RÉPUBLIQUE FRANÇAISE
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INRAE

LES RENCONTRES DE THURET
4e édition

Invasions biologiques végétales et animales *en Méditerranée*

Detection and management of alien scolytids invading Europe

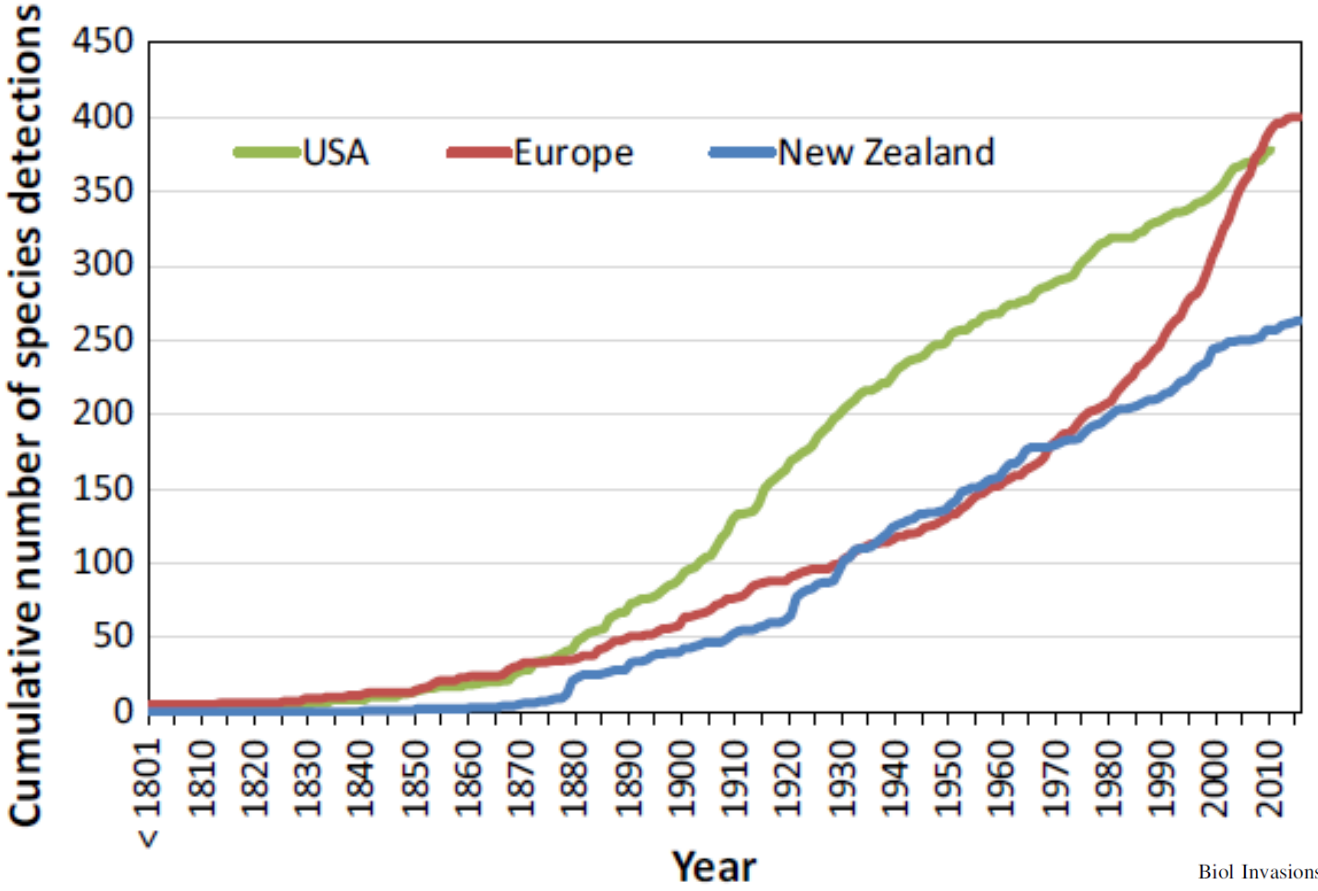
Massimo Faccoli

University of Padua

UNIVERSITÀ DEGLI STUDI DI PADOVA

DAFNAE
Dipartimento di Agronomia Animali Alimenti Risorse naturali e Ambiente

The number of alien species is constantly increasing worldwide …



… and this trend is not going to stop!

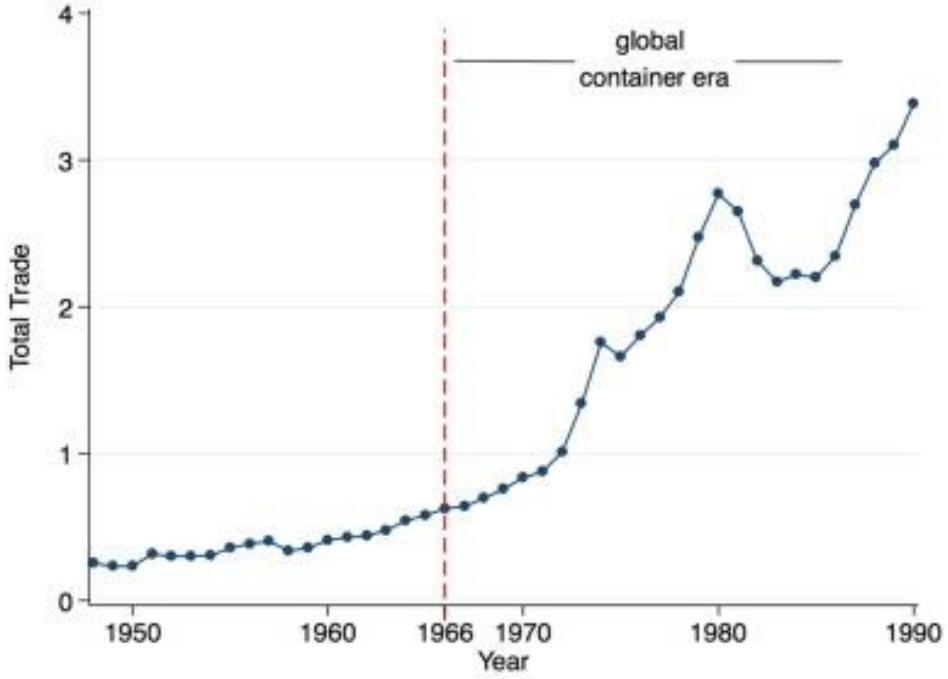
Biol Invasions (2017) 19:3141–3159
DOI 10.1007/s10530-017-1514-1

FOREST INVASION

Ecology of forest insect invasions

E. G. Brockerhoff · A. M. Liebhold

International trade is constantly increasing



Source: Authors' own calculation

Journal of International Economics 99 (2016) 50–70

Contents lists available at ScienceDirect

Journal of International Economics

journal homepage: www.elsevier.com/locate/jie

Estimating the effects of the container revolution on world trade

Daniel M. Bernhofen [a,b,c,*], Zouheir El-Sahli [d], Richard Kneller [b,c,e]

[a] American University, United States
[b] CESifo, Germany
[c] GEP, United Kingdom
[d] Lund University, Sweden
[e] University of Nottingham, United Kingdom

