebla	75
DF	75	Querétaro	14
Durango	2	Q. Roo	30
<b>Estado de México</b>	<b>160</b>	SLP	12
Guanajuato	11	Tabasco	21
Guerrero	92	Tlaxcala	25
<b>Hidalgo</b>	<b>145</b>	Veracruz	119
Jalisco	16	Yucatán	66
Michoacán	48	Zacatecas	7
Morelos	44	Total	1300
Recorded species 545		755 species are repeated in some states	

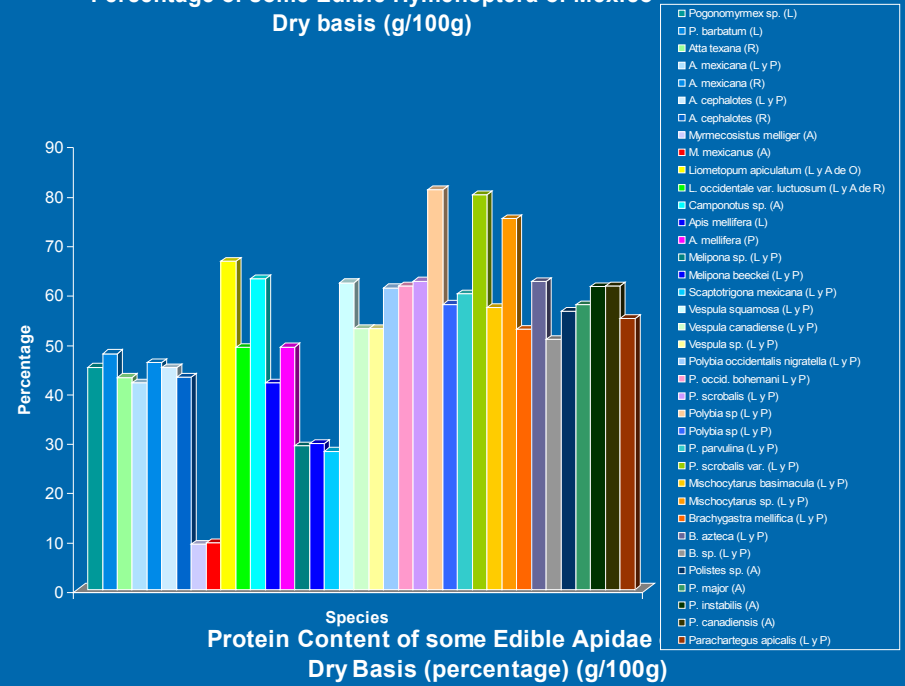


# NUTRITIVE VALUE , PROTEIN CONTENT

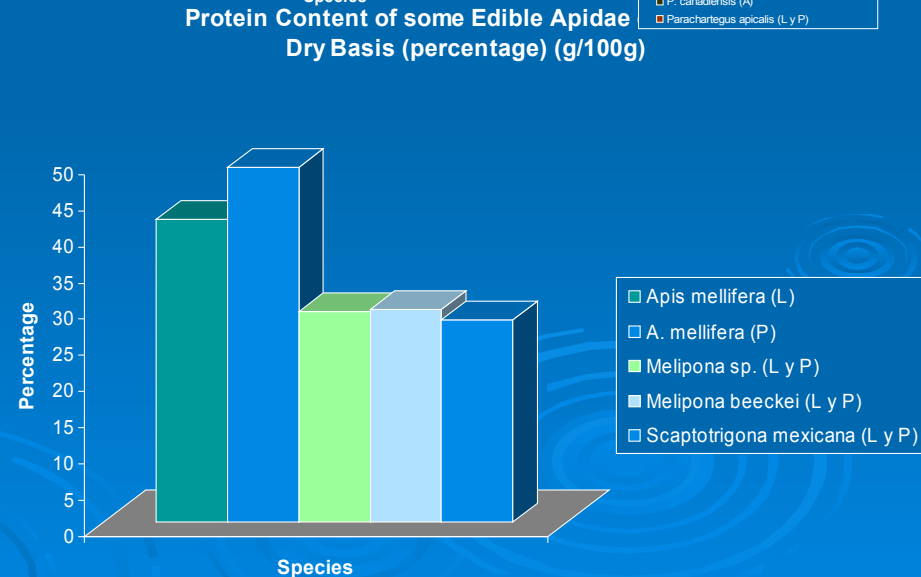
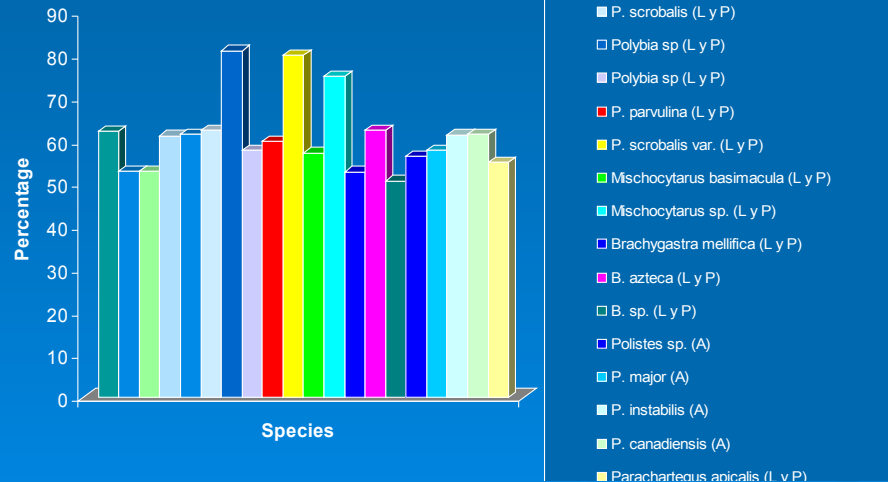
**Protein content of some Edible Formicidae of Mexico  
Dry Basis (percentage) (g/100g)**

