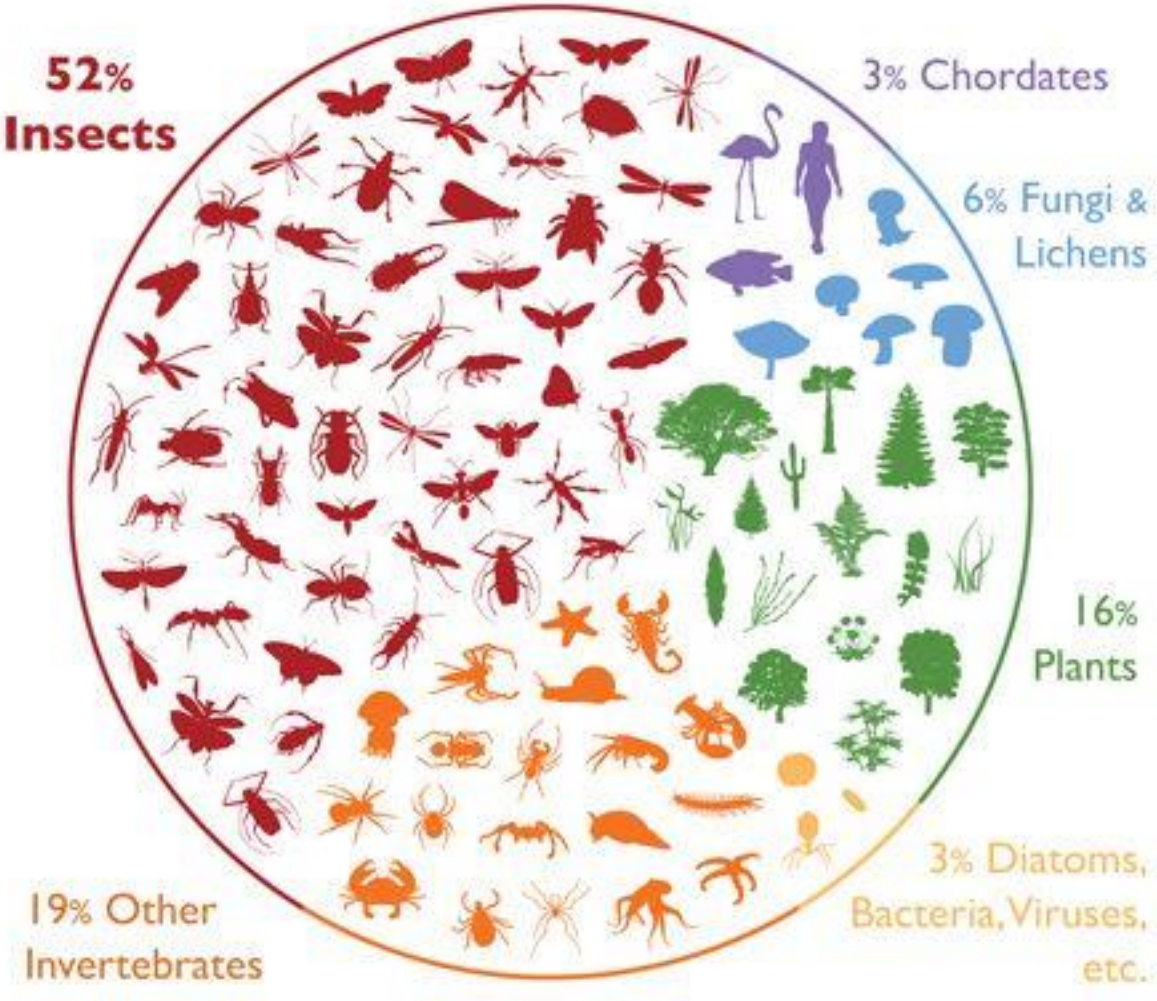
Le déclin des Insectes

Hervé Jactel

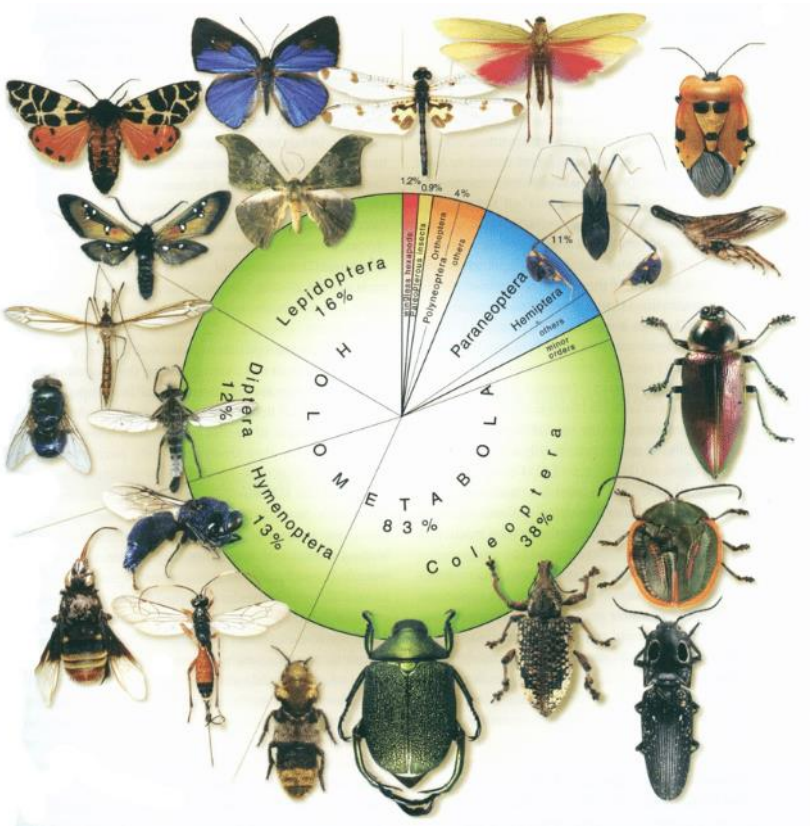
Distribution et dynamique de la biodiversité – AAF – 21 mai 2021

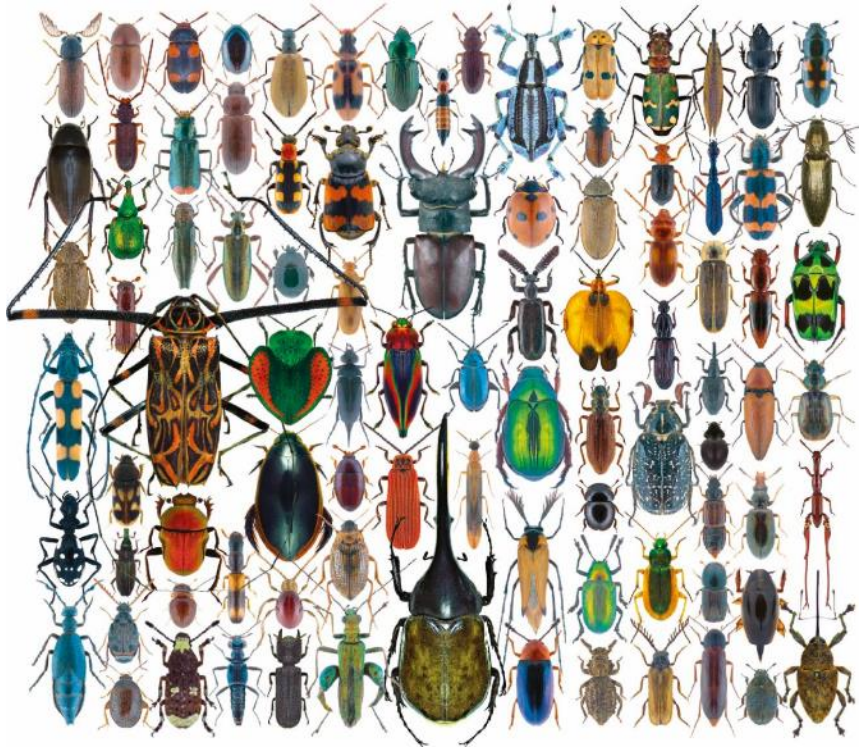
Biodiversité des Insectes



1.1 million espèces d'insectes décrites – 50% de la diversité des eucaryotes
5.5 millions d'espèces d'insectes sur Terre – 80% des eucaryotes

- apparus il y a 410 millions d'années (Dévonien)
- premiers à coloniser les terres émergées
- invention du vol, de la vie en société
- extraordinaire diversité de formes, fonctions, habitats





Mais…

- **une connaissance imparfaite (25% des espèces décrites?)**
- **une difficulté d'échantillonnage et d'identification**
- **des fluctuations démographiques importantes**
- **une taille minuscule…**

Que sait-on de la biodiversité des Insectes et de son déclin?

