



**Pesticide
Action
Network**
Europe

Pesticide
Environmental Risk
Assessment:
Environment
unprotected?

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ERA of Pesticides; EFSA, 15-16 November 2016

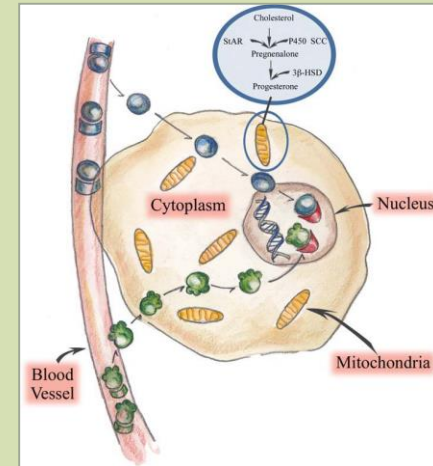
Pesticides



Deliberately made to be toxic to living organisms

- Cellular sites in target species similar to other organisms

Pesticides are toxic to non-target species



Species population

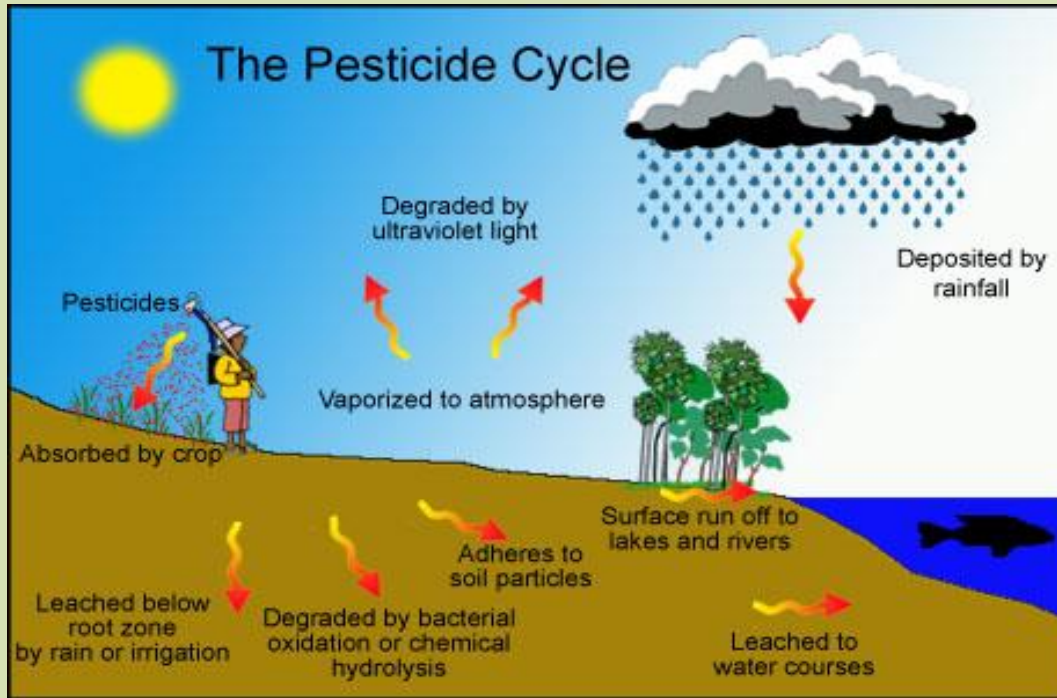
Impact ecosystems

biodiversity

Low water solubility + Repeated use →

Contamination of ecosystems

Pesticides, not just for crops



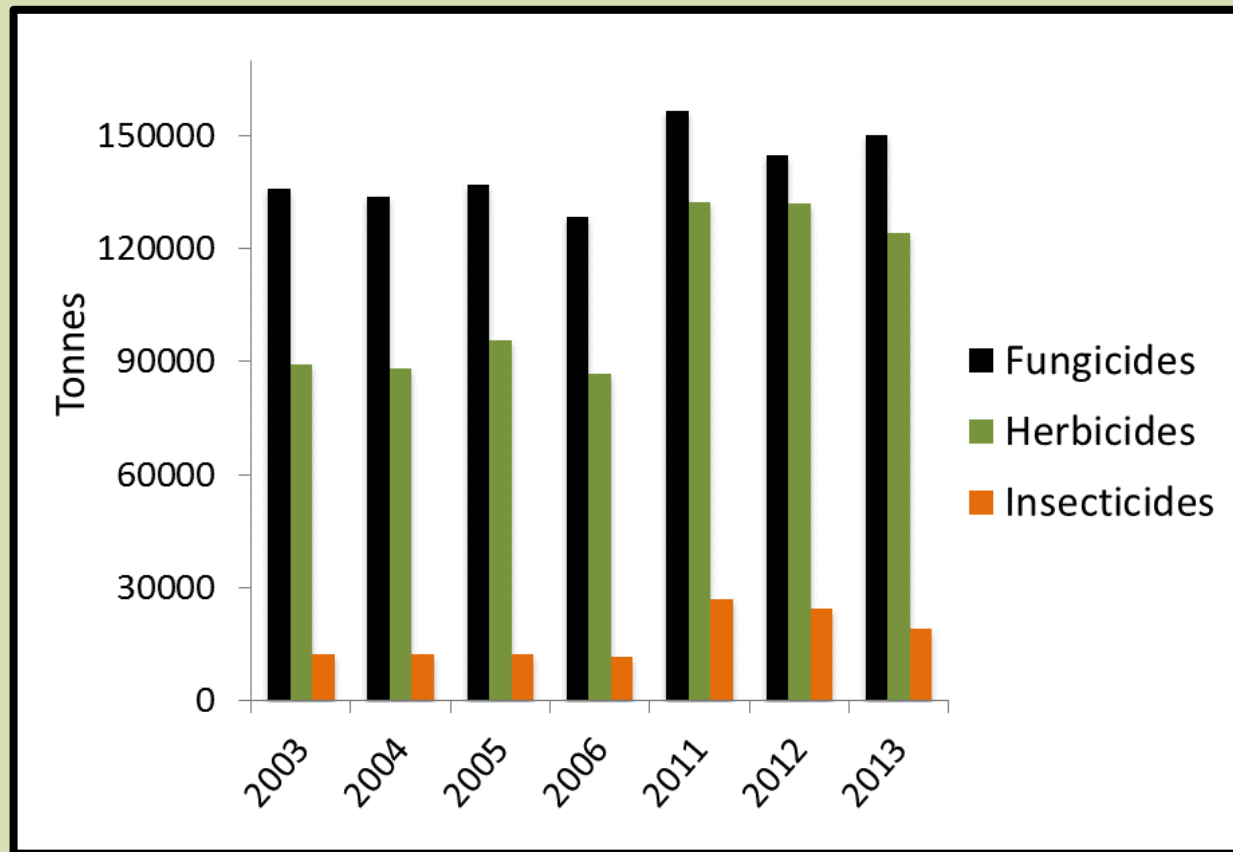
- Only a tiny fraction reaches the target pest

- Detected in: biota (flora and fauna), air, soil, sediments, rivers & streams, even in humans.
- About 38% of EU's total land area is treated with pesticides



Pesticide sales in EU

EU: 300,000,000 kg/year – world's highest consumer



Anthropogenic pressures



Pesticides not the only ones



- Population expansion
- Consumption of resources
 - Marine
 - Freshwater
 - Terrestrial
- Habitat and biodiversity loss (extinction)
- Ecosystem services loss
- Invasive species



- Land exploitation
- Deforestation
- Degradation of land and habitat loss
- Livestock production
- Intensive agricultural production