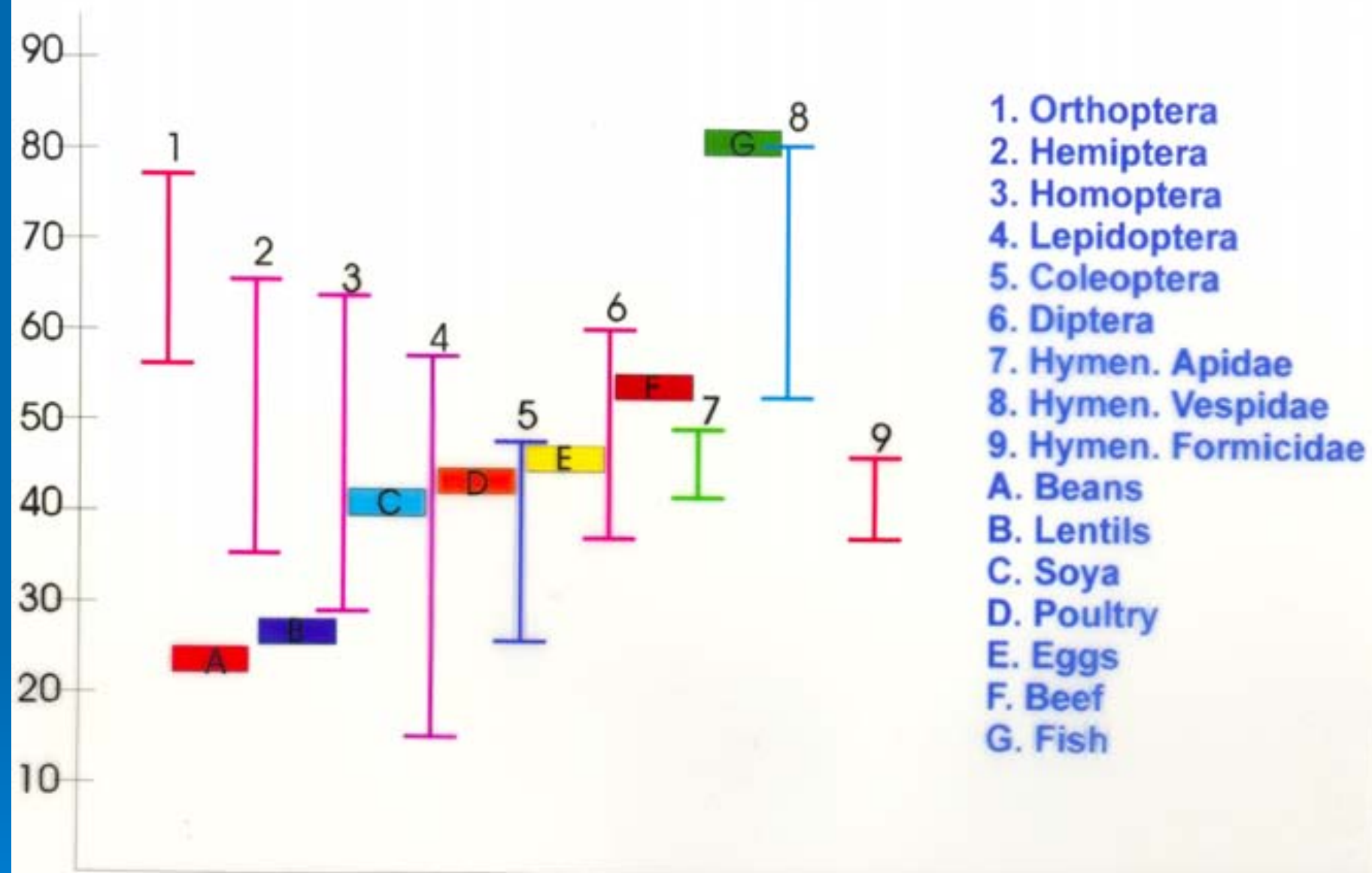


**Percentage of some Edible Hymenoptera of México  
Dry basis (g/100g)**