La réalité du déclin des Insectes

Defaunation in the Anthropocene

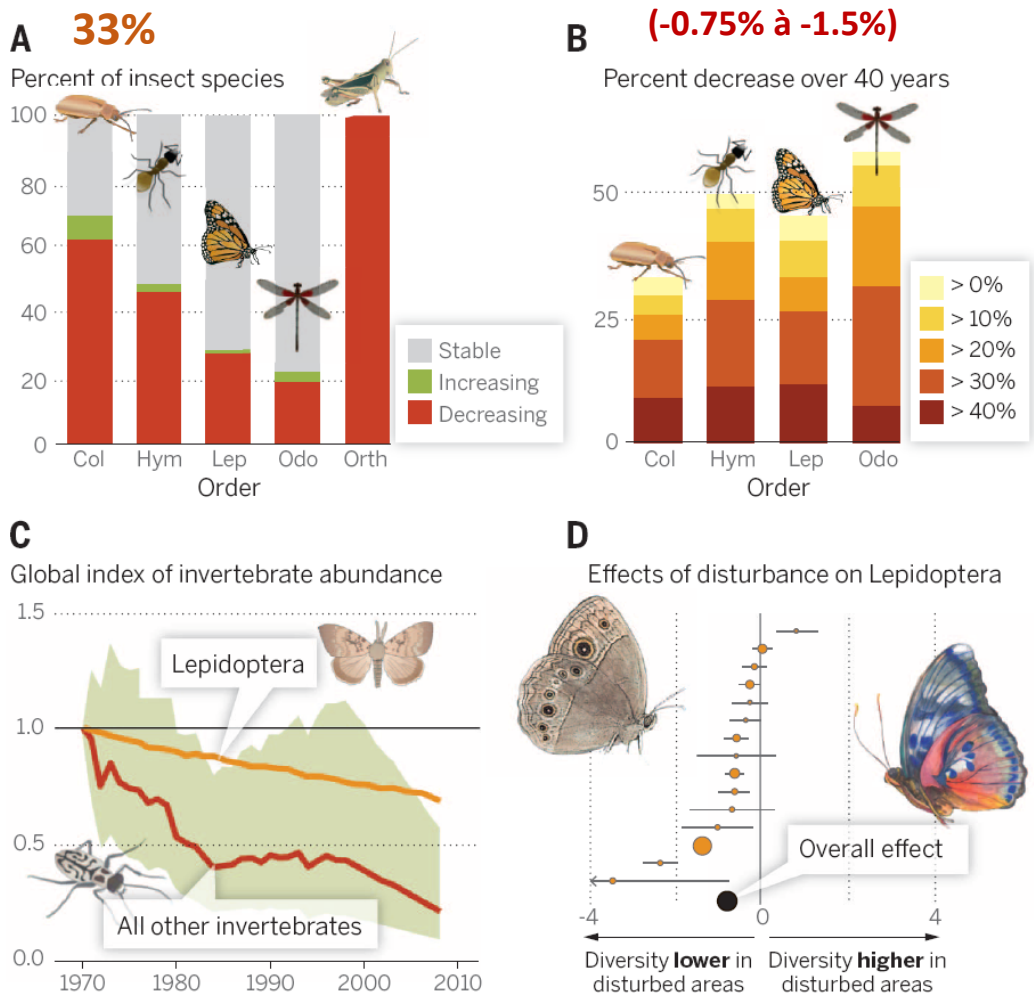
Rodolfo Dirzo,[1*] Hillary S. Young,[2] Mauro Galetti,[3] Gerardo Ceballos,[4] Nick J. B. Isaac,[5] Ben Collen[6]

Science 25 Jul 2014:
Vol. 345, Issue 6195, pp. 401-406
DOI: 10.1126/science.1251817

-30% à -60%

(-0.75% à -1.5%)

Fig. 1. Evidence of declines in invertebrate abundance. (**A**) Of all insects with IUCN-documented population trends, 33% are declining, with strong variation among orders (*19*). (**B**) Trends among UK insects (with colors indicating percent decrease over 40 years) show 30 to 60% of species per order have declining ranges (*19*). (**C**) Globally, a compiled index of all invertebrate population declines over the past 40 years shows an overall 45% decline, although decline for Lepidoptera is less severe than for other taxa (*19*). (**D**) A meta-analysis of effects of anthropogenic disturbance on Lepidoptera, the best-studied invertebrate taxon, shows considerable overall declines in diversity (*19*).

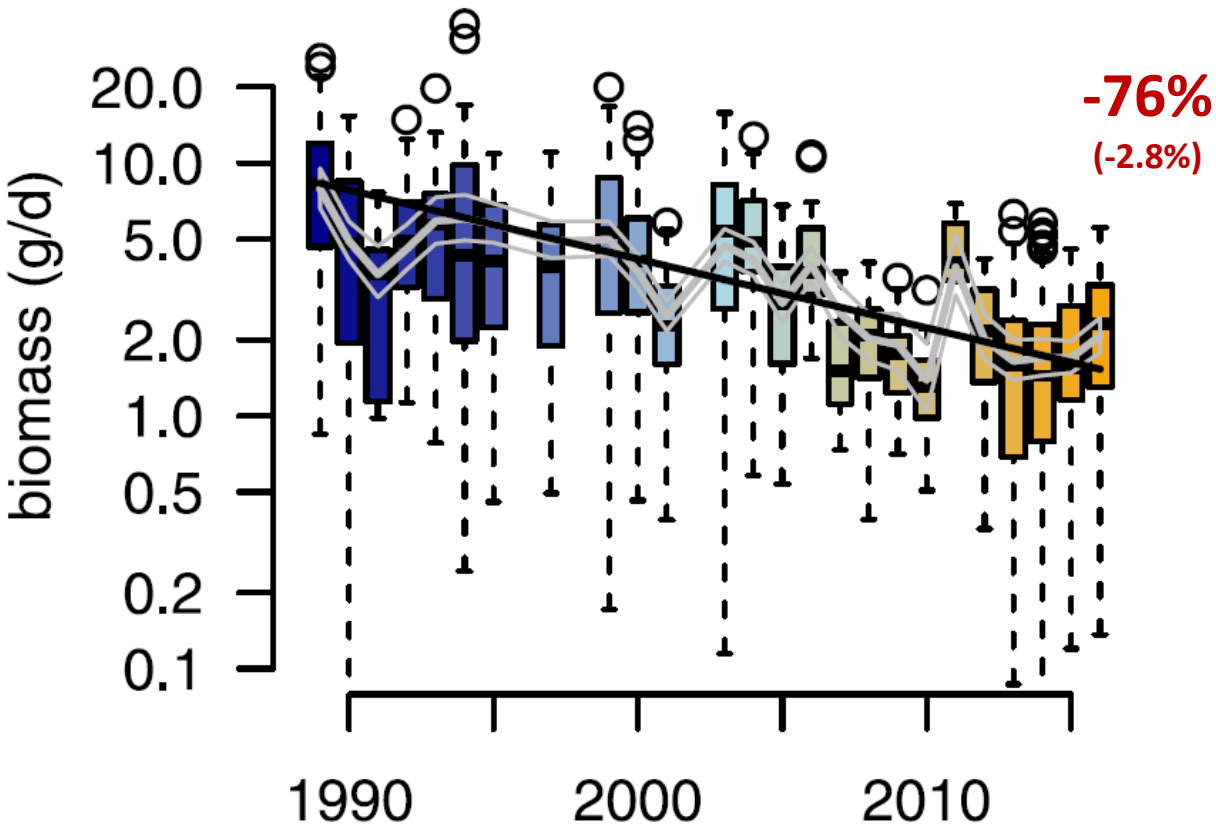


La réalité du déclin des Insectes

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

Caspar A. Hallmann[1]*, Martin Sorg[2], Eelke Jongejans[1], Henk Siepel[1], Nick Hofland[1], Heinz Schwan[2], Werner Stenmans[2], Andreas Müller[2], Hubert Sumser[2], Thomas Hörren[2], Dave Goulson[3], Hans de Kroon[1]

PLOS ONE | https://doi.org/10.1371/journal.pone.0185809 October 18, 2017



La réalité du déclin des Insectes

Article

Arthropod decline in grasslands and forests is associated with landscape-level drivers