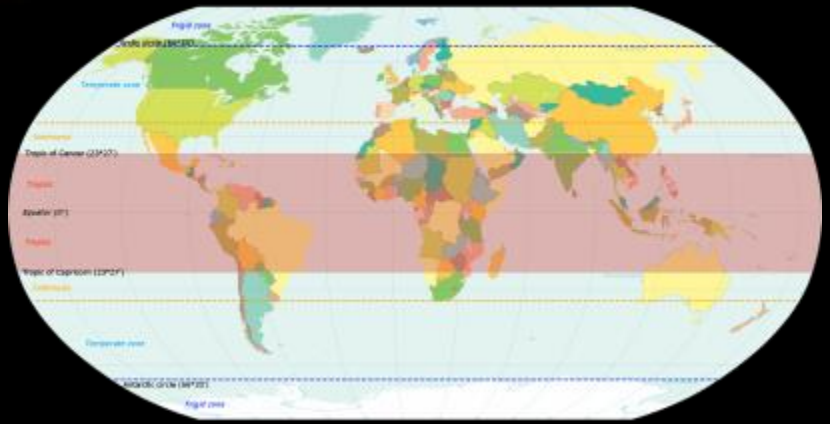
Climate change favors non-native species invasion

Review

Cell

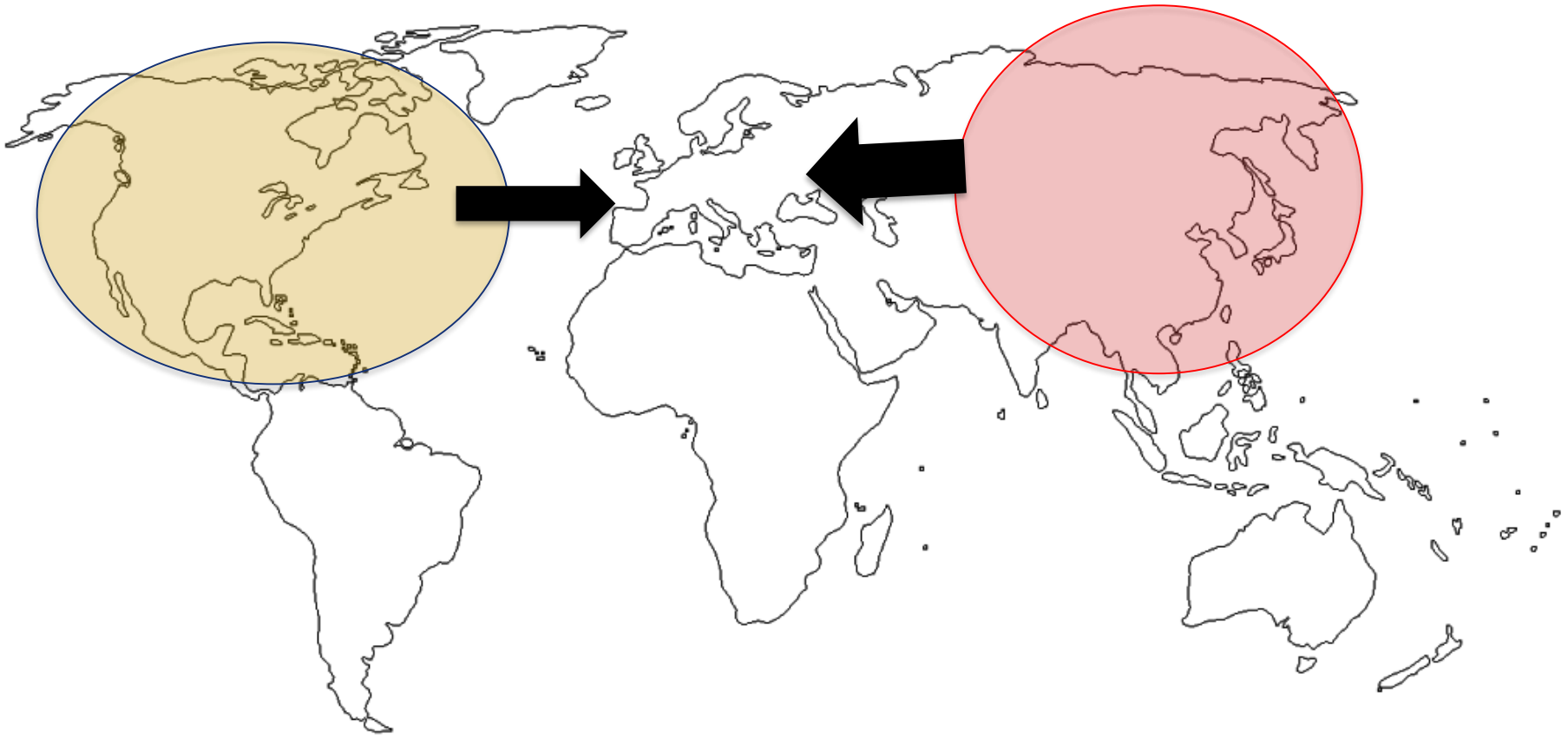
Alien species in a warmer world: risks and opportunities

Gian-Reto Walther[1], Alain Roques[2], Philip E. Hulme[3], Martin T. Sykes[4], Petr Pyšek[5,6], Ingolf Kühn[7], Martin Zobel[8], Sven Bacher[9], Zoltán Botta-Dukát[10], Harald Bugmann[11], Bálint Czúcz[10], Jens Dauber[12], Thomas Hickler[4], Vojtěch Jarošik[5,6], Marc Kenis[13], Stefan Klotz[7], Dan Minchin[14], Mari Moora[8], Wolfgang Nentwig[15], Jürgen Ott[16], Vadim E. Panov[17], Björn Reineking[18], Christelle Robinet[2], Vitaliy Semenchenko[19], Wojciech Solarz[20], Wilfried Thuiller[21], Montserrat Vilà[22], Katrin Vohland[23] and Josef Settele[7]



Where are alien species from?

Origin of the invasions



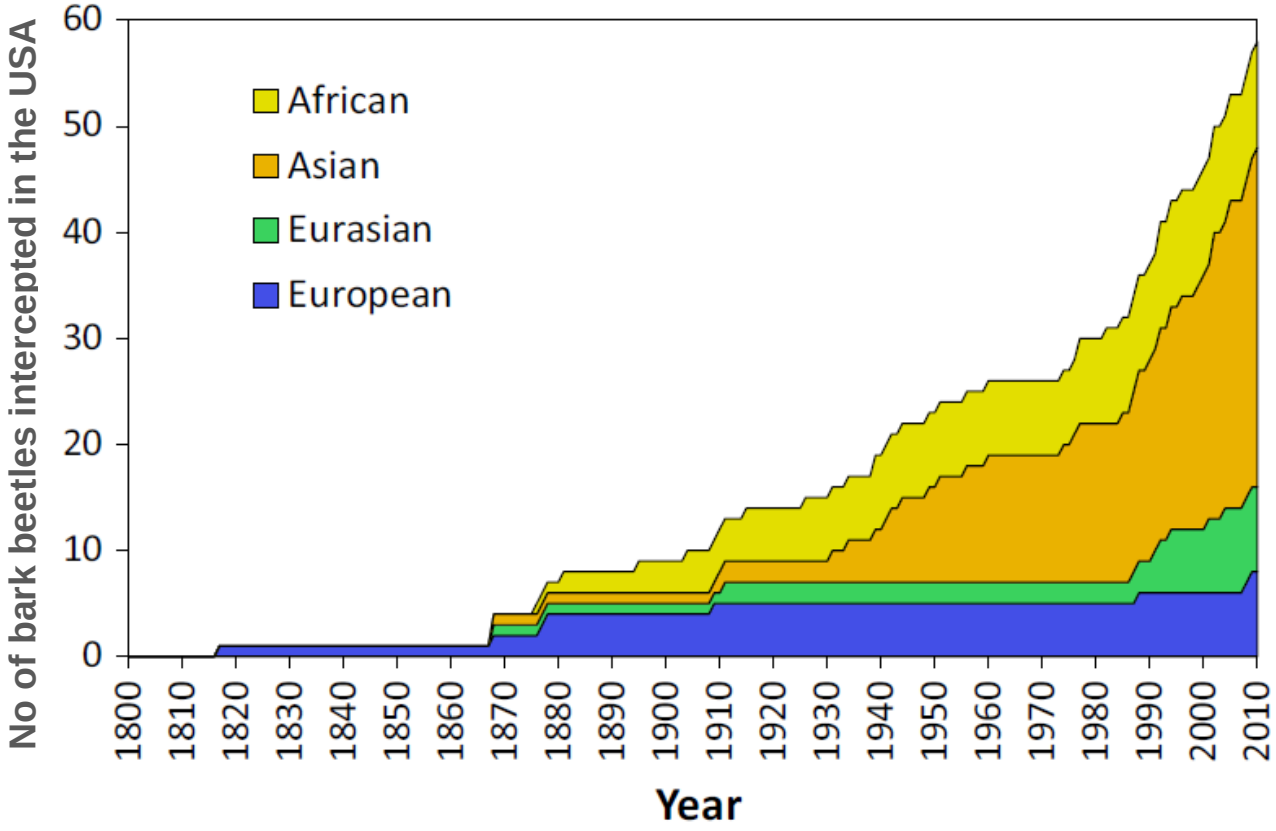
Mainly from Asia and N America, BUT…..

