

SPECIE ALIENE INVASIVE: ANDAMENTI, IMPATTI E RISPOSTE

Modulo 1 – Le invasioni biologiche

UNITA' FORMATIVA 4 – Parte 2 Gli impatti delle specie aliene

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MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE



Indice

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- ✓ Impatti sugli ecosistemi
- ✓ Impatti sulla salute
- ✓ Impatti economici
- ✓ Classificazione unificata in base agli impatti ambientali
- ✓ Classificazione EICAT
- ✓ Classificazione SEICAT
- ✓ Classificazioni EICAT e SEICAT

Impatti economici (1)

- € Eradicazione/controllo
- € Danni infrastrutture
- € Danni a agricoltura e foreste
- € Pesca
- € Salute umana
- € Ricerca, prevenzione, monitoraggio, ecc

**€ 12.5 miliardi/anno
(stima > 30 miliardi/anno)**



Kettunen, Genovesi, Gollasch, Pagad, Starfinger, ten Brink & Shine. 2008.
Assessment of the impacts of IAS in Europe and the EU. IEEP

Impatti economici (2)



Global threat to agriculture from invasive species

Dean R. Paini^{a,b,1}, Andy W. Sheppard^a, David C. Cook^{c,d}, Paul J. De Barro^e, Susan P. Worner^f, and Matthew B. Thomas^{a,h}

^aCommonwealth Scientific and Industrial Research Organization, Canberra, ACT 2601, Australia; ^bPlant Biosecurity Cooperative Research Centre, Bruce, ACT 2617, Australia; ^cDepartment of Agriculture and Food, Western Australia, Bunbury, WA 6230, Australia; ^dSchool of Agricultural and Resource Economics, The University of Western Australia, Crawley, WA 6009, Australia; ^eCommonwealth Scientific and Industrial Research Organization, Brisbane, QLD 4001, Australia; ^fBio-Protection Research Centre, Lincoln University, Lincoln 7647, New Zealand; ^gDepartment of Entomology, Penn State University, State College, PA 16802; and ^hCenter for Infectious Disease Dynamics, Penn State University, State College, PA 16802

Edited by Harold A. Mooney, Stanford University, Stanford, CA, and approved April 28, 2016 (received for review February 13, 2016)

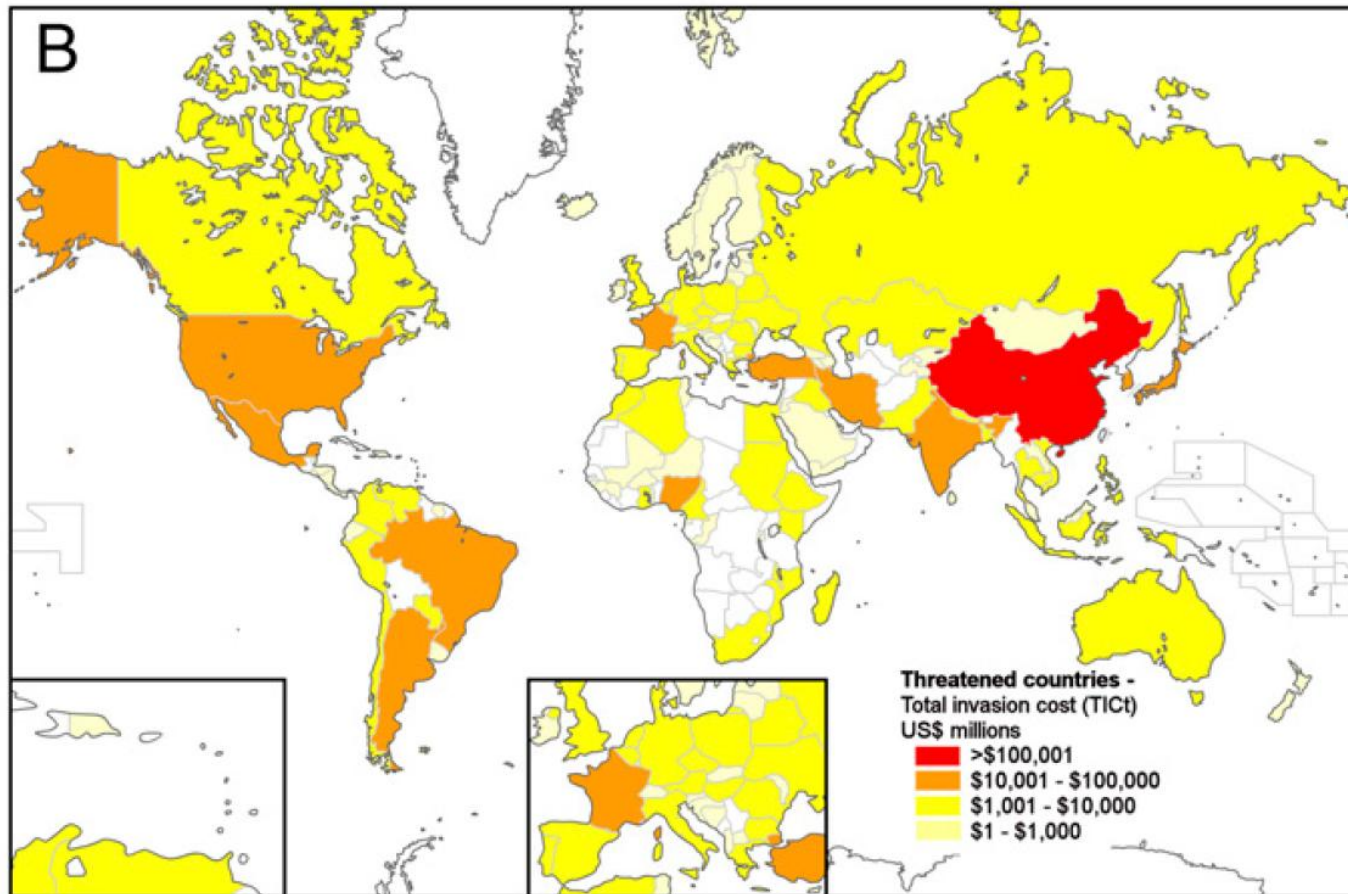
Invasive species present significant threats to global agriculture, although how the magnitude and distribution of the threats vary between countries and regions remains unclear. Here, we present an analysis of almost 1,300 known invasive insect pests and pathogens, calculating the total potential cost of these species invading each of 124 countries of the world, as well as determining which countries present the greatest threat to the rest of the world given their trading