Nature | Vol 574 | 31 October 2019

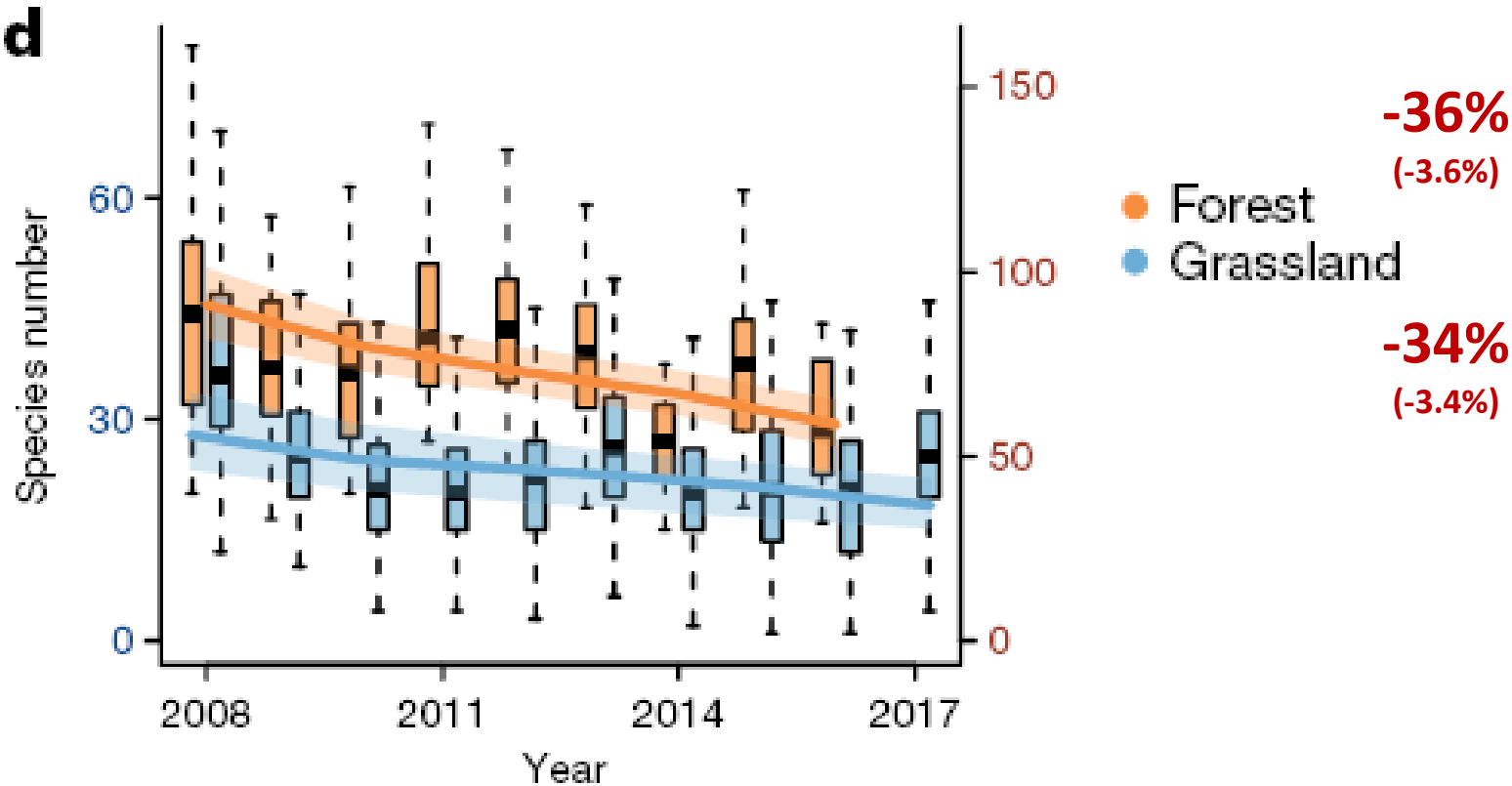
https://doi.org/10.1038/s41586-019-1684-3

Received: 8 February 2019

Accepted: 16 September 2019

Published online: 30 October 2019

Sebastian Seibold[1,2*], Martin M. Gossner[3], Nadja K. Simons[1,4], Nico Blüthgen[4], Jörg Müller[2,5], Didem Ambarlı[1,6], Christian Ammer[7], Jürgen Bauhus[8], Markus Fischer[9], Jan C. Habel[1,10], Karl Eduard Linsenmair[11], Thomas Nauss[12], Caterina Penone[9], Daniel Prati[9], Peter Schall[7], Ernst-Detlef Schulze[13], Juliane Vogt[1], Stephan Wöllauer[12] & Wolfgang W. Weisser[1]



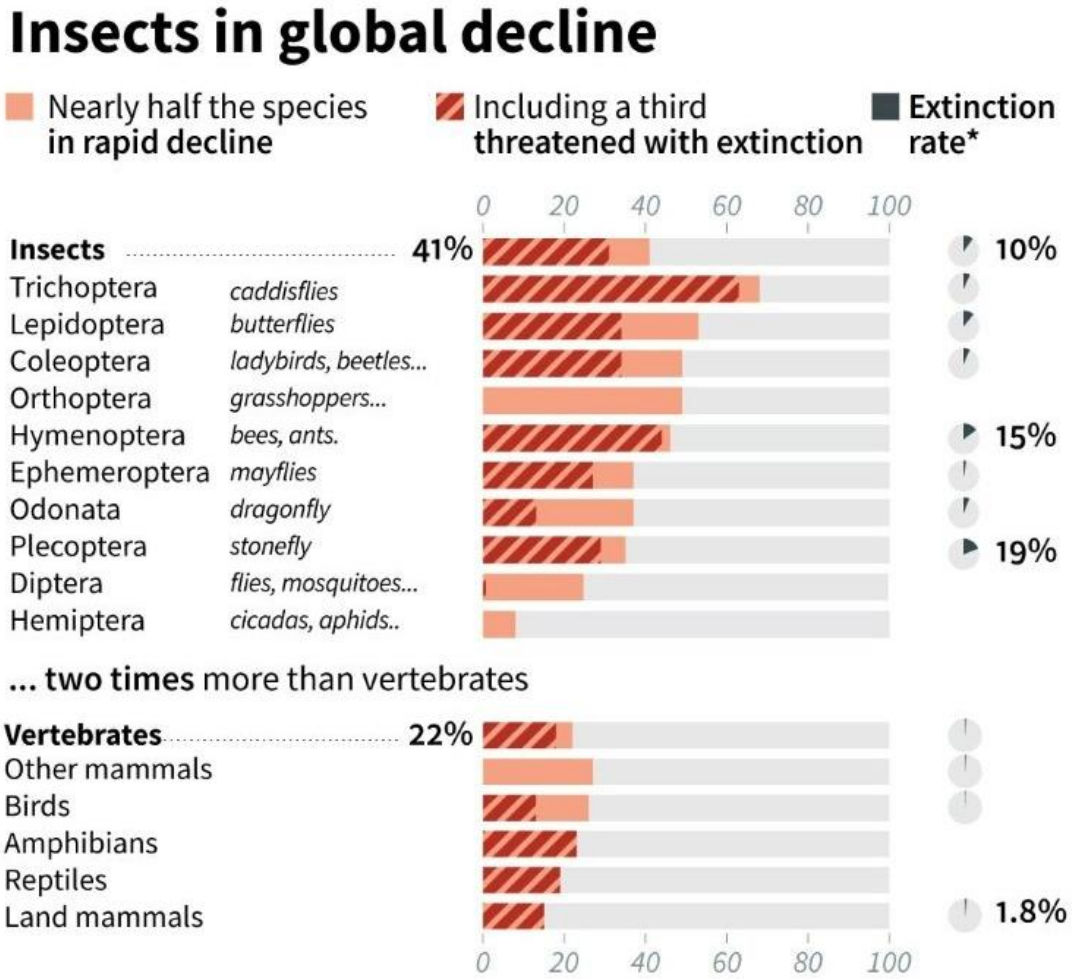
La réalité du déclin des Insectes

Worldwide decline of the entomofauna: A review of its drivers

Francisco Sánchez-Bayo[a,*], Kris A.G. Wyckhuys[b,c,d]

Biological Conservation 232 (2019) 8–27

41%
(-1%)