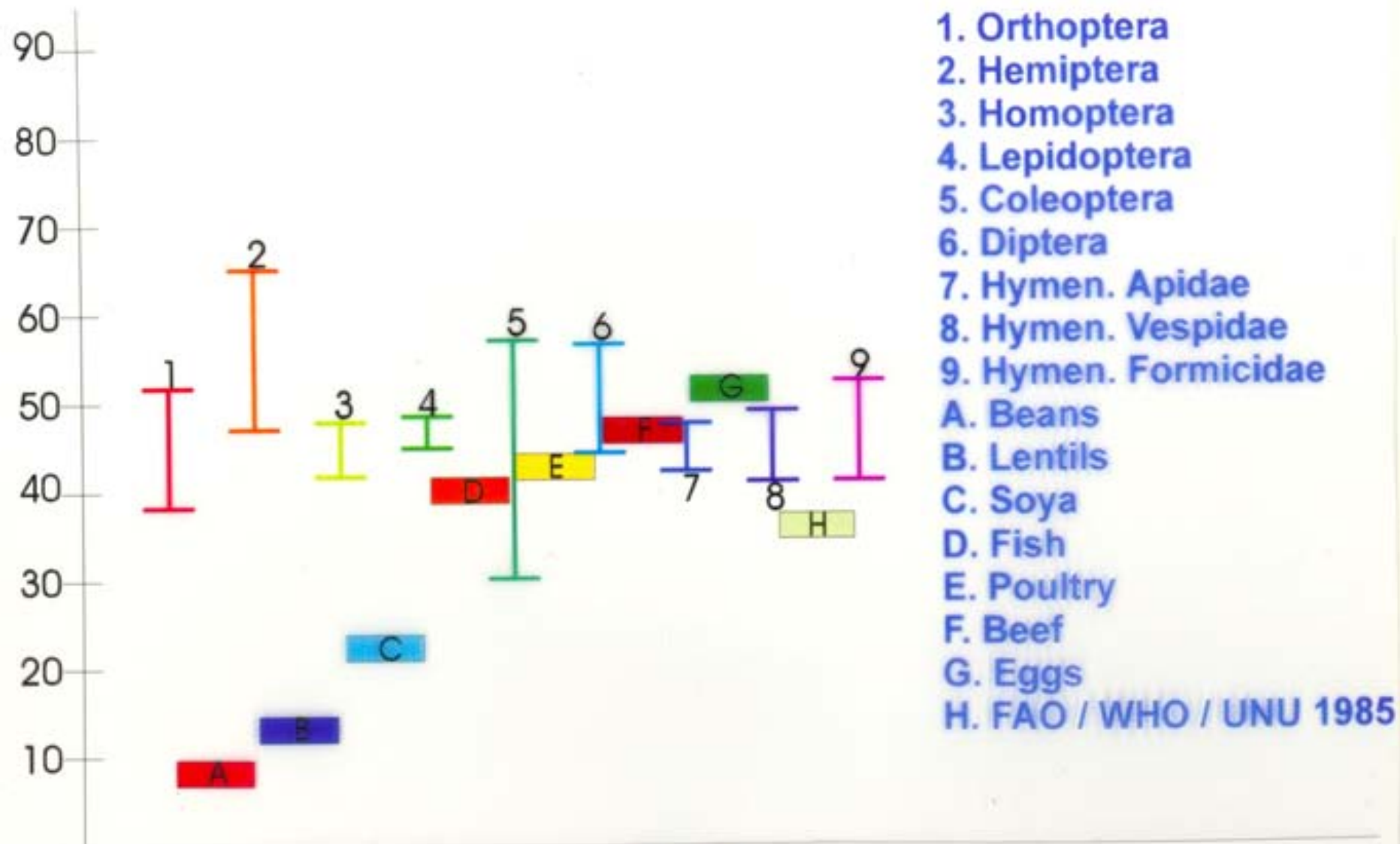
**Protein Content of some Edible Vespidae  
of Mexico  
Dry Basis (percentage)(g/100g)**