of each country's annual mean (2000–2009) importation (in millions of US dollars) from each trading partner as a proportion of total imports from all trading partners (17) as a proxy for species arrival likelihood. For establishment likelihood, we analyzed the worldwide distribution of the almost 1,300 insect pests and fungal pathogens (18) using a self-organizing map (SOM), which analyses pest assemblages and pest associations to generate establishment

Costo potenziale totale per l'Agricoltura

Impatti economici (3)

Minaccia all'agricoltura 1/3

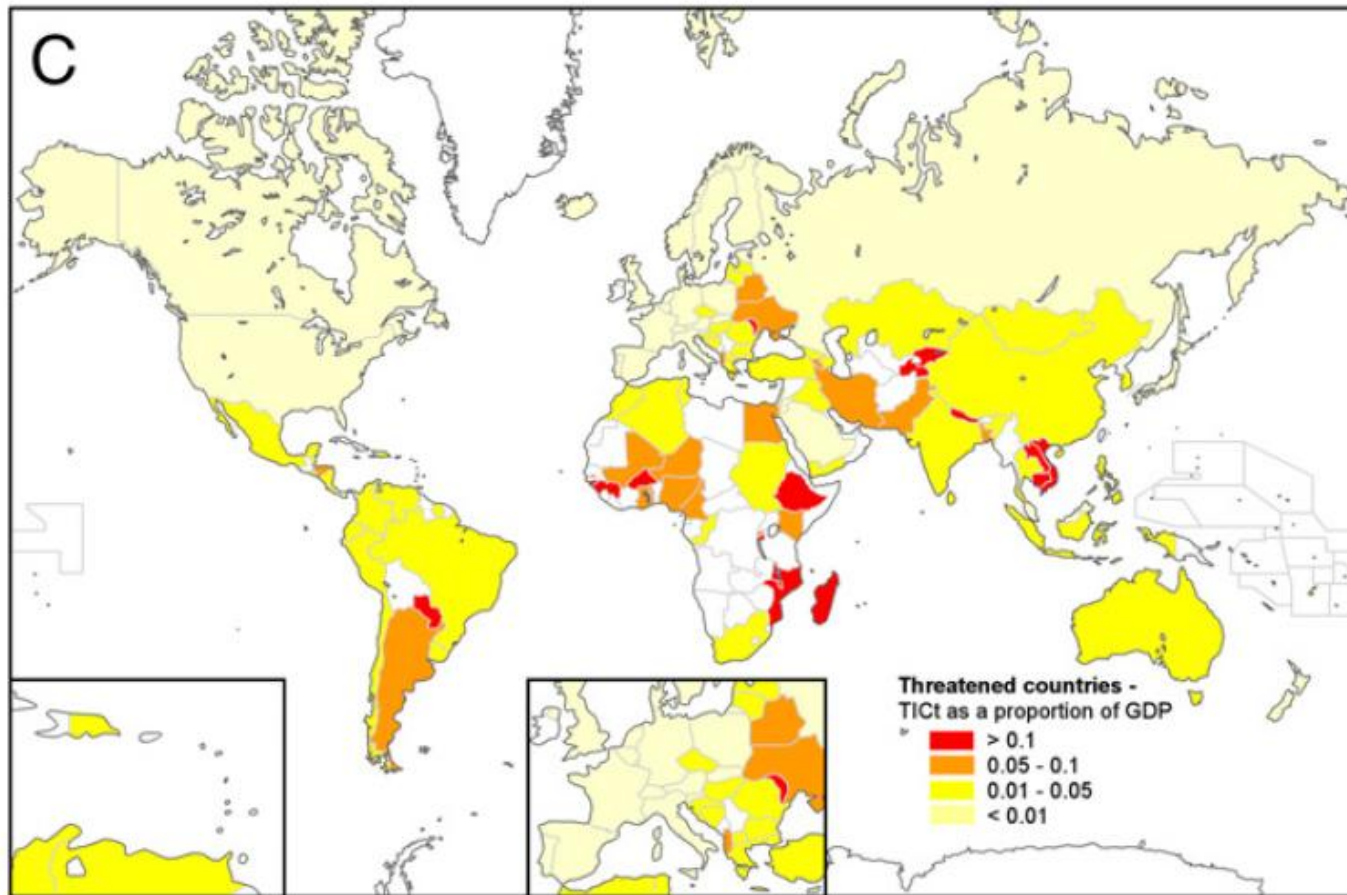


Costo totale potenziale FUTURO delle IAS per paese

Paini, D. R., Sheppard, A. W., Cook, D. C., De Barro, P. J., Worner, S. P., & Thomas, M. B. (2016). Global threat to agriculture from invasive species. *PNAS*, 113(27), 7575-7579.

Impatti economici (4)

Minaccia all'agricoltura 2/3



Costo totale potenziale FUTURO delle IAS per paese come % del PIL

Paini, D. R., Sheppard, A. W., Cook, D. C., De Barro, P. J., Worner, S. P., & Thomas, M. B. (2016). Global threat to agriculture from invasive species. *PNAS*, 113(27), 7575-7579.

Impatti economici (5)