- Industrialization
- Urbanization
- Freshwater exploitation
- Pollution
 - Freshwater
 - Marine
 - Air
 - Land
- Ecosystem degradation

Anthropogenic pressures



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- Land exploitation
- Deforestation

Pesticides are intentionally released to open fields

- Loss
- Livestock production
- Intensive agricultural production



- Industrialization
- Urbanization

- Air and water pollution
- Pollution
 - Freshwater
 - Marine
 - Air
 - Land
- Ecosystem degradation



Legal requirements - pesticides

PPPR (EC) 1107/2009:

Rec 8:

*“The purpose of this Regulation is to ensure **a high level of protection** of both human and animal health and the environment.... **The precautionary principle should be applied.**”*

Art 2(b,e): *“Residues/products shall not have **any unacceptable effect on the environment.**”* (non-target species, biodiversity and ecosystems)

Annex II 3.8.: no unacceptable effects on bees, no endocrine disruptors

But are these objectives fulfilled?



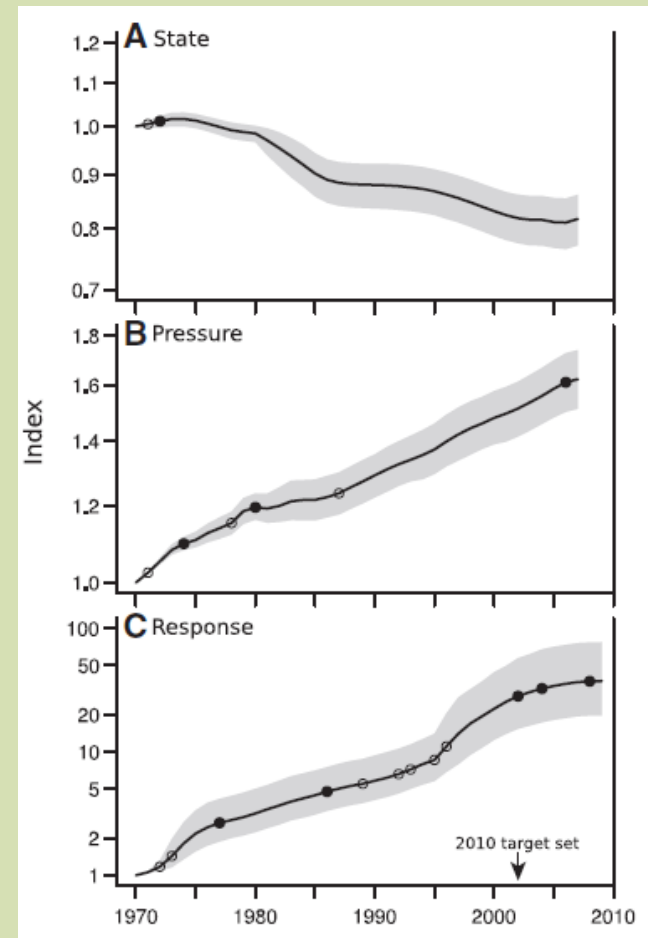
Accelerating global biodiversity loss

2002 Convention on Biological Diversity: reduction targets by 2010

Study period :1970s-2010

Indicators

- Declines in population trends
- Increasing pressures
- Policy and management responses are increasing but are not effective



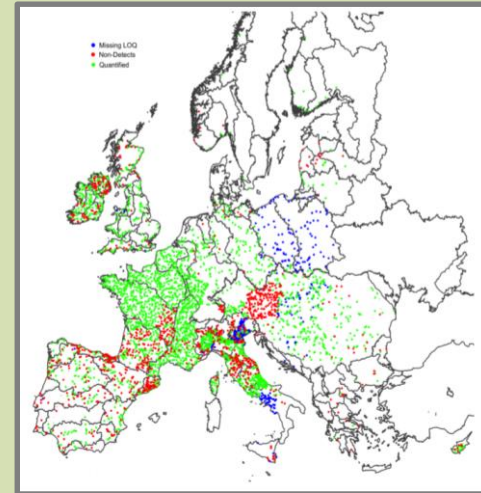
Butchart SHM, Walpole M, Collen B, van Strien A, Scharlemann JPW et al (2010). Global biodiversity: Indicators of recent decline. *Science*, **328**: 1164-1168