PNAS

Global rise in emerging alien species results from increased accessibility of new source pools

Hanno Seebens[a,b,1], Tim M. Blackburn[c,d,e], Ellie E. Dyer[c,d], Piero Genovesi[f,g], Philip E. Hulme[h], Jonathan M. Jeschke[i,j,k], Shyama Pagad[l], Petr Pyšek[m,n], Mark van Kleunen[o,p], Marten Winter[q], Michael Ansong[r], Margarita Arianoutsou[s], Sven Bacher[t], Bernd Blasius[u], Eckehard G. Brockerhoff[v], Giuseppe Brundu[w], César Capinha[x,y], Charlotte E. Causton[z], Laura Celesti-Grapow[aa], Wayne Dawson[ab], Stefan Dullinger[b], Evan P. Economo[ac], Nicol Fuentes[ad], Benoit Guénard[ae], Heinke Jäger[af], John Kartesz[ag], Marc Kenis[ah], Ingolf Kühn[a,ai,j], Bernd Lenzner[b], Andrew M. Liebhold[aj], Alexander Mosena[ak,al], Dietmar Moser[b], Wolfgang Nentwig[am,an], Misako Nishino[ao], David Pearman[ap,aq], Jan Pergl[ar], Wolfgang Rabitsch[as], Julissa Rojas-Sandoval[at], Alain Roques[au], Stephanie Rorke[av], Silvia Rossinelli[t], Helen E. Roy[av], Riccardo Scalera[aw], Stefan Schindler[b], Kateřina Štajerova[m,n], Barbara Tokarska-Guzik[ax], Kevin Walker[ay], Darren F. Ward[az,ba], Takehiko Yamanaka[bb], and Franz Essl[a,b,1]

… exploring new markets means accessibility of new species pools



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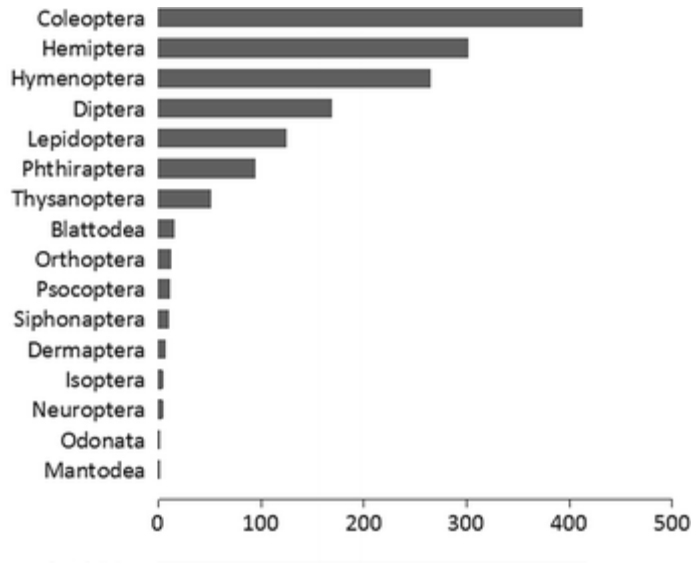
FOREST INVASION

Ecology of forest insect invasions

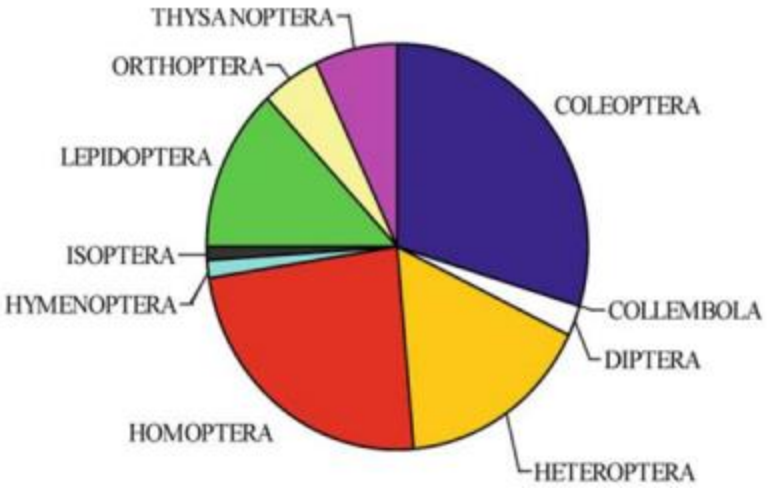
E. G. Brockerhoff · A. M. Liebhold

Who are the invaders?

New Zealand



USA



Biol Invasions (2018) 20:1657–1669
https://doi.org/10.1007/s10530-017-1652-5

ORIGINAL PAPER

Establishment patterns of non-native insects in New Zealand

Emma Edney-Browne · Eckehard G. Brockerhoff · Darren Ward

Biological Invasions (2006) 8: 611–630
DOI 10.1007/s10530-005-1798-4

Interceptions of nonindigenous plant pests at US ports of entry and border crossings over a 17-year period

Deborah G. McCullough[1,*], Timothy T. Work[2], Joseph F. Cavey[3], Andrew M. Liebhold[4] & David Marshall[5]

Wood-boring beetles are among the most common alien species, and scolytids are the most succesfull ones!