Minaccia all'agricoltura 3/3



Costo delle invasioni future

5 MAGGIORI SPECIE ALIENE INVASIVE

Future perdite annuali
(prossimi 5–10 anni) **2 miliardi**

= minaccia alla **sicurezza alimentare**

Paini, D. R., Sheppard, A. W., Cook, D. C., De Barro, P. J., Worner, S. P., & Thomas, M. B. (2016). Global threat to agriculture from invasive species. *PNAS*, 113(27), 7575-7579.

Classificazione unificata in base agli impatti ambientali

Sviluppo di una metodologia standard per classificare le specie aliene sulla base della natura e della rilevanza dei loro impatti.

IUCN Environmental Impact Classification for Alien Taxa (EICAT)

OPEN ACCESS Freely available online

Essay

A Unified Classification of Alien Species Based on the Magnitude of their Environmental Impacts

Tim M. Blackburn^{1,2,3*}, Franz Essl⁴, Thomas Evans⁵, Philip E. Hulme⁶, Jonathan M. Jeschke⁷, Ingolf Kühn^{8,9}, Sabrina Kumschick¹⁰, Zuzana Marková^{11,12}, Agata Mrugała¹², Wolfgang Nentwig¹³, Jan Pergl¹¹, Petr Pyšek^{11,12}, Wolfgang Rabitsch¹⁴, Anthony Ricciardi¹⁵, David M. Richardson¹⁰, Agnieszka Sendek⁸, Montserrat Vilà¹⁶, John R. U. Wilson^{10,17}, Marten Winter⁹, Piero Genovesi¹⁸, Sven Bacher¹⁹