EU freshwater ecosystems unprotected

Study - Outline

- 2006-2010 EEA data
- 4000 EU sites; 91 EU rivers
- 223 Organic pollutants
- Fish, invertebrates, algae



C_{max} Vs **Acute Risk** Threshold

- LC50/10

C_{mean} Vs **Chronic Risk** Threshold

- LC50/ 100,1000,50

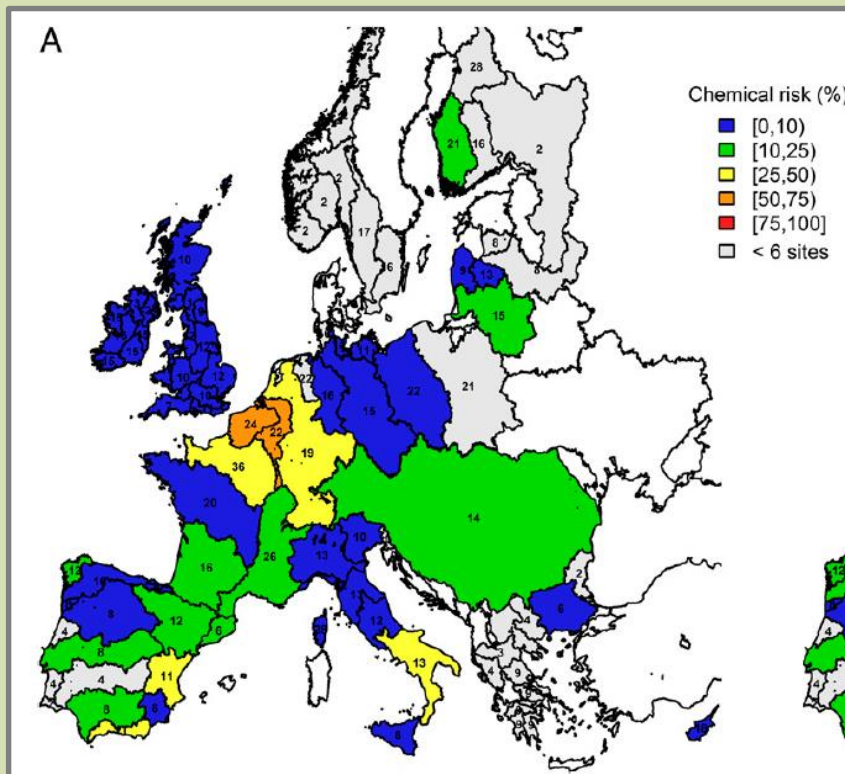
Malaj E, von der Ohe PC, Grote M, Kuhne R et al. (2014). Organic chemicals jeopardize the health of freshwater ecosystems on the continental scale. *PNAS* **111**: 9549-9554