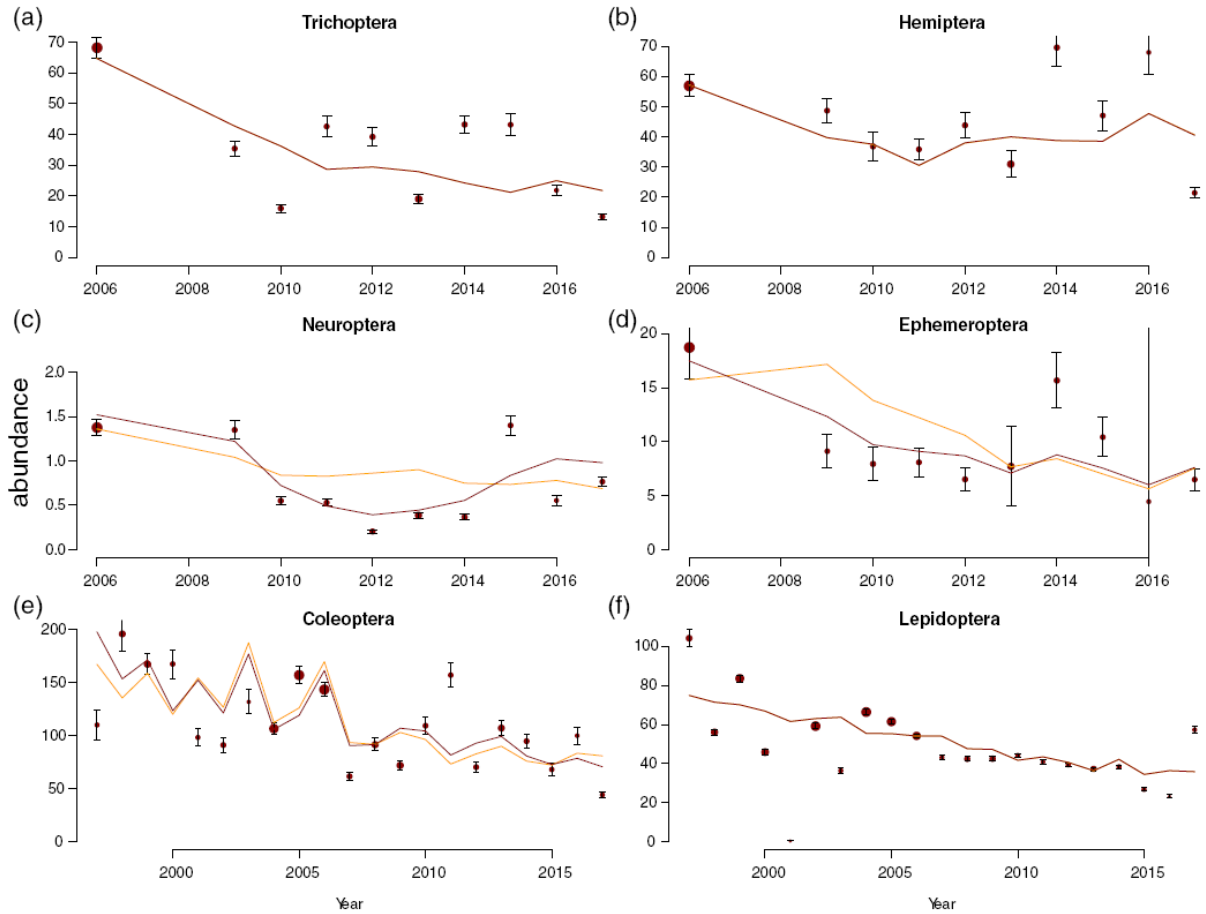
La réalité du déclin des Insectes

Declining abundance of beetles, moths and caddisflies in the Netherlands

CASPAR A. HALLMANN,[1] THEO ZEEGERS,[2] ROEL VAN KLINK,[3,4] RIKJAN VERMEULEN,[4] PAUL VAN WIELINK,[5] HENK SPIJKERS,[6] JURRIËN VAN DEIJK,[7] WOUTER VAN STEENIS[8] and EELKE JONGEJANS[1] [1]Department of Animal Ecology and Physiology, Radboud University, Nijmegen, The

Insect Conservation and Diversity (2019) doi: 10.1111/icad.12377

-42%
(-5.0%)



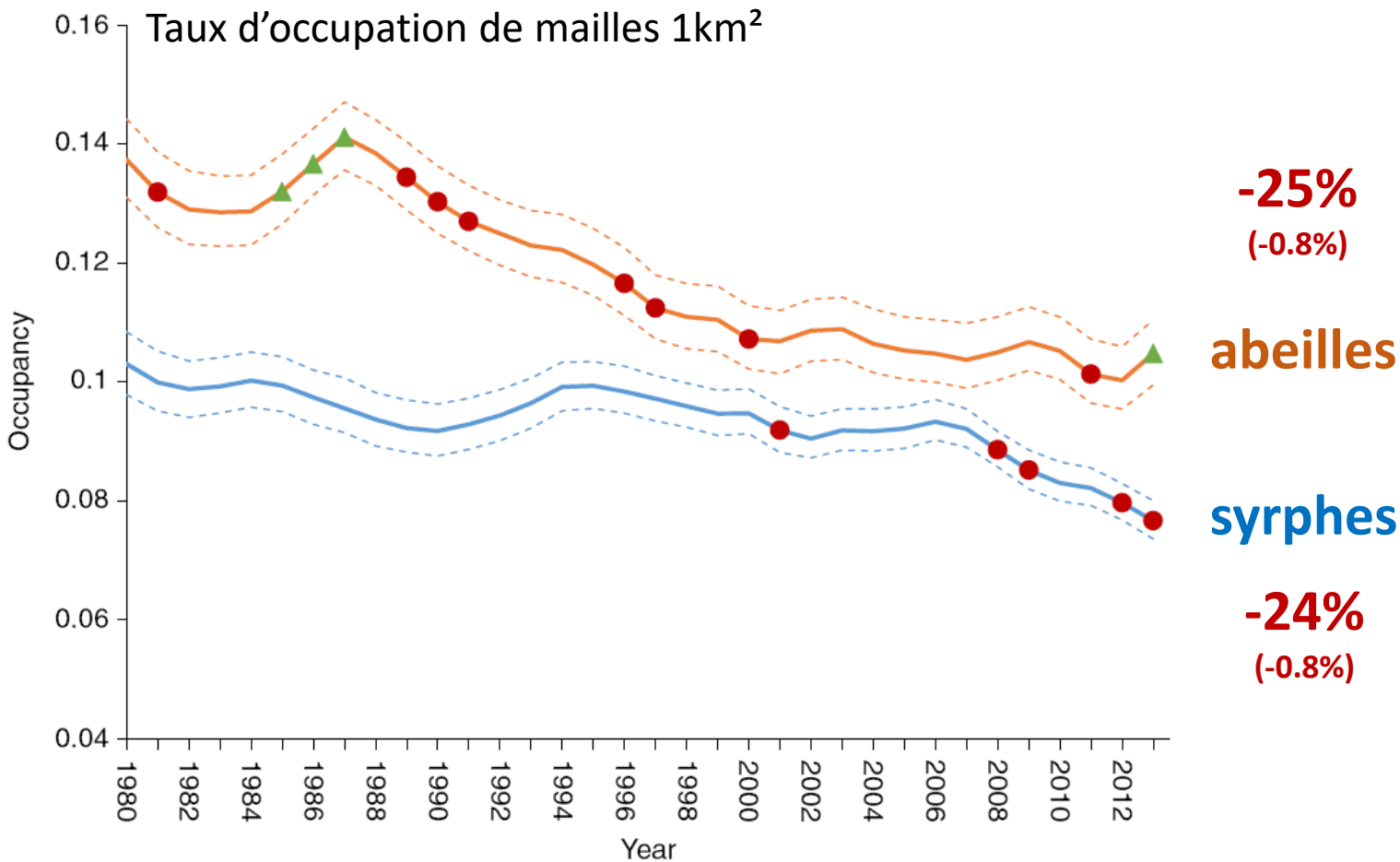
-61%
(-4.0%)

La réalité du déclin des Insectes

Widespread losses of pollinating insects in Britain

Gary D. Powney[1], Claire Carvell[1], Mike Edwards[2], Roger K. A. Morris[3], Helen E. Roy[1], Ben A. Woodcock[1] & Nick J. B. Isaac[1]