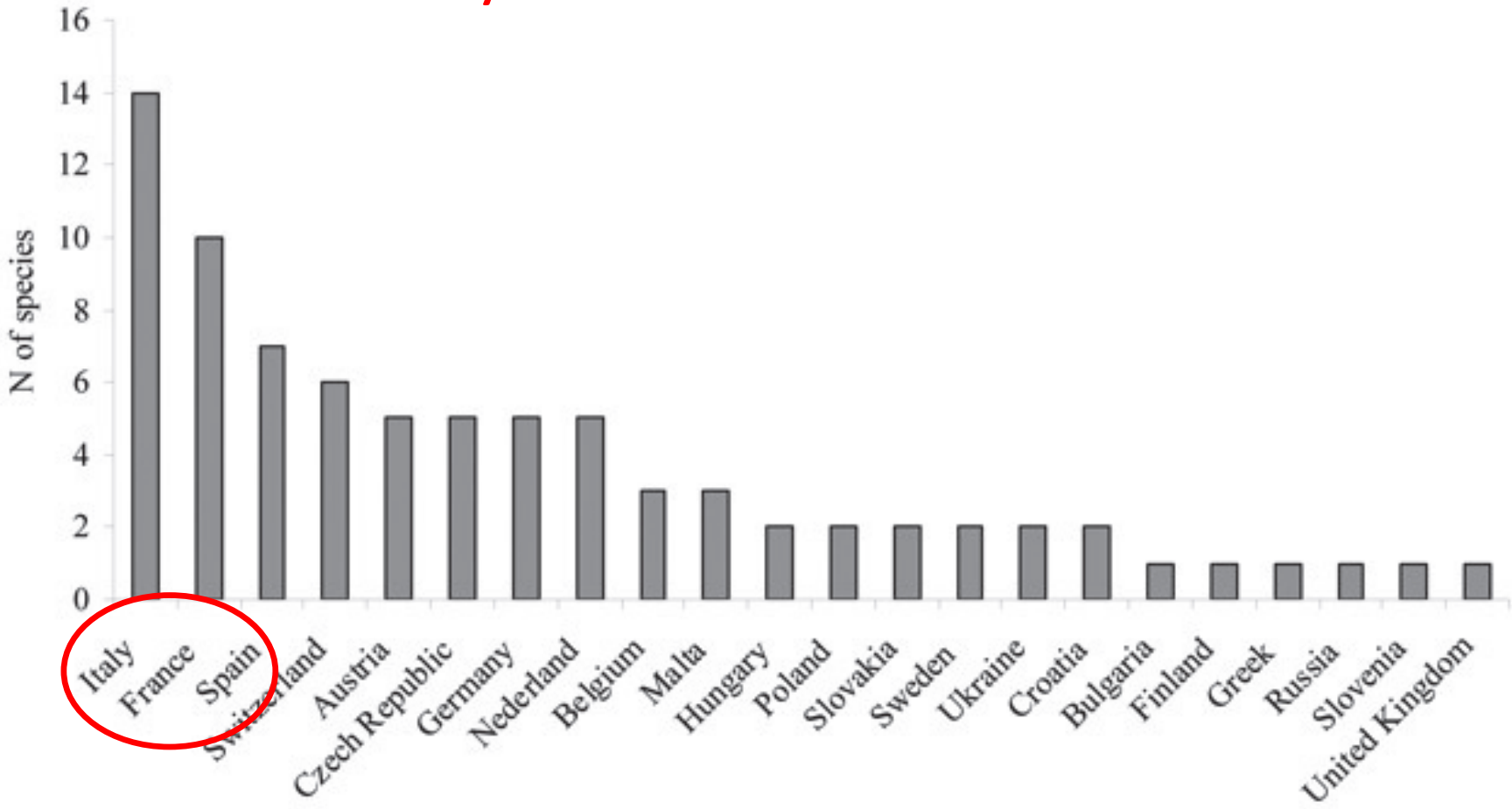
Why alien scolytids are so important?

Many species can be extremely destructive

Easily transported in many different woody products such as:

Wood, timber, wood-packaging materials, ornamental plants, bonsai …

Distribution of alien scolytids in Europe: mainly in Mediterranean countries



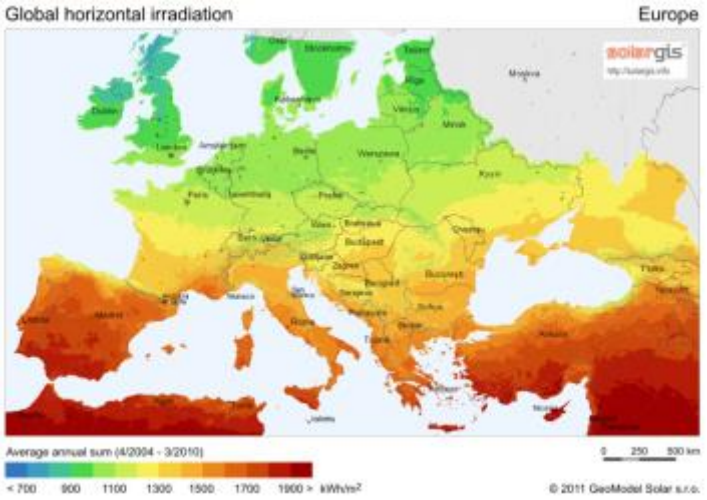
ZooKeys 56: 227–251 (2010)
doi: 10.3897/zookeys.56.529
www.pensoftonline.net/zookeys

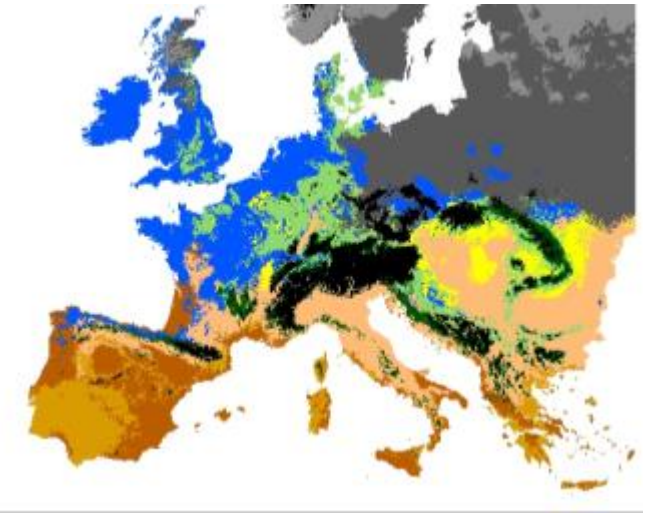
Bark beetles and pinhole borers (Curculionidae, Scolytinae, Platypodinae) alien to Europe

Lawrence R. Kirkendall[1], Massimo Faccoli[2]

Why mainly in Med regions?

Climatic conditions (mild winters, warm summers, wet spring and falls)