EU freshwater ecosystems unprotected



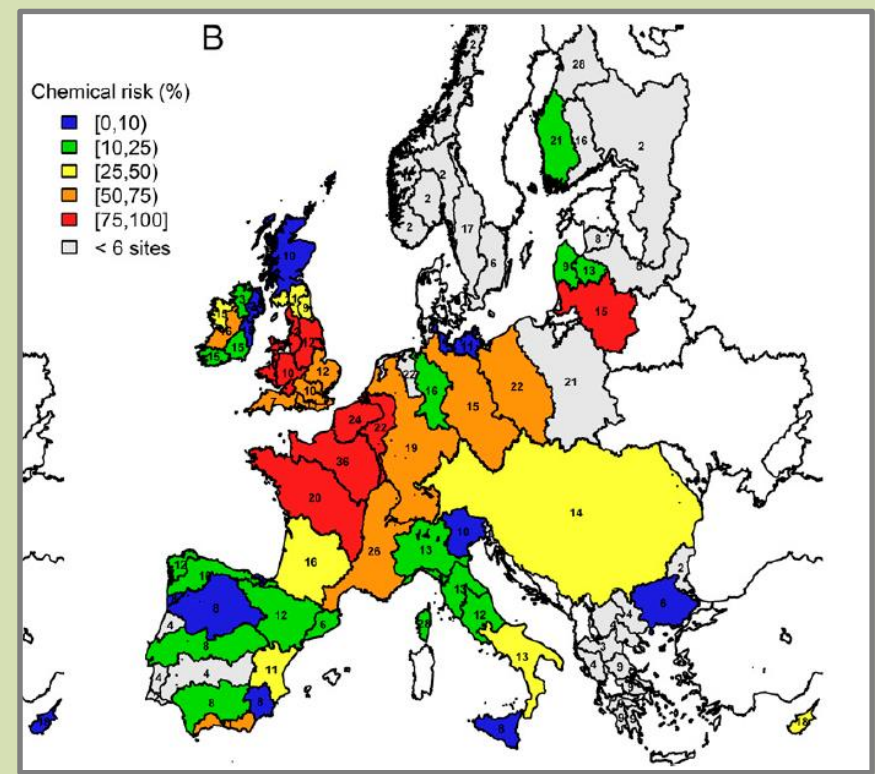
Acute Toxicity

- Acute Risk at 14% sites



Chronic Toxicity

- Chronic Risk 42% sites

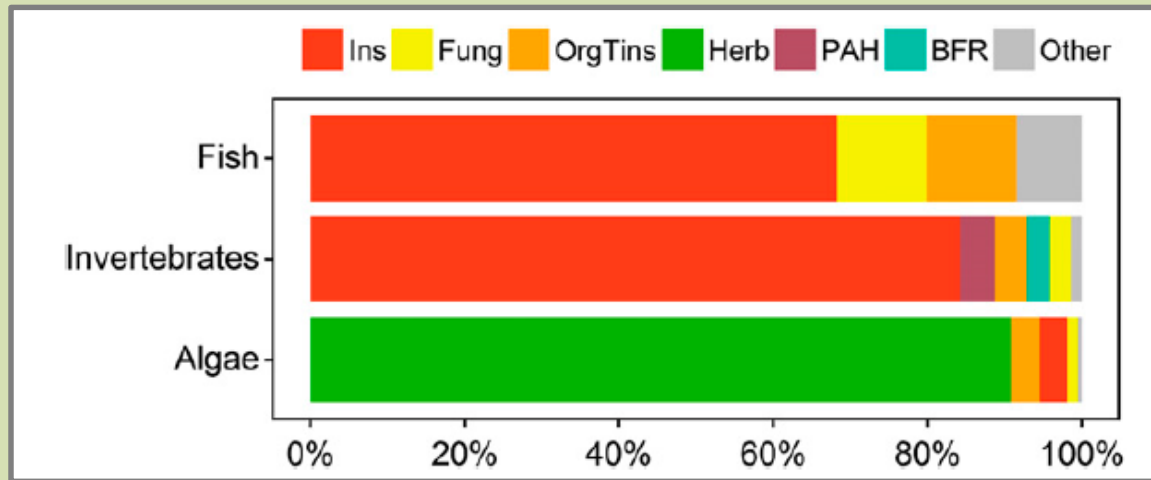


Malaj E, von der Ohe PC, Grote M, Kuhne R et al. (2014). Organic chemicals jeopardize the health of freshwater ecosystems on the continental scale. *PNAS* **111**: 9549-9554