NATURE COMMUNICATIONS | (2019)10:1018 |



La réalité du déclin des Insectes

The EU Butterfly Indicator for Grassland species: 1990-2017

Technical report 2019

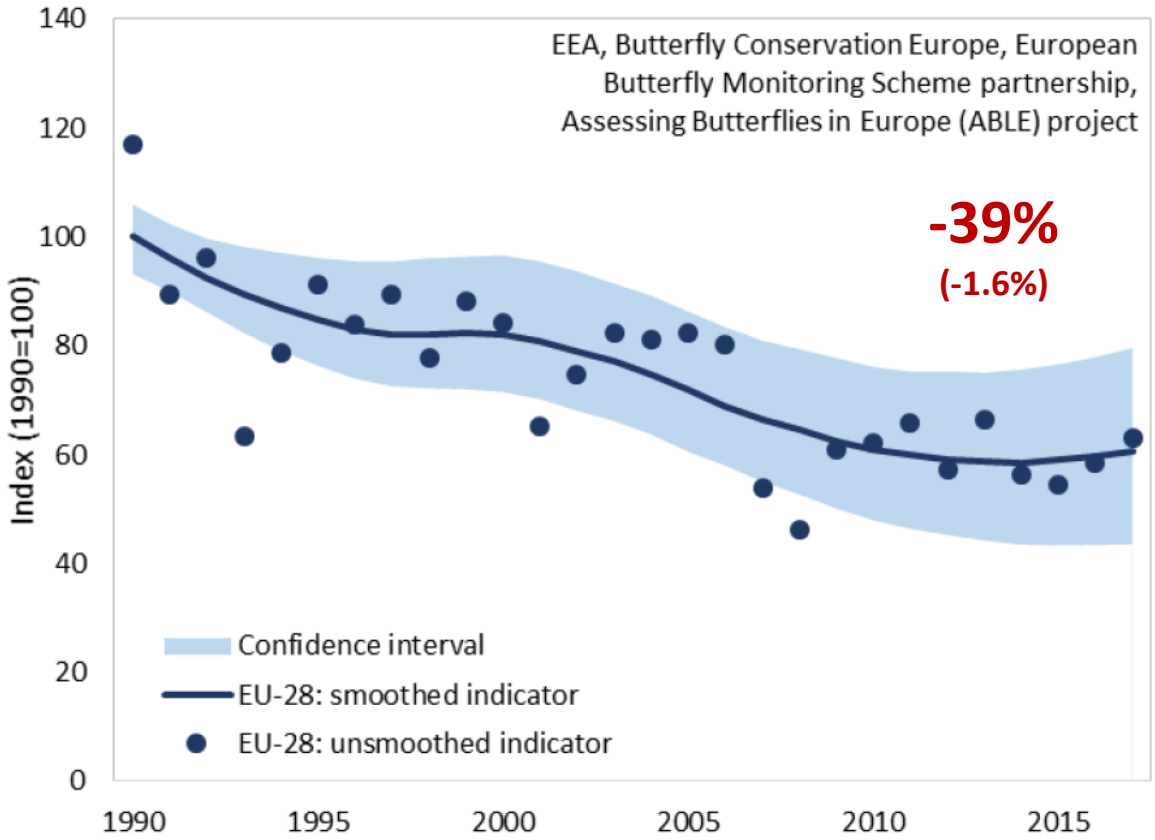


Figure 3: The Grassland Butterfly Indicator for the EU. The indicators are based on the countries in map 1 in the EU and characteristic grassland butterfly species in figure 2. The shaded areas represent the 95% confidence limits surrounding the smoothed trend.

La réalité du déclin des Insectes

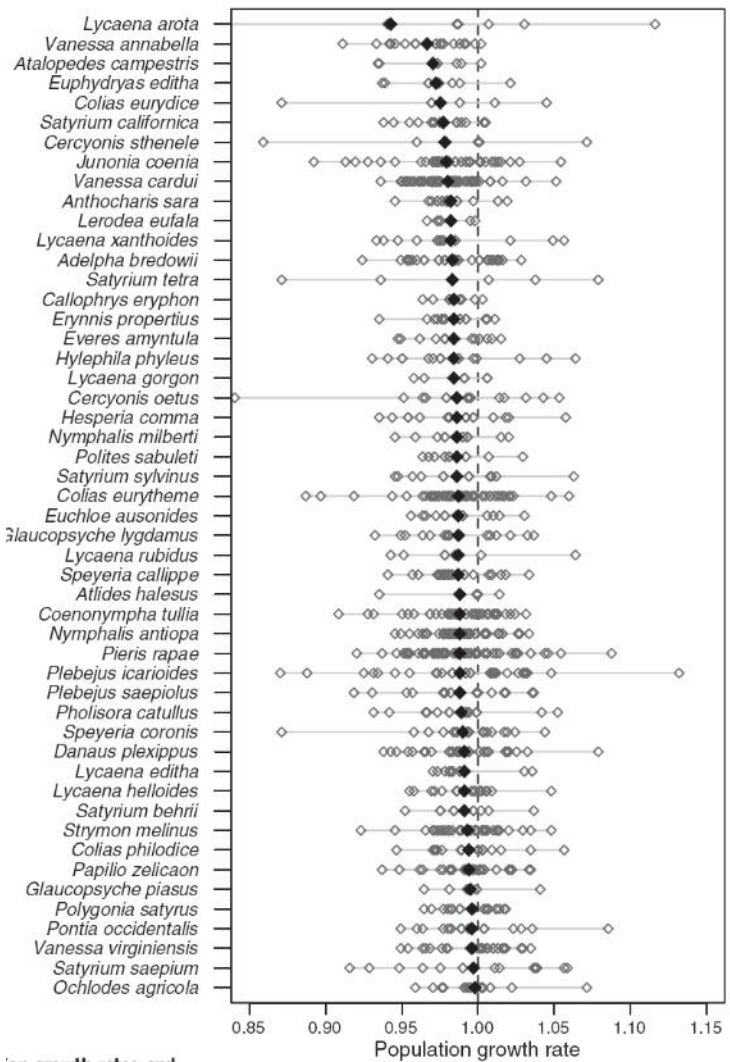
INSECT DECLINES

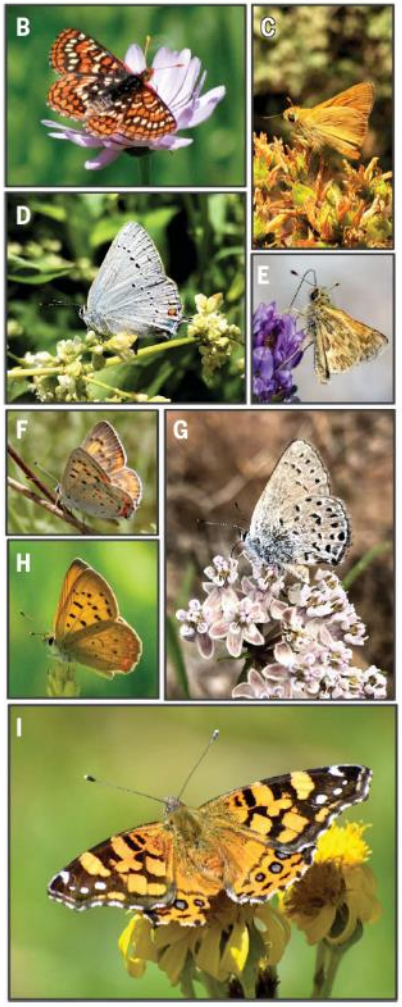
Fewer butterflies seen by community scientists across the warming and drying landscapes of the American West

M. L. Forister[1*], C. A. Halsch[1], C. C. Nice[2], J. A. Fordyce[3], T. E. Dilts[4], J. C. Oliver[5], K. L. Prudic[6], A. M. Shapiro[7], J. K. Wilson[6], J. Glassberg[8,9]

Science **371**, 1042–1045 (2021)

50 espèces





Les causes du déclin des Insectes

Worldwide decline of the entomofauna: A review of its drivers

Francisco Sánchez-Bayo[a,*], Kris A.G. Wyckhuys[b,c,d]