Figure

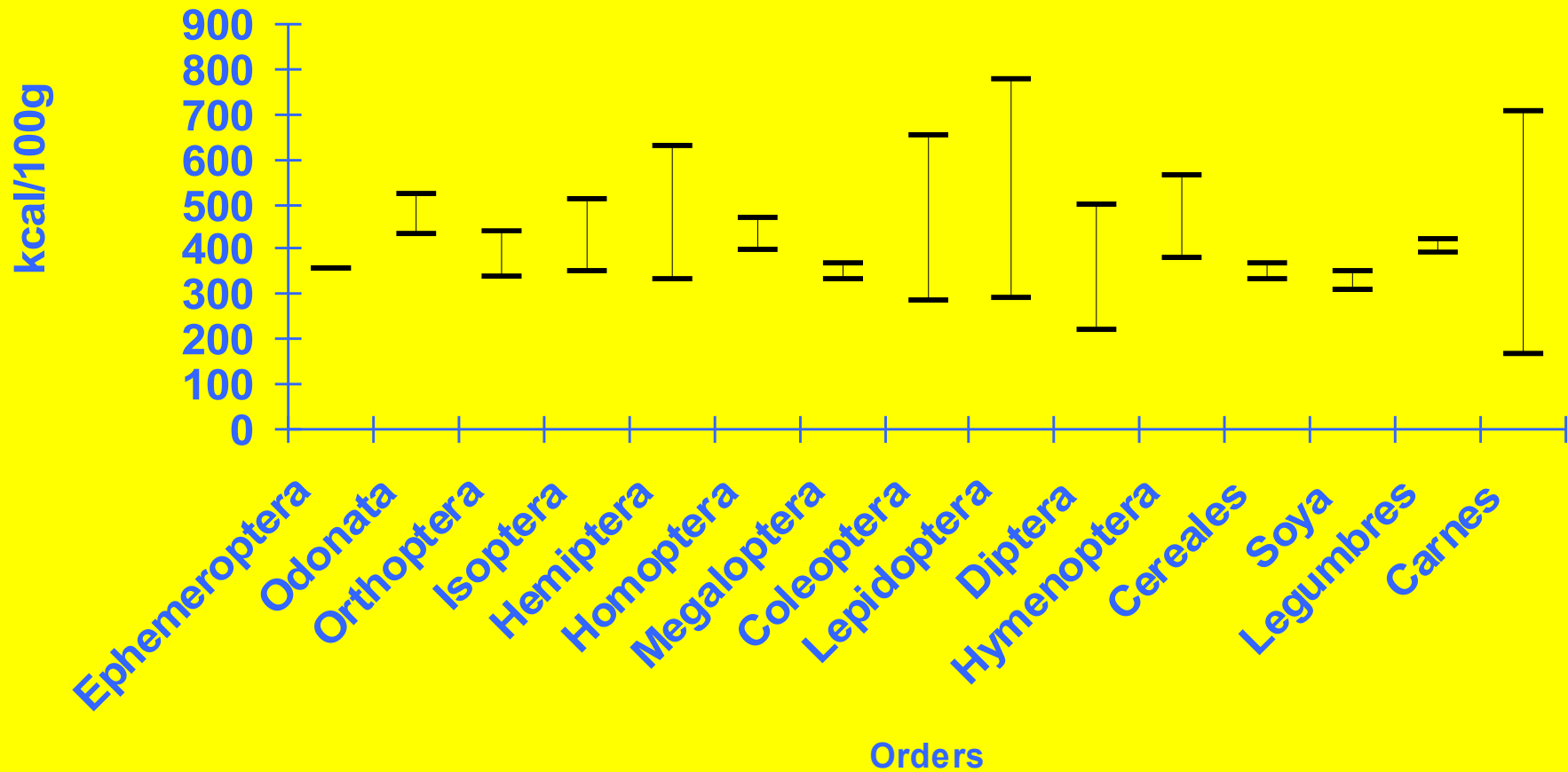
Ranges of protein percentage of edible insects in the different orders studied compared with the protein value of some conventional alimentary products.