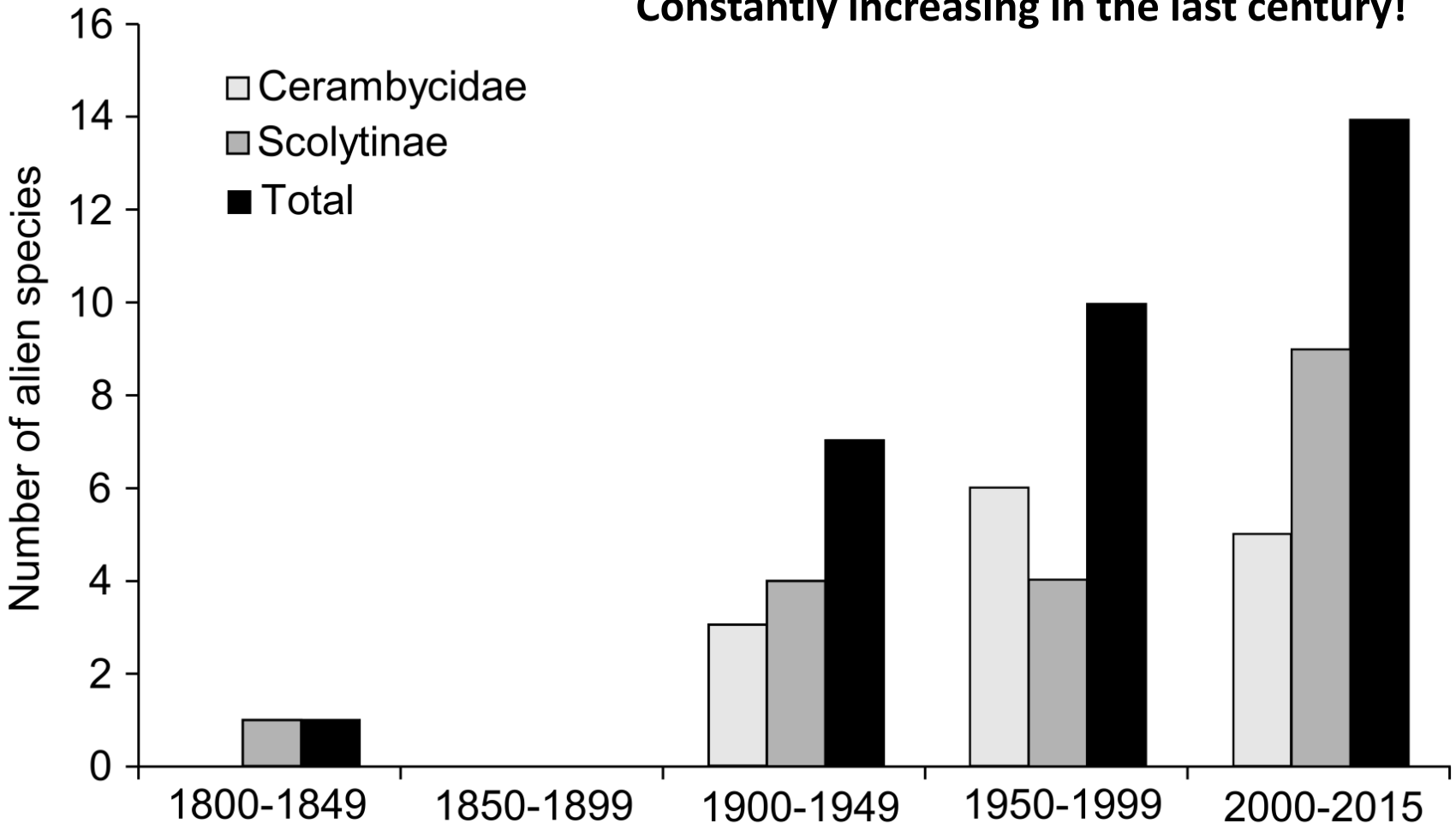


High forest and habitat diversity

High number of major international ports

Temporal trend of the invasions

Constantly increasing in the last century!



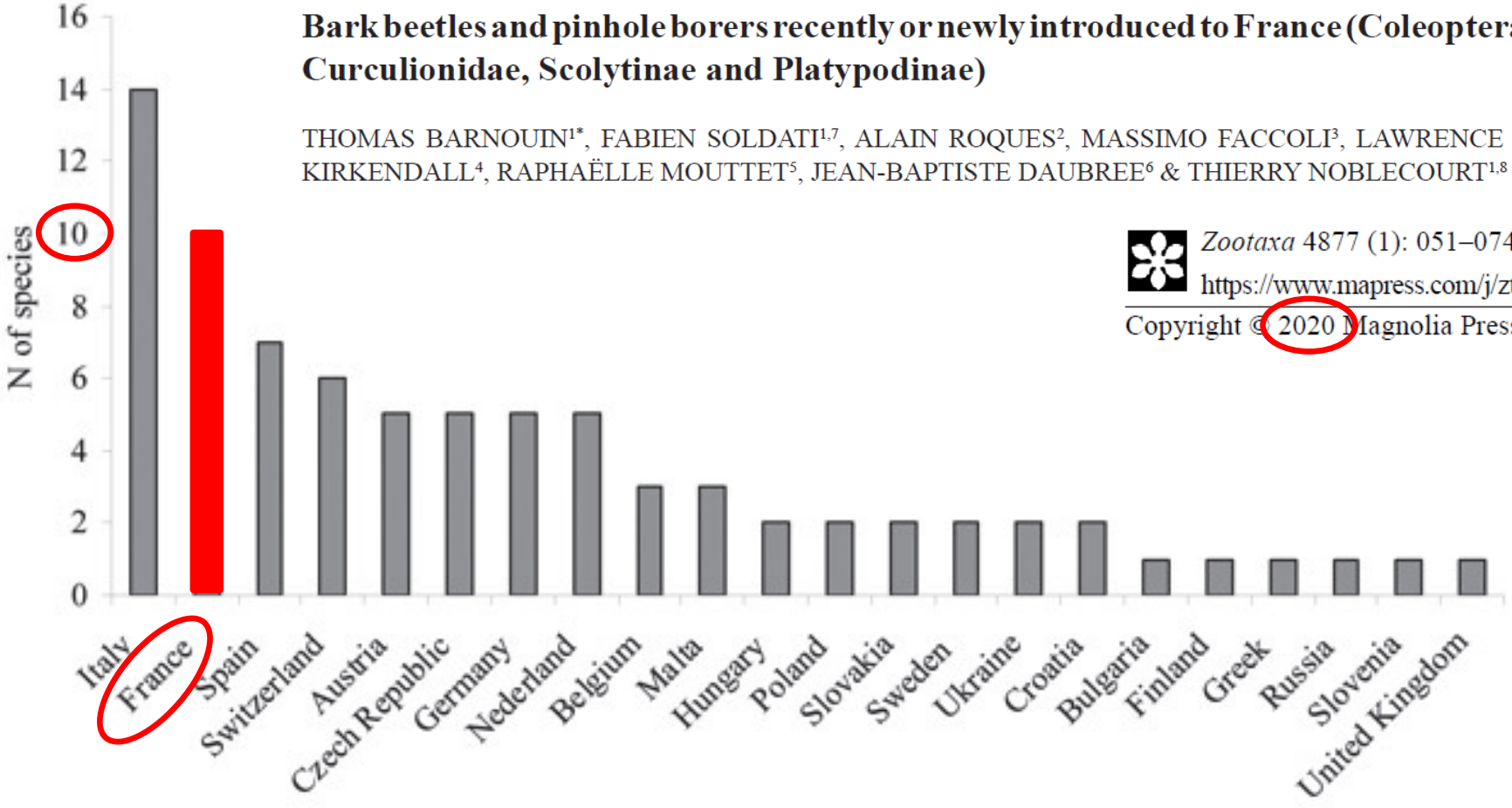
Alien Wood-Boring Beetles in Mediterranean Regions

Davide Rassati, François Lieutier, and Massimo Faccoli

T.D. Paine, F. Lieutier (eds.), *Insects and Diseases of Mediterranean Forest Systems*, DOI 10.1007/978-3-319-24744-1_6

Temporal trend of the invasions: the example of France

10 years later…. : 23 alien species recorded in France!



Bark beetles and pinhole borers recently or newly introduced to France (Coleoptera: Curculionidae, Scolytinae and Platypodinae)

THOMAS BARNOUIN[1*], FABIEN SOLDATI[1,7], ALAIN ROQUES[2], MASSIMO FACCOLI[3], LAWRENCE R. KIRKENDALL[4], RAPHAËLLE MOUTTET[5], JEAN-BAPTISTE DAUBREE[6] & THIERRY NOBLECOURT[1,8]

Zootaxa 4877 (1): 051–074
https://www.mapress.com/j/zt/

Bark beetles and pinhole borers (Curculionidae, Scolytinae, Platypodinae) alien to Europe

Lawrence R. Kirkendall[1], Massimo Faccoli[2]

ZooKeys 56: 227–25[illegible] (2010)
doi: 10.3897/zookeys.56.529
www.pensoftonline.net/zookeys

International trade will continue to expand, and as well the number of established alien pests

How to contain the problem?

1) Drawing up inventories of the alien species:
Which species are already present in our countries?

The first inventory of aliens at a continental scale!