Pesticides- the underlying cause

Pesticides - Contribution



■ Fish: 81% insecticides

■ Invertebrates: 87% insecticides

■ Algae: 96% herbicides

■ Chemical risk

■ ↑ Agricultural land

■ ↓ Natural vegetation

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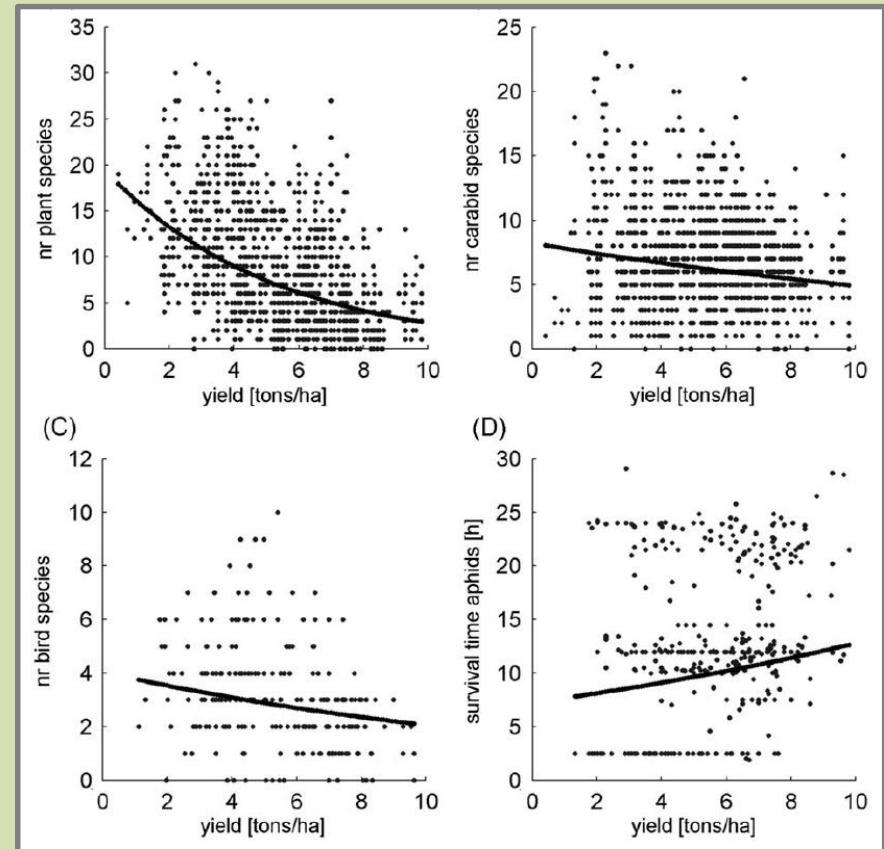


Pesticide effects on biodiversity

Study

- 8 EU countries, 9 sites:
 - 30 x 30 up to 50 x 50 km²
 - 30 arable farms/site (cereals)
- Indicators:
 - Wild plants, carabids & birds
 - Biological control (aphids survival)
 - Farmers' practises, landscape

Cereal yield



Geiger F, Bengtsson J, Berendse F, Weisser WW, Emmerson M, et al. (2010). Persistent negative effects of pesticides on biodiversity and biological control potential on European farmland. *Basic and Applied Ecology* **11**: 97-105



Pesticide effects on biodiversity

Results

	Explanatory variable	Standardized effect	p-value
Wild plants	<i>Mean field size</i>	-0.094	0.014
	% of land under AES	0.149	<0.001
	Frequency of herbicide application	-0.1061	0.003
	Frequency of insecticide application	-0.105	0.013
	Applied amounts of a.i. of fungicides	-0.262	<0.001
Carabids	% of land under AES	0.062	0.012
	Applied amounts of a.i. of insecticides	-0.061	0.001
Birds	Frequency of fungicide application	-0.127	0.017
Biological control	% of land under AES	-0.144	0.002
	Applied amounts of a.i. of insecticides	0.114	0.001