Figure

Ranges of Total quantity of essential amino acids in edible insects of the different orders studied compared with the value of essential amino acids of some conventional alimentary products and with the FAO / WHO / UNU 1985 Pattern.

# Energy provided by different orders of edible insects and conventional food



# RANGE OF CONTENT OF DIVERSE MINERAL SALTS OF SOME ORDERS OF EDIBLE INSECTS OF MEXICO COMPARED WITH CONVENTIONAL PRODUCTS

**g/100g**

<b>Insects</b>	<b>Na</b>	<b>K</b>	<b>Ca</b>	<b>Zn</b>	<b>Fe</b>	<b>Mg</b>
Orthoptera	0.066-0.609	0.044-0.574	0.051-0.120	0.016-0.078	0.016-0.044	0.352-0.943
Hemiptera	0.020-0.572	0.014-0.256	0.075-0.104	0.024-0.112	0.012-0.130	0.744-2.550
Lepidoptera	0.048-0.544	0.048-2.912	0.048-0.088	0.022-0.040	0.017-0.054	0.384-1.628
Hymenoptera	0.063-1.608	0.063-1.030	0.040-0.224	0.016-0.050	0.014-0.046	0.348-1.129
<b>Conventional Products</b>						
<b>Animals</b>						
Cattle	0.060	0.370	0.01	0.00042	0.028	0.025
Poultry	0.086	0.321	0.02		0.015	0.023
Fish	0.104	0.256	0.01	0.0025	0.0302	0.023
Turkey				0.00296		
Milk			0.12	0.00334	0.0001	0.01
Egg			0.05	0.00144	0.023	0.01



# VITAMINS THAT LODGE SOME EDIBLE INSECTS OF MEXICO BY ORDER

Vitamin/Orders	Quantity	Vitamin/Orders	Quantity
<b>Thiamin</b>		<b>Vitamin C</b>	
Orthoptera	1.430 a 6.110 mg/100g	Orthoptera	23.84 a 23.92 mg
Hemiptera	0.643 a 1.329 mg	Coleoptera	15.44 a 45.76 mg
Lepidoptera	1.548 a 1.650 mg	Lepidoptera	8.6 a 46.33 mg
Coleoptera	0.08 a 0.157 mg	Hymenoptera	32.1 a 36.14 mg
Hymenoptera	0.210 a 1.05 mg	<b>Vitamin A</b>	
Diptera	1.37 a 1.47 mg	Orthoptera	0.33 a 160.52 UI
<b>Riboflavin</b>		Lepidoptera	73.56 a 79.81 UI
Orthoptera	1.320 a 2.250 mg	Hymenoptera	2.93 a 5.07 UI
Hemiptera	0.908 a 0.990 mg	<b>Vitamin D</b>	
Lepidoptera	2.987 a 3.230 mg	Orthoptera	164.91 a 852.66 UI
Coleoptera	0.349 a 0.355 mg		
Hymenoptera	0.050 a 1.700 mg		
Odonata	0.09 a 0.109 mg		
Diptera	0.48 a 2.56 mg		
<b>Niacin</b>			