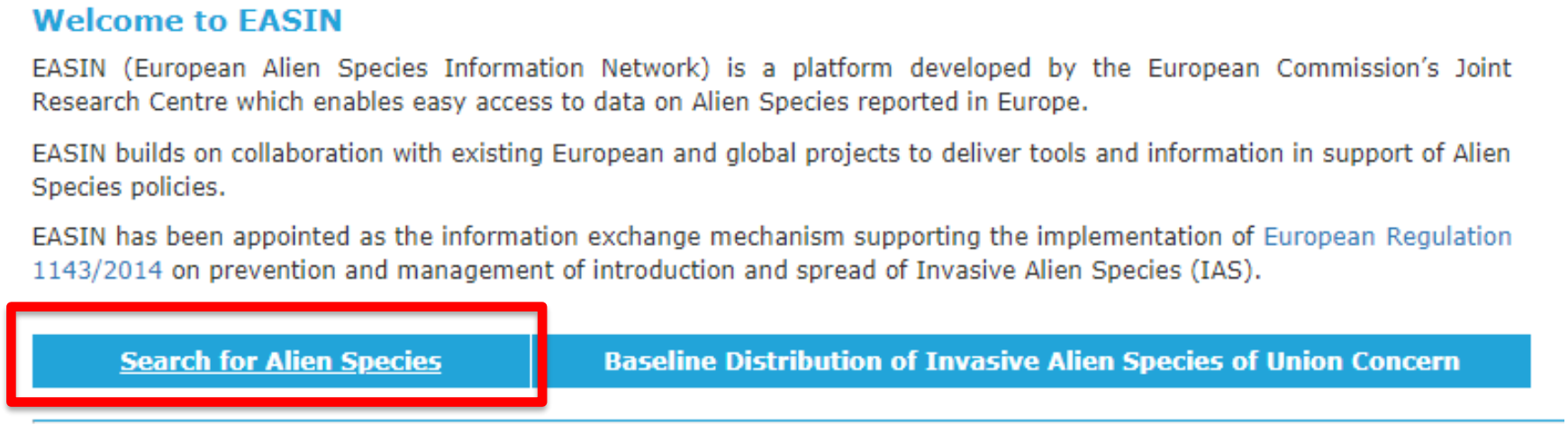
JOINT RESEARCH CENTRE

European Alien Species Information Network - EASIN

European Commission > EU Science Hub > EASIN

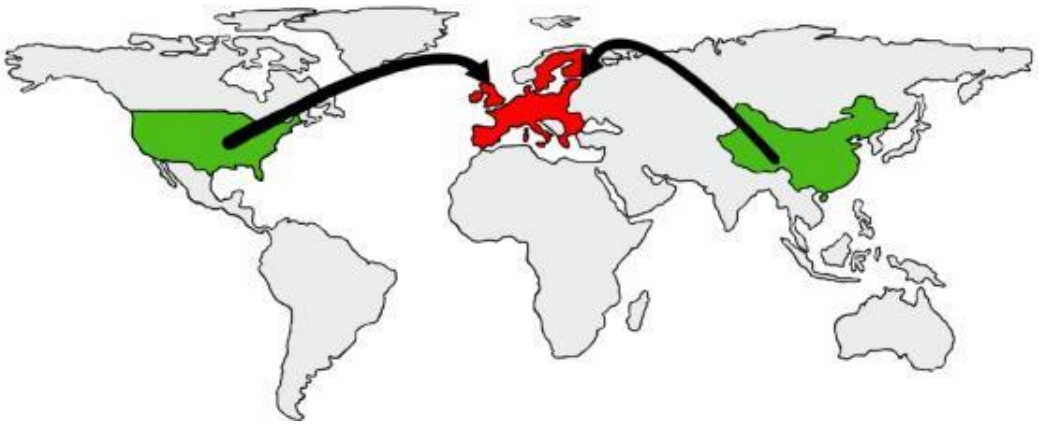
https://easin.jrc.ec.europa.eu/

EASIN facilitates the exploration of existing Alien Species information from a variety of distributed information sources



How to contain the problem?

2) Better understand the entry pathways



How the alien species may reach and entry our countries?

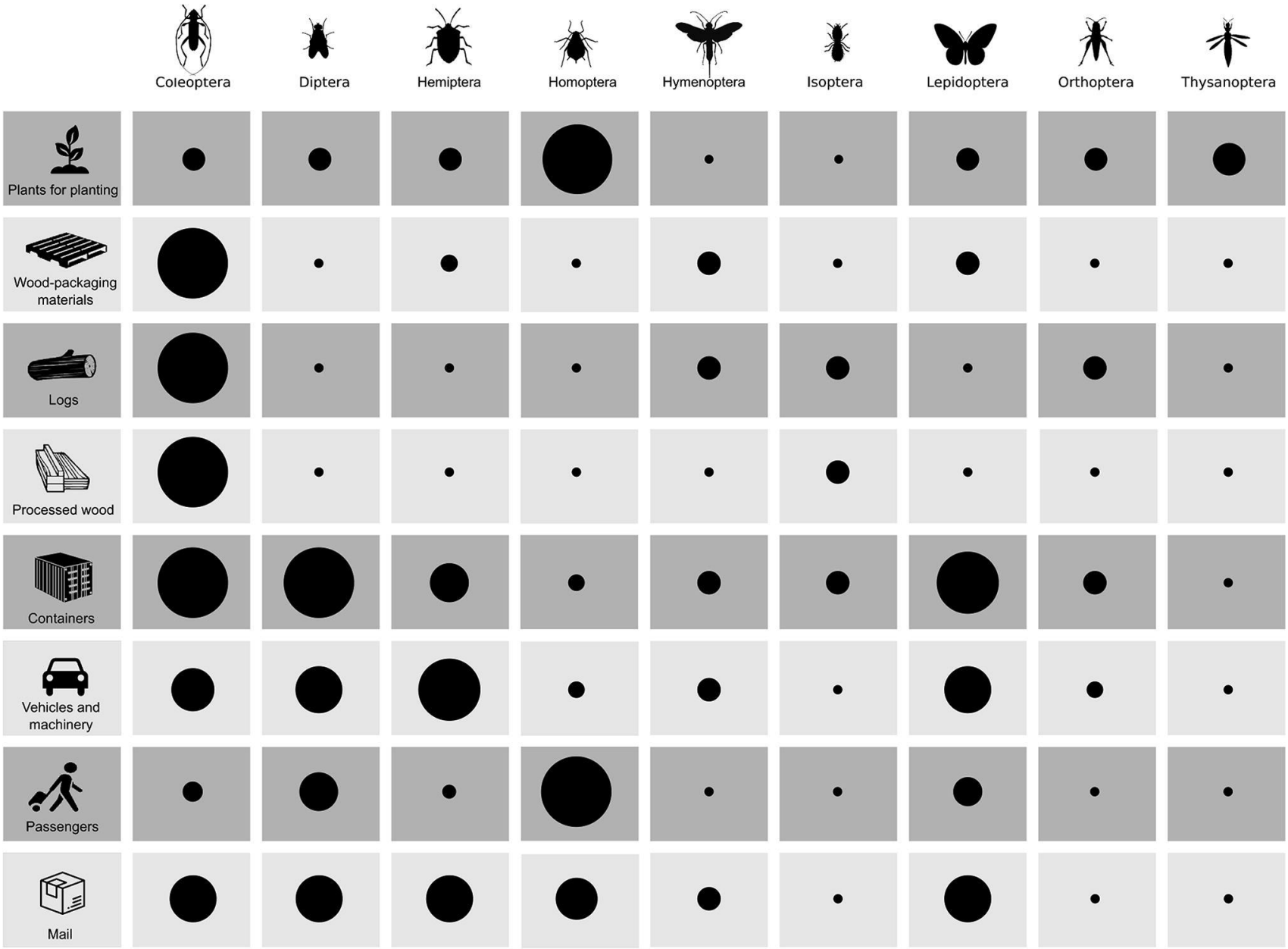
Pathway evaluation and pest risk management in transport (PERMIT)

Summary

Movements of Invasive Alien Species (IAS) globally by trade and human movement present severe and increasing risks of transfer of plant pests (principally invertebrates and plant pathogens) globally. Climate change adds further opportunities for pest establishment and impact, both by providing increased survival and growth opportunities for pests and, through environmental stresses, making trees more vulnerable to those

EU COST Action FP1002

Different species use different pathways!