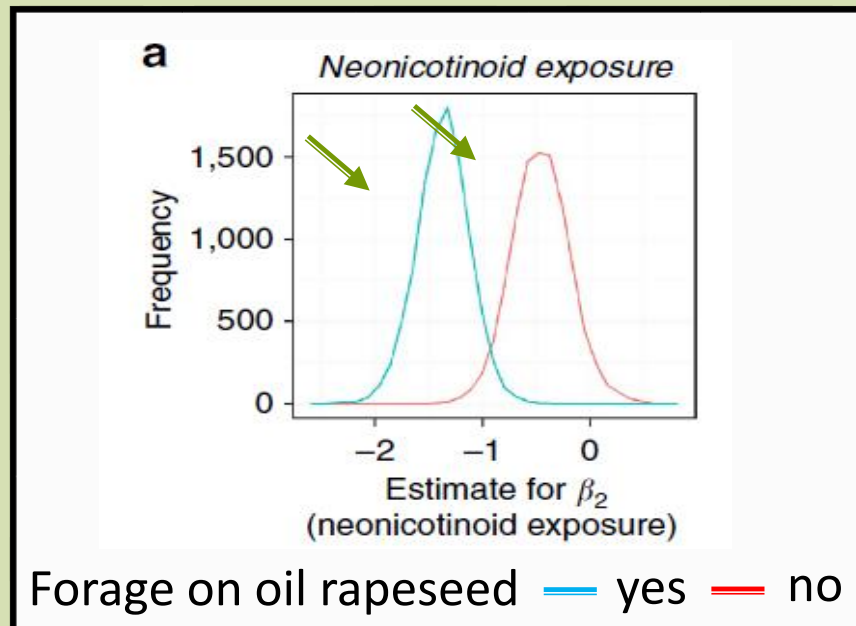
Geiger F, Bengtsson J, Berendse F, Weisser WW, Emmerson M, et al. (2010). Persistent negative effects of pesticides on biodiversity and biological control potential on European farmland. *Basic and Applied Ecology* **11**: 97-105



Impact of neonicotinoids on wild bees

Study

- 62 wild bee species in UK
- Oilseed rape treated crops
- Data from 1994-2011:
 - 31,818 surveys
 - 4,056 Km²



- Other pollinators affected:
 - Butterflies
 - Bumble bees

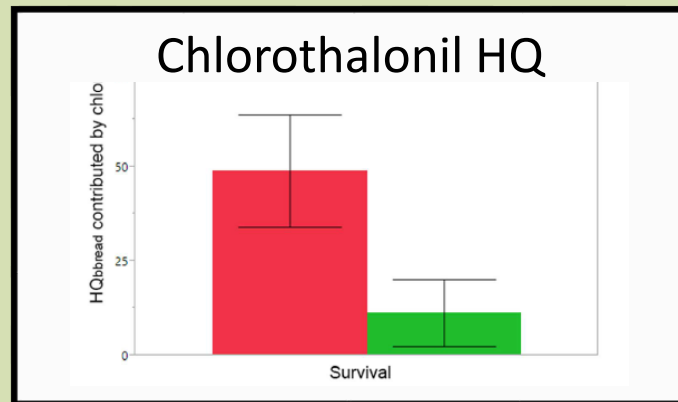
Woodcock BA, Isaac NJB, Bullock JM, Roy DB et al. (2016). Impact of neonicotinoid use on long-term population changes in wild bees in England. *Nature Communications* 7:12459