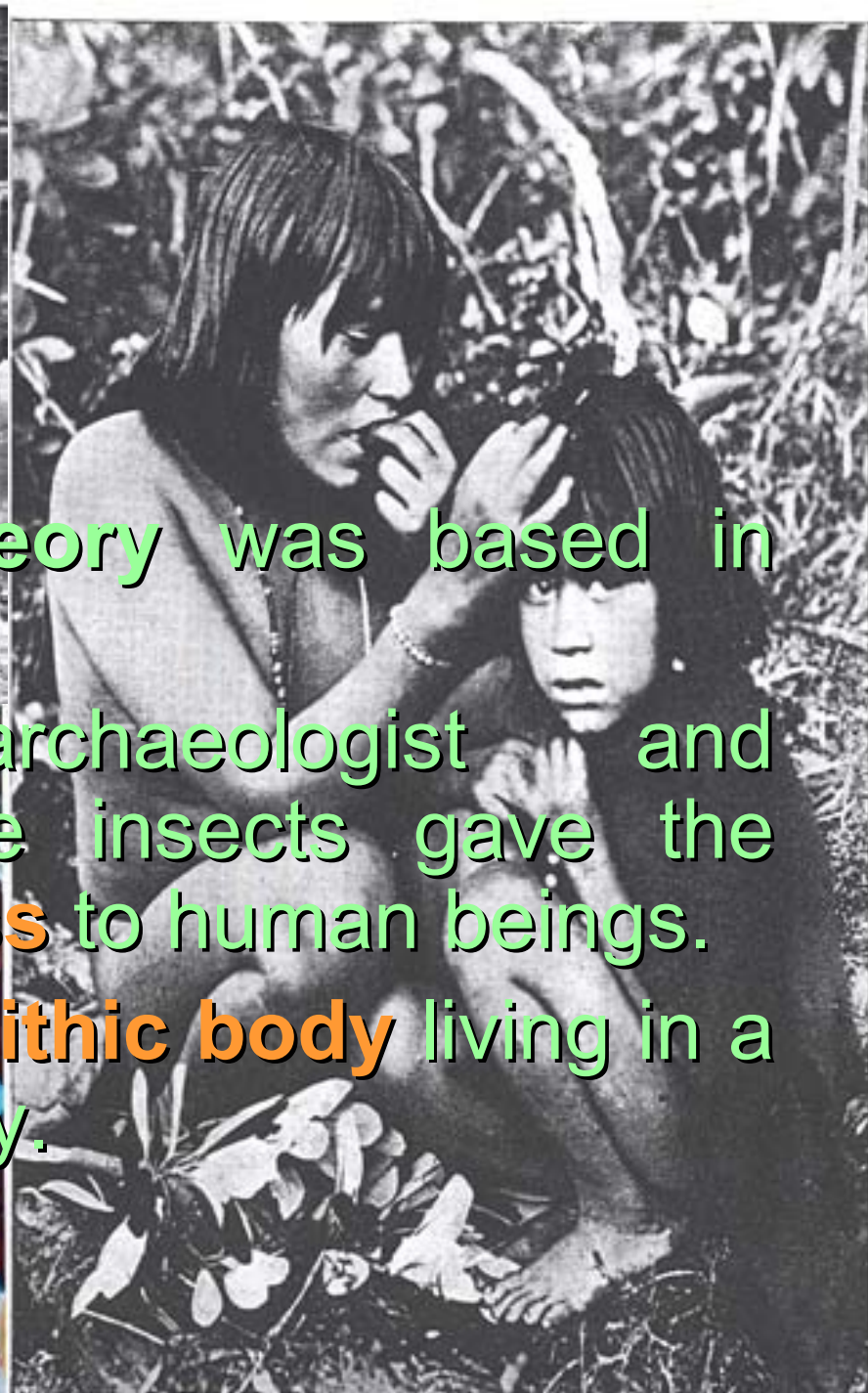
## DIGESTIBILITY

<b>IN VITRO</b>	→ Dry Matter	72% - 96%	
	→ Protein	64% - 87%	(> 60% = Protein concentrates) (Ramos-Elorduy et al. 1981)
<b>IN VIVO</b>	→ PER		89% Bees, 82% Ants, 75% Grasshoppers
	→ UPN	vs. Caseine 100%	71.7% Bees, 77.63% Ants, 57.4% Grasshoppers
	→ DA		90% Bees, 91.3% Ants, 83.7% Grasshoppers

## EFFICIENCY CONVERSION

<b>INSECTS</b>	2.1 : 1 to 11.8 : 1	avg. 4-5 : 1	0.5 : 1 Flies
Chickens	2.6 : 1		
Sheep	19 : 1		
Livestock	20 : 1		
<b>INSECT TRANSDUCTION</b>			
5 - 8 % vegetal protein 48 - 61 % animal protein			
Crickets	5 times faster than cows		

VALUES OF PROFIT OF EDIBLE INSECTS		MINIMUM	MEDIA	MAXIMUM	
DIGESTIBILITY IN VITRO	Dry matter	61	78.5	96	
	Proteinic	78	88.5	99	
DIGESTIBILITY IN VIVO	Proteinic				
	White rats	DA	77.74	82.29	86.84
		Casein	93.17	94.03	94.89
	PER		0.82	1.39	1.95
		Casein	2.4	2.97	3.53
	PNU	31.64	40.00	48.35	
Casein	47.52	53.98	60.43		
EFFICIENCY CONVERSION					
Chicken	<i>Tenebrio</i>	1.39	2.37	1.37	
	<i>Musca</i>	1.37	1.45	1.63	
	<i>Cochlyiomia</i>	1.24	1.30	1.71	
	<i>Grasshoppers</i>	1.45	1.47	1.41	
	<i>Bugs</i>	1.78	1.93	1.59	
Catfish	<i>Tenebrio</i>	1.6		1.66	