How to contain the problem?

3) Use the most efficient protocols and tools for survey and early-detection

c) Lures type

a) Trap models

b) Trap position

a) Trap models

Many trap models of different colors, size, and shape are available on the market, but….

Black

Green

Purple

Multi-funnel

Black

Green

Cross-vane

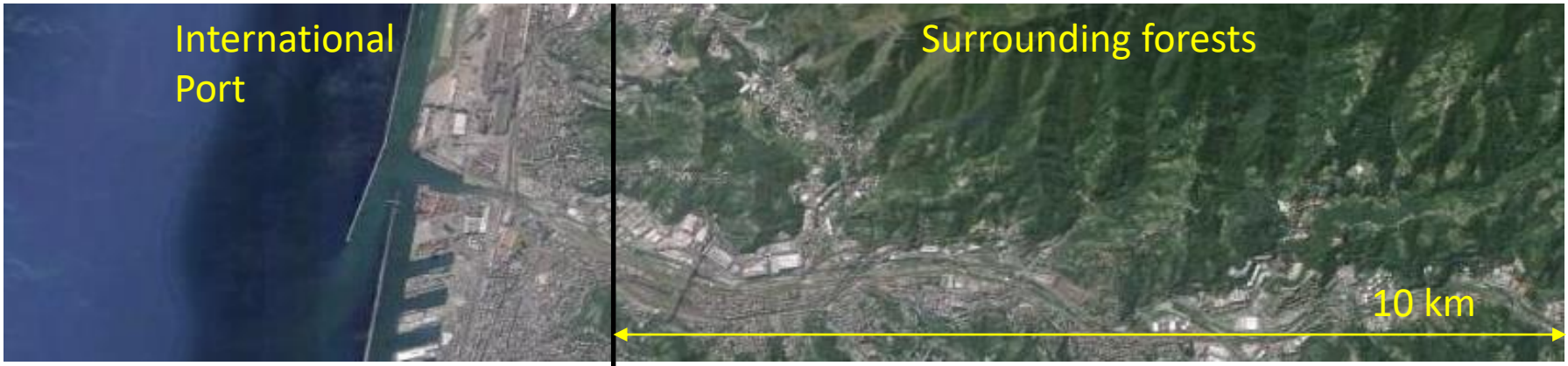
Any color

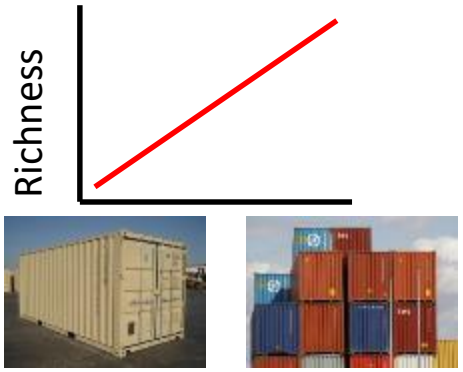
Multitrap

… different species needs different requirements!

b) Trap position

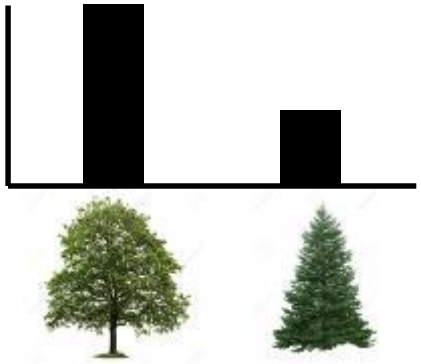
Identify the best sites for survey!





Import

Forest cover



Forest type

c) Lures type

How to choose the best lure type?

Unknown target species
(generic early-detection of a wide range of species)

Use of **generic lures** (e.g., ethanol, α-pinene) in the point-of-entry

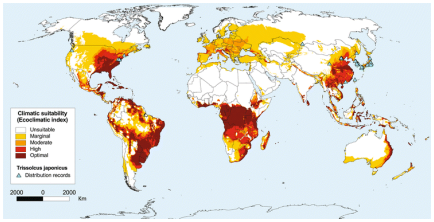
Well-known target species
(Invasive quarantine species)

Use of **specific pheromones** (if available) in the target ecosystem

How to contain the problem?

4) Develop new tools, strategies and detection methods

Sentinel trees



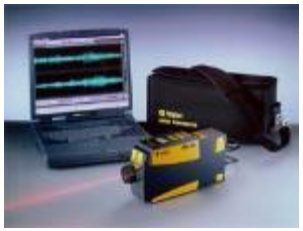
Species distribution models

Remote sensing

Trans-trap

Baited traps

LAMP



Vibrometer

Sniffer dogs

-detect

Developing tools for
on-site phytosanitary inspection

ANOPLORISK

Euphresco

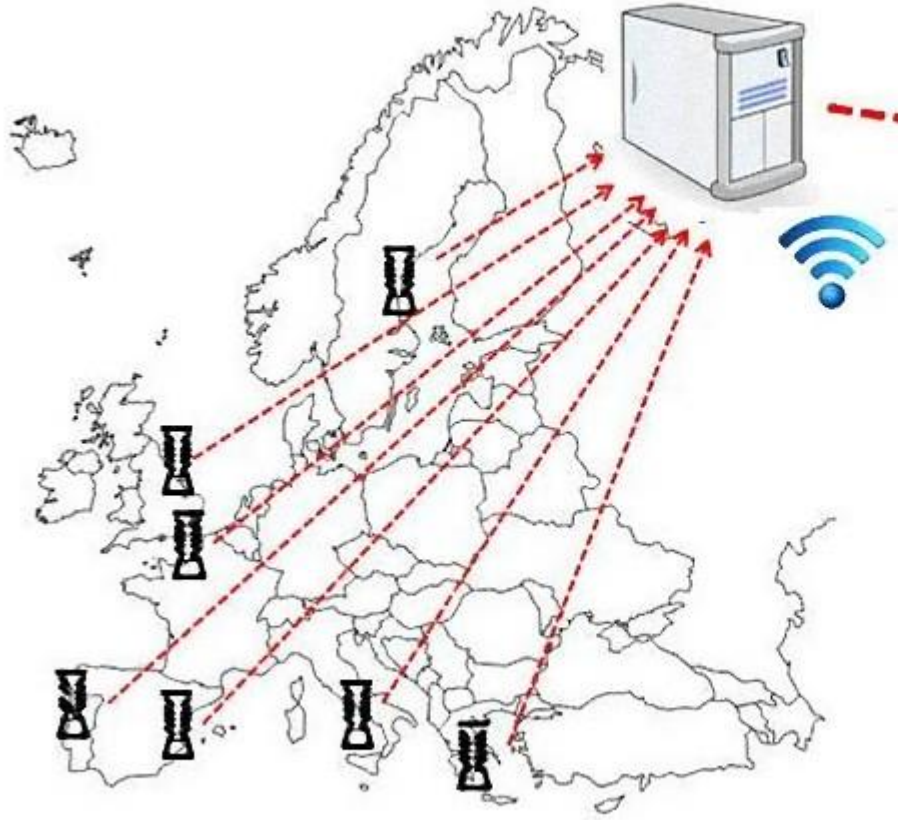
EUPHRESCO Project

ANOPLORISK: Risk Management for the EC listed *Anoplophora* species, *A. chinensis* and *A. glabripennis*

How to contain the problem?