Biological Conservation 232 (2019) 8–27

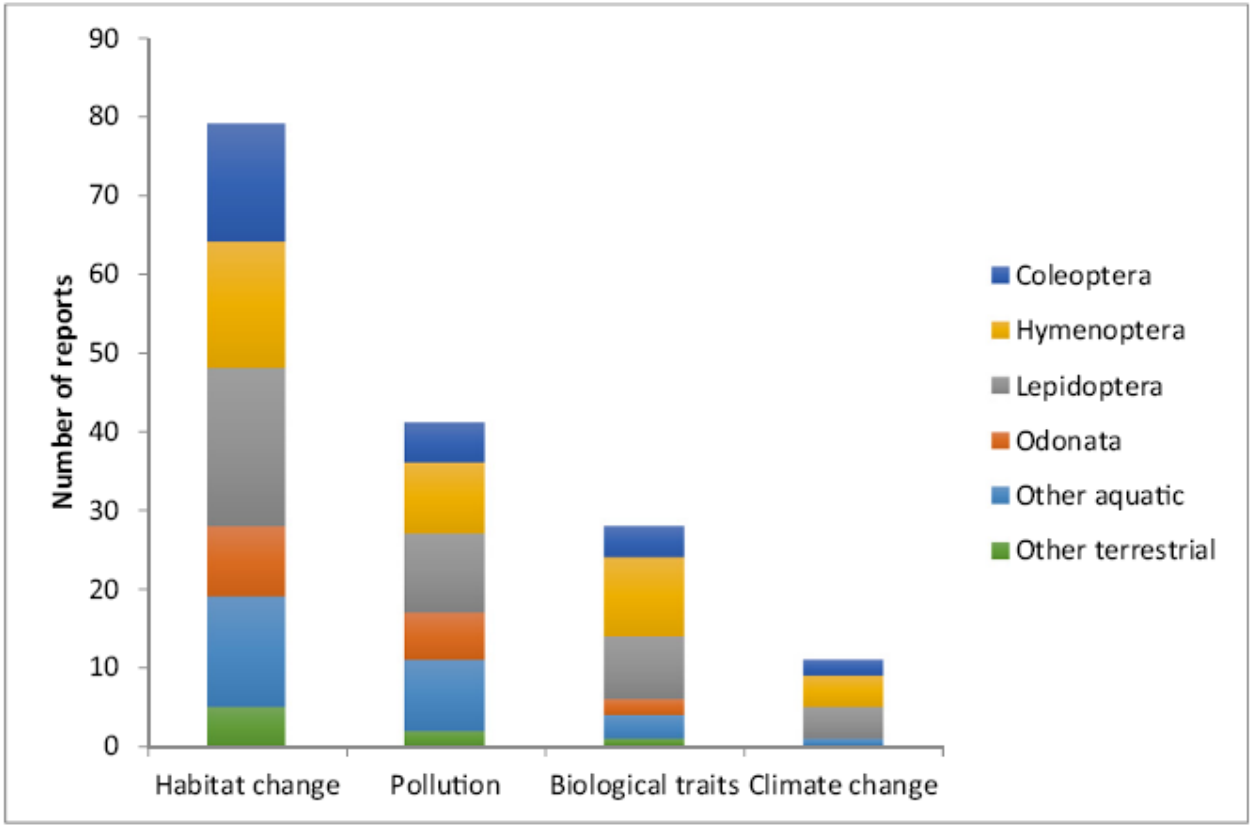
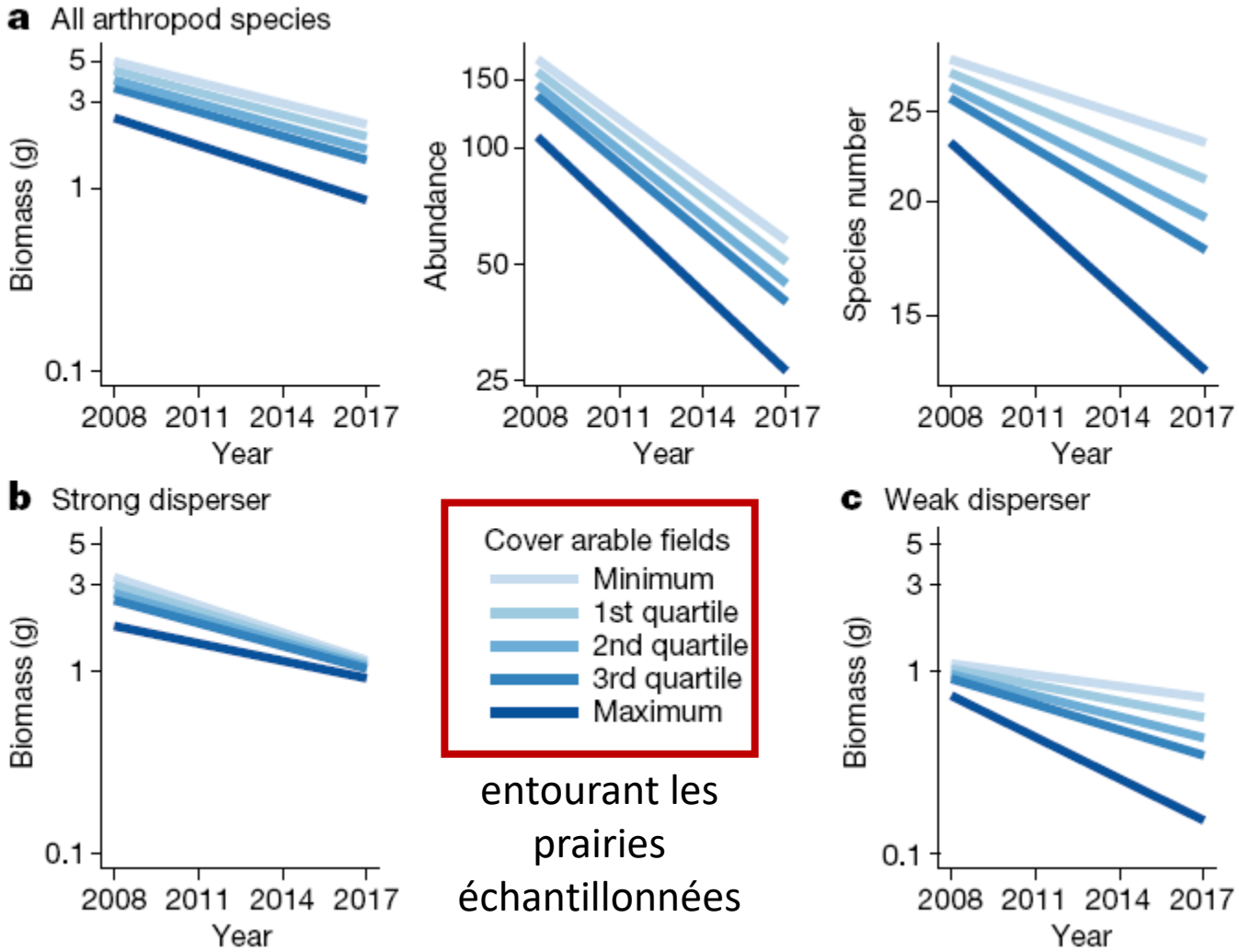


Fig. 5. The four major drivers of decline for each of the studied taxa according to reports in the literature.

Les causes du déclin des Insectes

C1. Perte ou dégradation des habitats



entourant les prairies échantillonnées

Seibold et al. 2019

Les causes du déclin des Insectes

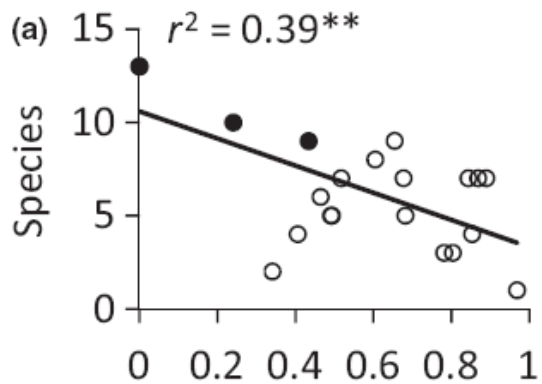
C2. Pollution - insecticides

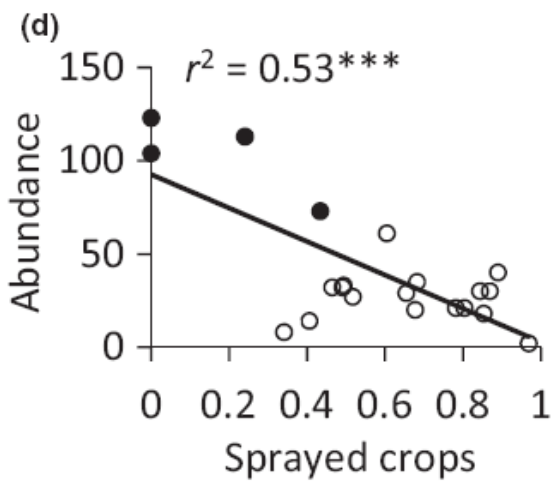
Insect Conservation and Diversity (2019) **12**, 289–295 doi: 10.1111/icad.12

SHORT COMMUNICATION

Agricultural intensification drives butterfly decline

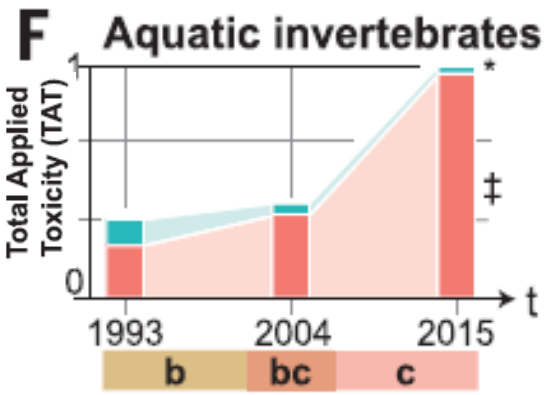
JAN CHRISTIAN HABEL,[1] WERNER ULRICH,[2] NINA BIBURGER,[1] SEBASTIAN SEIBOLD[1,3] and THOMAS SCHMITT[4,5] [1]Terrestrial Ecology Research

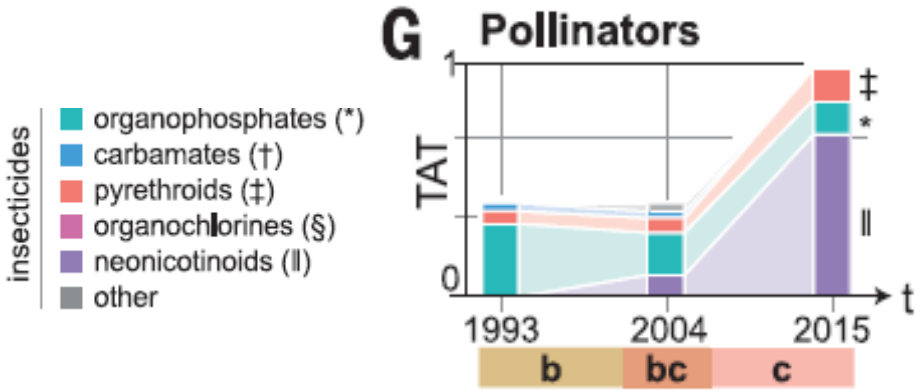




Applied pesticide toxicity shifts toward plants and invertebrates, even in GM crops