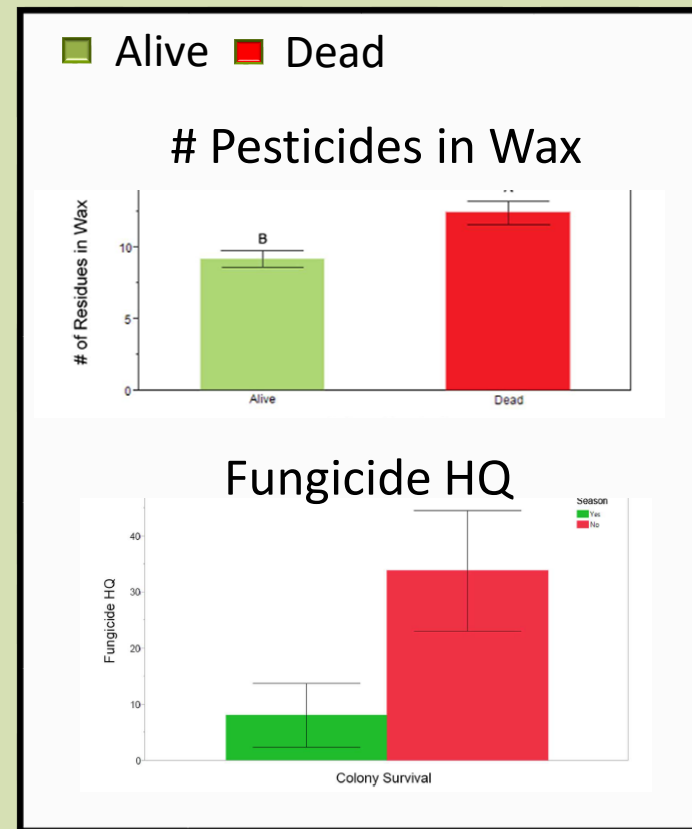
Bees unprotected from herbicides

Study

- Pesticides in bee matrices:
 - Bees (13)
 - Beebread (61)
 - Wax (71)
- Hazard Quotient
- Colony Survival



Bee mortality



Traynor KS, Pettis JS, Tarpy DR, Mullin CA, Frazier JL et al. In-hive pesticide exposome: assessing risks to migratory honey bees from in-hive pesticide contamination in the Eastern United States. *Scientific Reports*, 6:33207



ERA - Underestimation of harm? Insecticides

Insecticides

Regulatory Acceptable
Concentration (RAC) sw/sed

Vs

Measured Insecticide
Concentrations (MICs) n=23

44.7% MICs > RACs

55% of sites (n=1566)

- Limited monitoring data
- > Environmental Quality Standards (WFD)
- 90% with mixtures

Insecticide are the main drivers of biodiversity loss

Stehle S, Schulz R (2015). Pesticide Authorization in the EU – environment unprotected? *Environ Sci Pollut Res* **22**: 19632-19647



ERA – Underestimation of harm?

Fungicides

- Predicted Environmental Concentrations (PECs) *FOCUS scenarios*
- Measured Fungicide Concentration (MFC) sw/sed
- Are PECs worst case scenarios? *No, its an underestimation*

Seawater

Sediment

Step 3 **15%** PEC_{sw} <MFC_{sw}

67% PEC_{sed}<MFC_{sed}

Step 4 **28%** PEC_{sw} <MFC_{sw}

76% PEC_{sed}<MFC_{sed}

Herbicide permitted levels unsafe

Knäbel A, Meyer K, Rapp J, Schulz R, (2014). Fungicide field concentrations exceed FOCUS surface water predictions: Urgent need of model improvement. *Environ Sci Technol*, **48**, 455-463.

Environment Unprotected - Recapitulate

- Pressures are increasing steadily
- Biodiversity loss and ecosystem degradation is increasing
- Real-time monitoring is missing
- Scenarios fail to predict worst-case and the environment remains unprotected
- Long term, chronic effects of ERA are underestimated



Final remarks



- Urgent need to reduce pesticide environmental exposure
- Europe has to adopt non toxic alternatives for agriculture
- Environmental Risk Assessment must have a truly conservative, ecological-based approach
- Abandon the concept that ecosystems always recover
- EU models should consider low dose, long term effects. Reproduction impairment, endocrine disruption and chronic effects on species should be identified
- EU should ban completely the use of dangerous and already banned pesticides (MS derogations) and prohibit exports



Thank you!