5) International collaboration and coordination:

exploit information on interceptions from international databases!



EUROPHYT: European Union Notification System for Plant Health Interceptions

Which species are most commonly intercepted in EU countries?

USDA

PIN
(Port Information Network)

Which species are most commonly intercepted in other continents?

How to contain the problem?

6) Quick and sure identification of trapped insects and associated organisms:

Genetic analysis:
DNA metabarcoding

Morphological taxonomy:
better exploit and reinforce laboratories for species identification

List of trapped species (if I have primers or keys)

How to contain the problem?

7) Citizen science: awareness raising campaigns: keep **people informed** and exploit citizen science!

USA: survey of alien species at home!

Cheap

Easy to handle

Interception of scolytids!

Download the IAS Europe App

Developed by JRC through MYGEOSS and EASIN teams, the app enables to report Invasive Alien Species occurrences in Europe allowing citizens to countribute to early detections of new invaders.

GET IT ON Google Play

Download on the App Store

LIFE ARTEMIS

Awareness Raising, Training and Measures on Invasive alien Species in forests

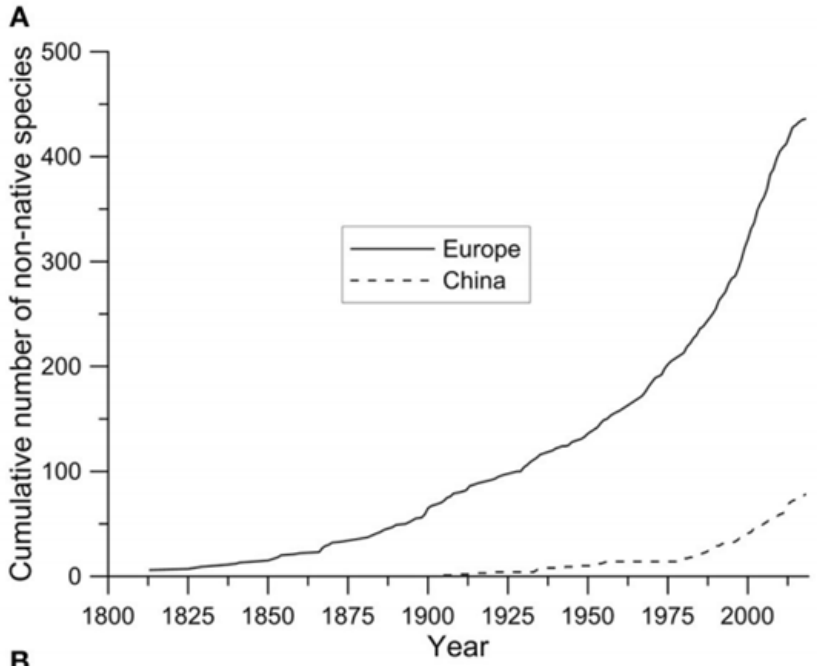
LIFE15 GIE/SI/000770

Conclusions

- Biological invasions will increase in the next future

- We cannot stop them!

- But we can contrast by:



1) Better knowledge of IAS

2) Better understanding of arrival pathways

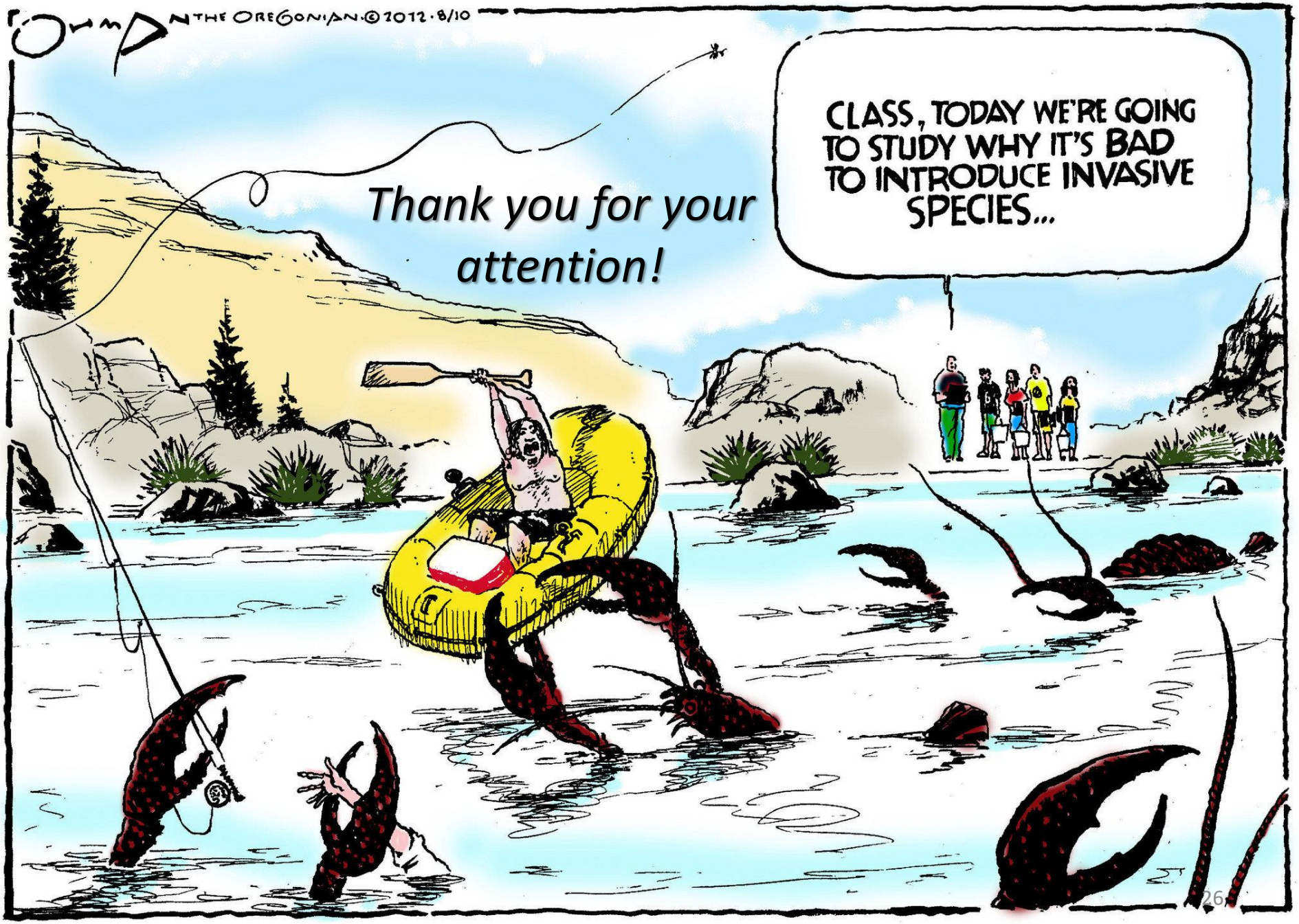
3) Develop and exploit new and innovative tools

4) Increase collaboration between operators and stakeholders

5) Increase International collaboration and coordination

6) Quick species identification

7) Exploit citizen science


THE OREGONIAN © 2012 · 8/10
CLASS, TODAY WE'RE GOING TO STUDY WHY IT'S BAD TO INTRODUCE INVASIVE SPECIES...
Thank you for your attention!