Ralf Schulz[1,2]*, Sascha Bub[1], Lara L. Petschick[1], Sebastian Stehle[1,2], Jakob Wolfram[1]





Les causes du déclin des Insectes

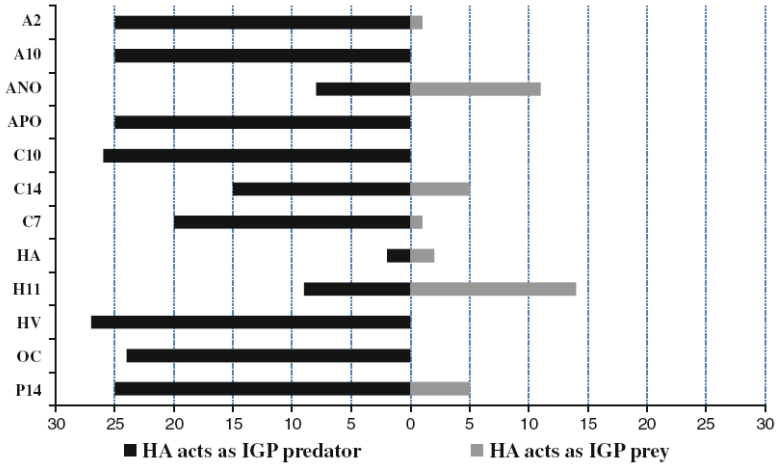
C3. Invasions biologiques

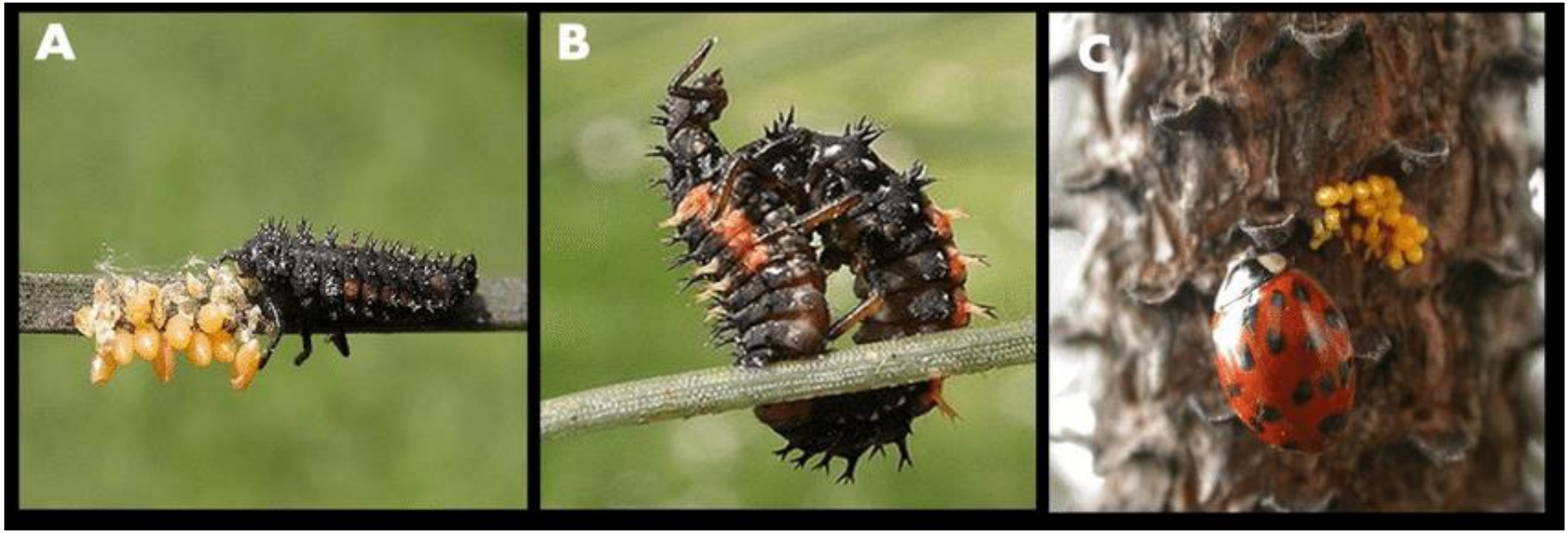
BioControl (2013) 58:73–83
DOI 10.1007/s10526-012-9470-2

Intraguild predation between the invasive ladybird *Harmonia axyridis* and non-target European coccinellid species

Angelos Katsanis · Dirk Babendreier · Wolfgang Nentwig · Marc Kenis

Fig. 2 Symmetry of IGP between *H. axyridis* and European coccinellids at the fourth larval instar. n = 30. Bars indicate the number of replicates falling into each category: left bars *H. axyridis* acts as an intraguild predator, right bars *H. axyridis* acts an intraguild prey. Species abbreviations are mentioned in Fig. 1





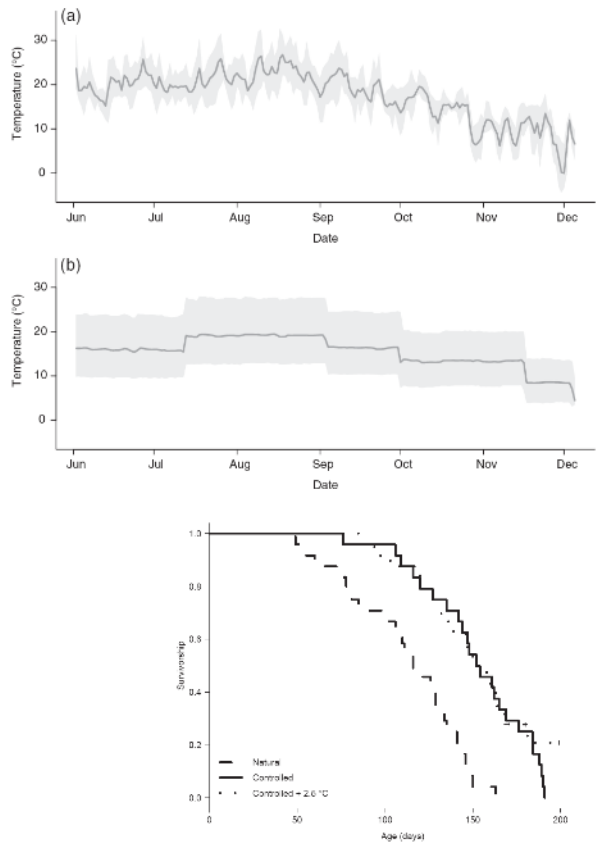
Les causes du déclin des Insectes

C4. Changements climatiques

Agricultural and Forest Entomology (2016), DOI: 10.1111/afe.12200

Potential effects of climate warming on the survivorship of adult *Monochamus galloprovincialis*

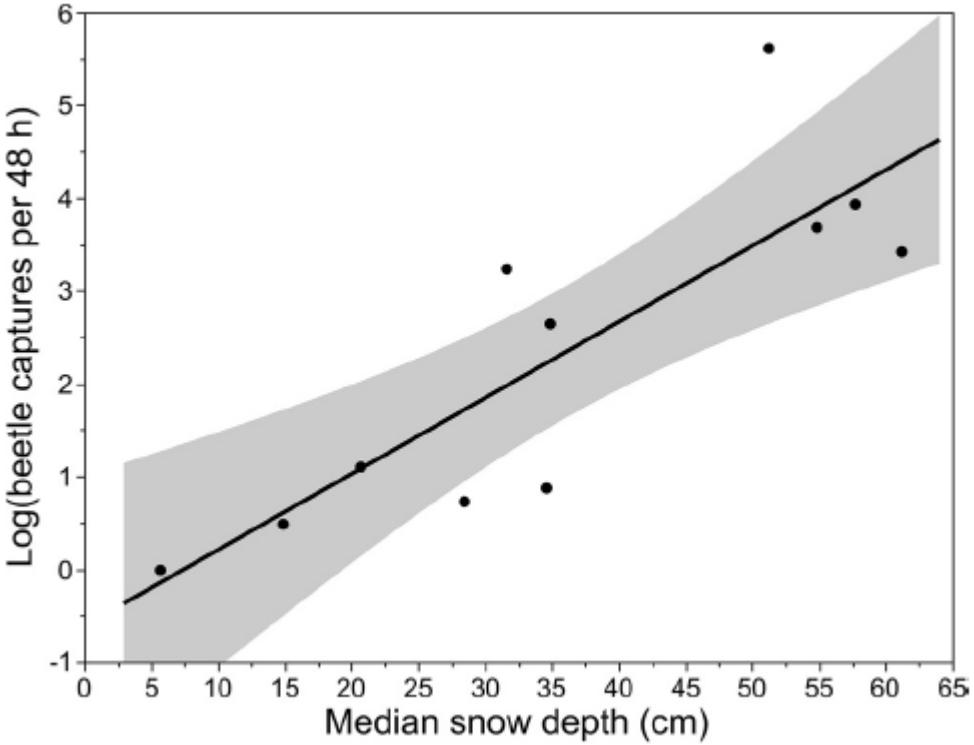
Guillaume David*†, Brice Giffard*†‡, Dominique Piou*†§, Alain Roques‖ and Hervé Jactel*†