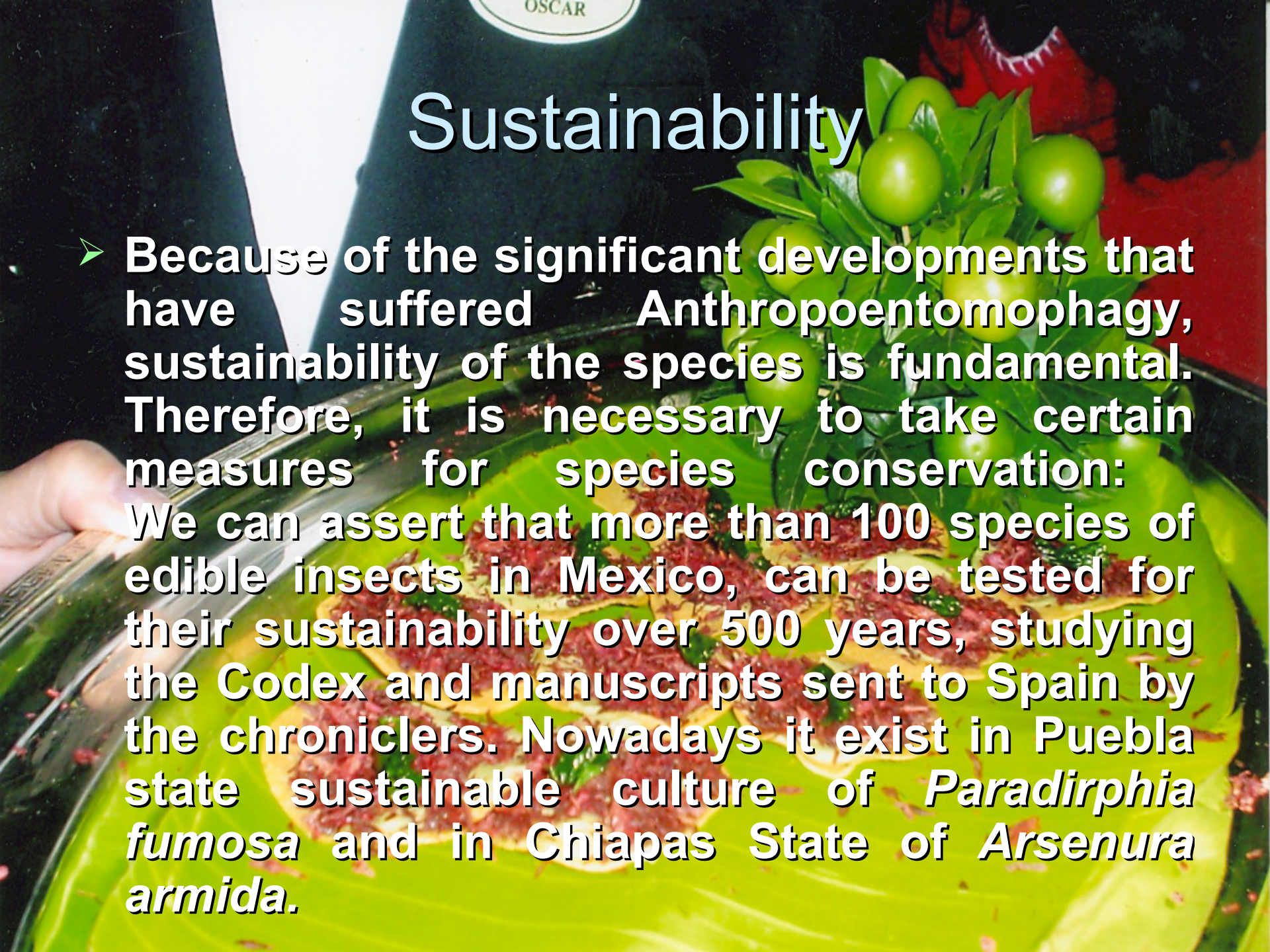


- **“Saving genes”** theory was based in insects ingestion.

- According to archaeologist and anthropologist, edible insects gave the **reproductive success** to human beings.

- But we have a **paleolithic body** living in a **postindustrial society**.