Decline in beetle abundance and diversity in an intact temperate forest linked to climate warming

Jennifer E. Harris[a], Nicholas L. Rodenhouse[a,*], Richard T. Holmes[b]

Biological Conservation 240 (2019) 108219



Les conséquences du déclin des Insectes

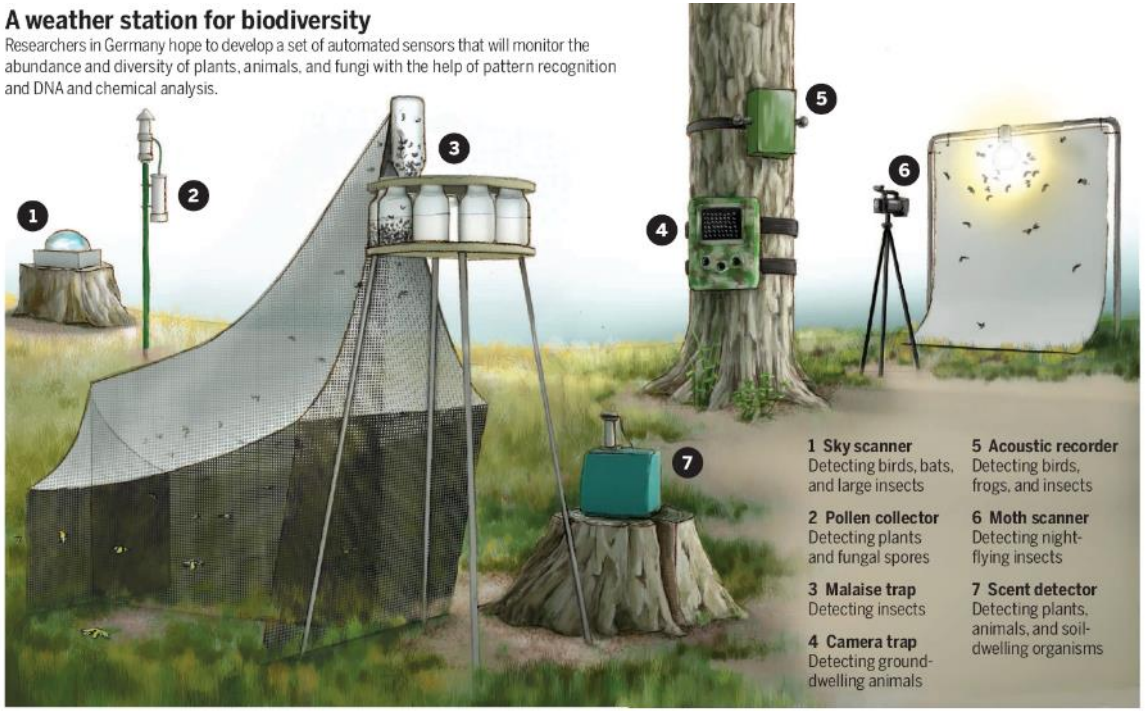
Diminution des services rendus

- Pollinisation de 75% des plantes cultivées
- Décomposition de la matière organique (termites, bousiers)
- Ressources trophiques pour les oiseaux, chauve-souris, poissons
- Agents de biocontrôle (prédateurs, parasitoïdes)
- Fourniture de biens (miel, soie)
- Alimentation animale et humaine
- Sources de bioinspiration
- Biens culturels

(certains insectes sont aussi des pestes ou des fléaux, ravageurs des cultures, vecteurs de maladie mais il ne représentent que moins de 1% des espèces d'insectes)

3 recommandations pour freiner le déclin des insectes

1. Développer des méthodes d'évaluations fiables du déclin de la diversité et de l'abondance des insectes

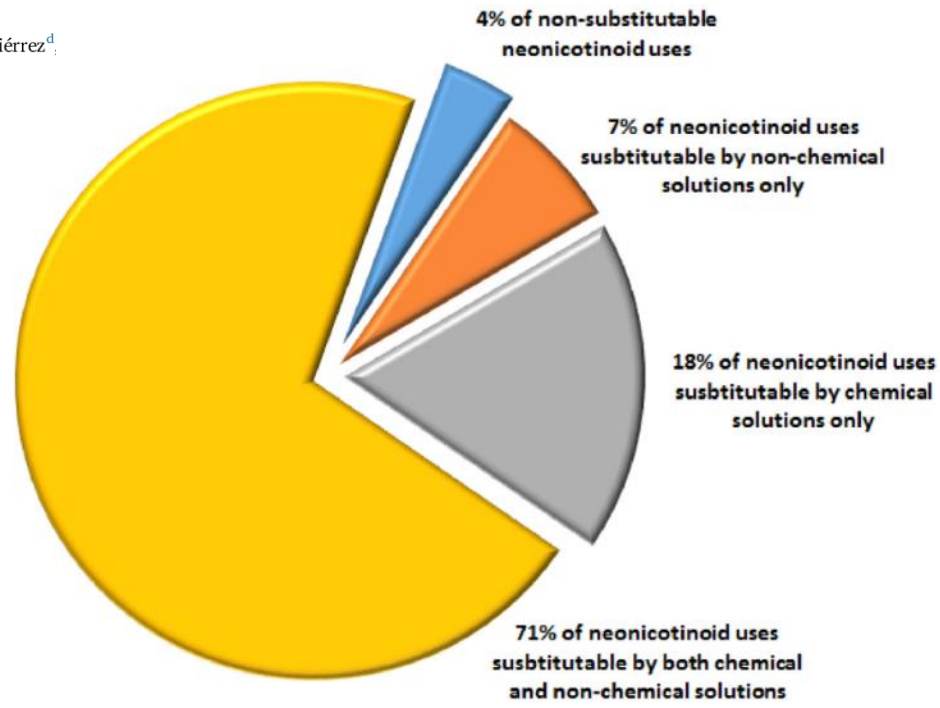


3 recommandations pour freiner le déclin des insectes

2. S'attaquer aux causes du déclin des insectes et mieux préserver le patrimoine naturel

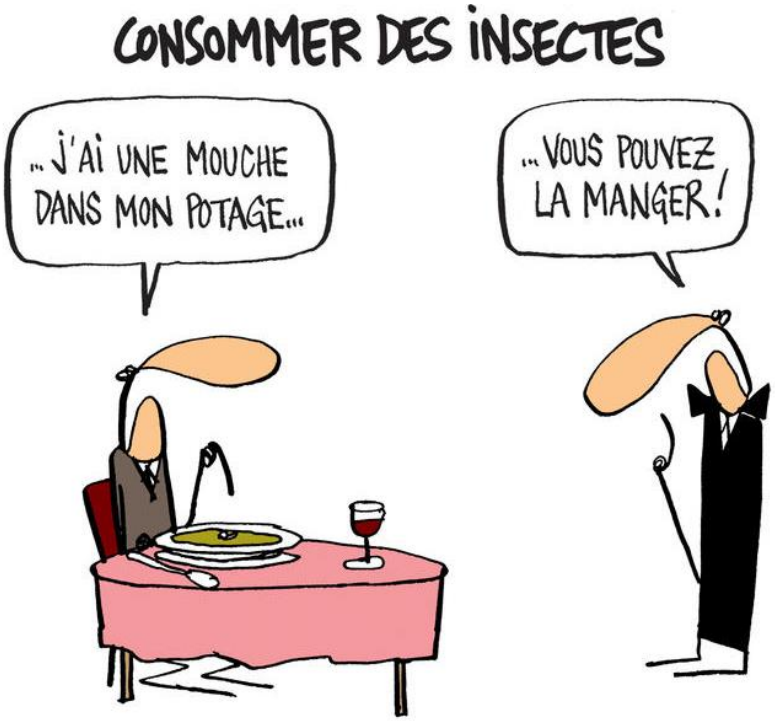
Alternatives to neonicotinoids

Hervé Jactel[a,*], François Verheggen[b], Denis Thiéry[c], Abraham J. Escobar-Gutiérrez[d], Emmanuel Gachet[e], Nicolas Desneux[f], the Neonicotinoids Working Group[1]



3 recommandations pour freiner le déclin des insectes

3. Inventer une nouvelle relation de l'Homme à l'Insecte



Remerciements à

Jean-Luc Imler, Louis Lambrechts, Anna-Bella Failloux, Jean Dominique Lebreton, Yvon Le Maho, Jean-Claude Duplessy, Pascale Cossart and Philippe Grandcolas

Insect decline: immediate action is needed

Volume 343, issue 3 (2020), p. 267-293.

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Merci pour votre attention