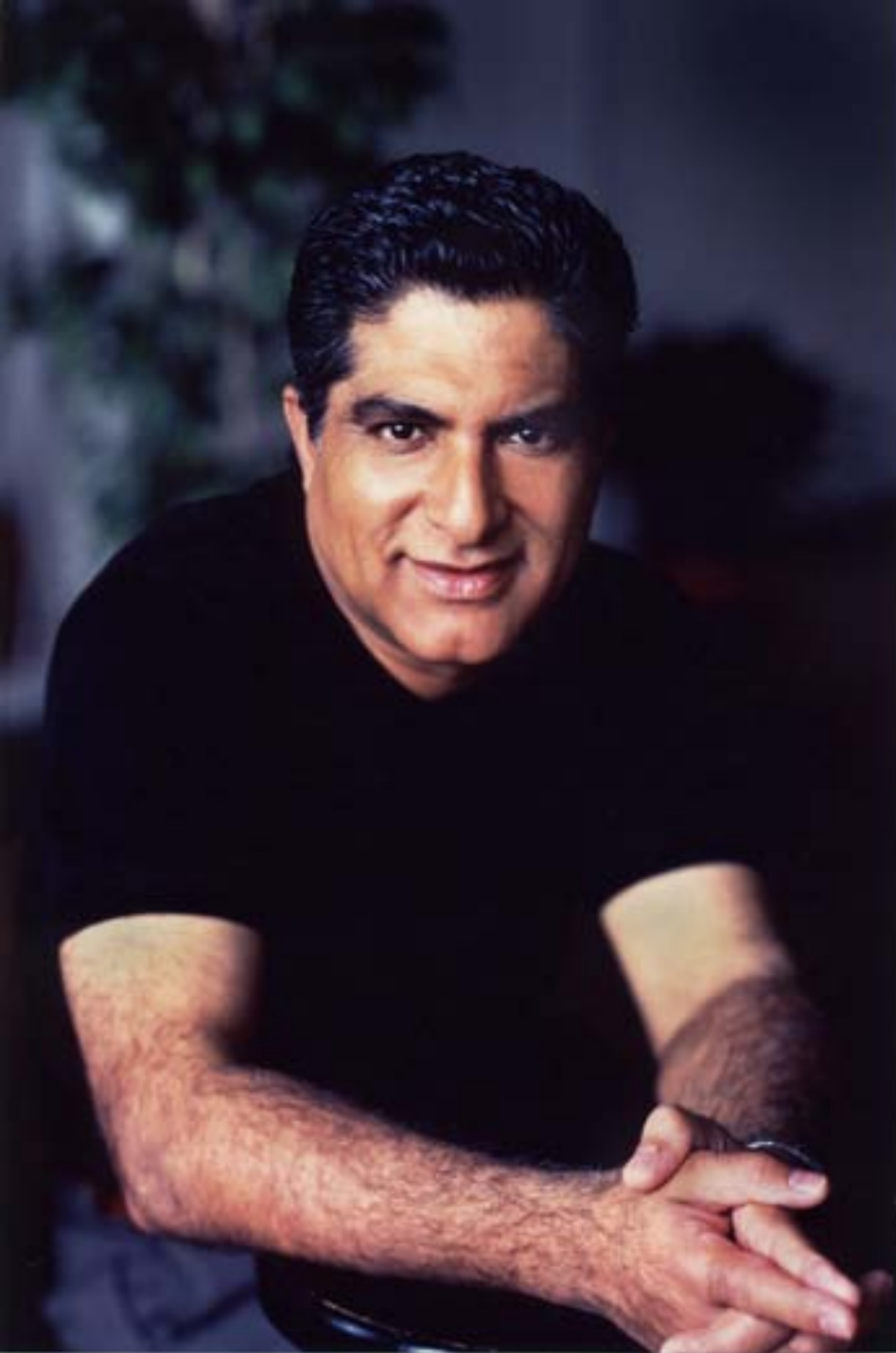


# Sustainability

- Because of the significant developments that have suffered Anthroentomophagy, sustainability of the species is fundamental. Therefore, it is necessary to take certain measures for species conservation:  
We can assert that more than 100 species of edible insects in Mexico, can be tested for their sustainability over 500 years, studying the Codex and manuscripts sent to Spain by the chroniclers. Nowadays it exist in Puebla state sustainable culture of *Paradirphia fumosa* and in Chiapas State of *Arsenura armida*.

# Conservation of the species

- Geographical location (range from its territory).
- Correct identification of species.
- Literature searched.
- Type of nutrition.
- Range of temperature, humidity and altitude.
- Knowledge of life cycle.
- Knowledge of population density.
- Dates for optimal exploitation, avoiding species risk
- Knowledge of survival rate, degree of parasitism or predation.
- Investigate if it exists a protoculture.
- To study, planning and implementation a formal culture.



As Deepak Chopra mention: “if insects disappear from the planet, five years after the human beings life would not exists more”, and on the opposite “if human beings dissapear from the planet five years after life would flourish, because we are the predators and the danger today”.