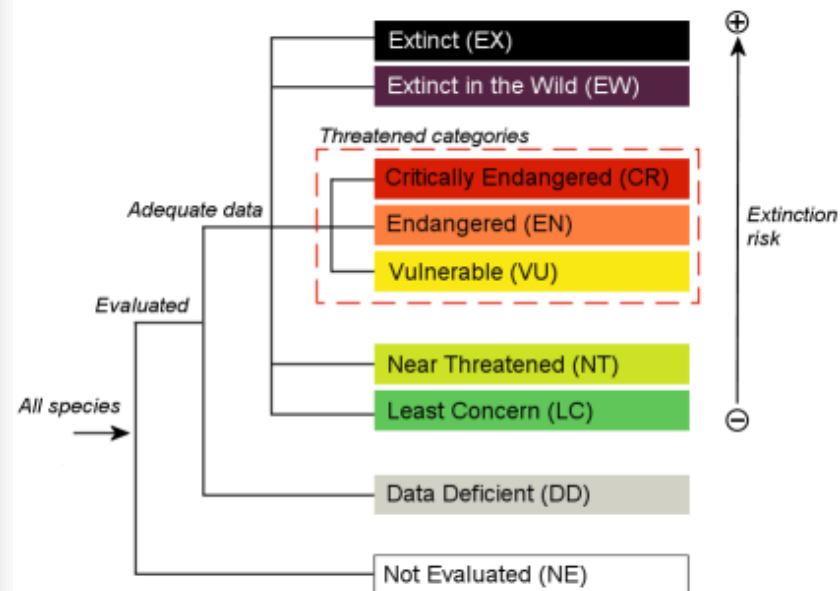
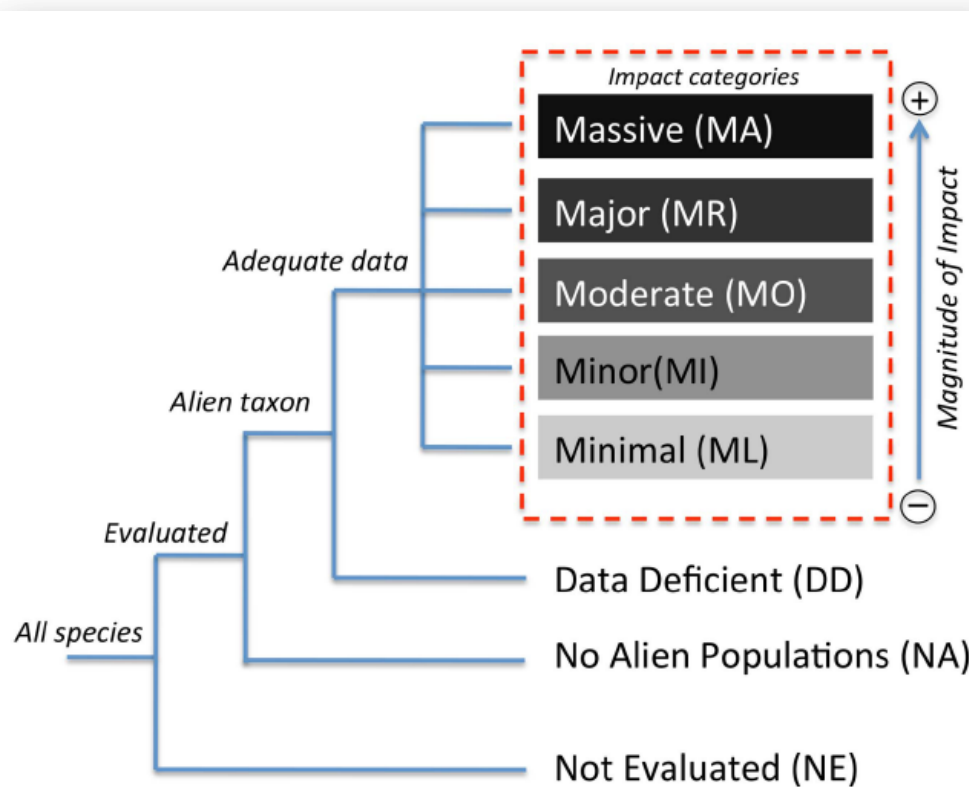
Diversity and Distributions, (Diversity Distrib.) (2015) 1–4



Framework and guidelines for implementing the proposed IUCN Environmental Impact Classification for Alien Taxa (EICAT)

Charlotte L. Hawkins¹, Sven Bacher², Franz Essl³, Philip E. Hulme⁴, Jonathan M. Jeschke^{5,6}, Ingolf Kühn^{7,8}, Sabrina Kumschick^{9,10}, Wolfgang Nentwig¹¹, Jan Pergl¹², Petr Pyšek^{12,13}, Wolfgang Rabitsch¹⁴, David M. Richardson⁹, Montserrat Vilà¹⁵, John R. U. Wilson^{9,10}, Piero Genovesi¹⁶ and Tim M. Blackburn^{1,17,18,*}

Classificazione EICAT (1)



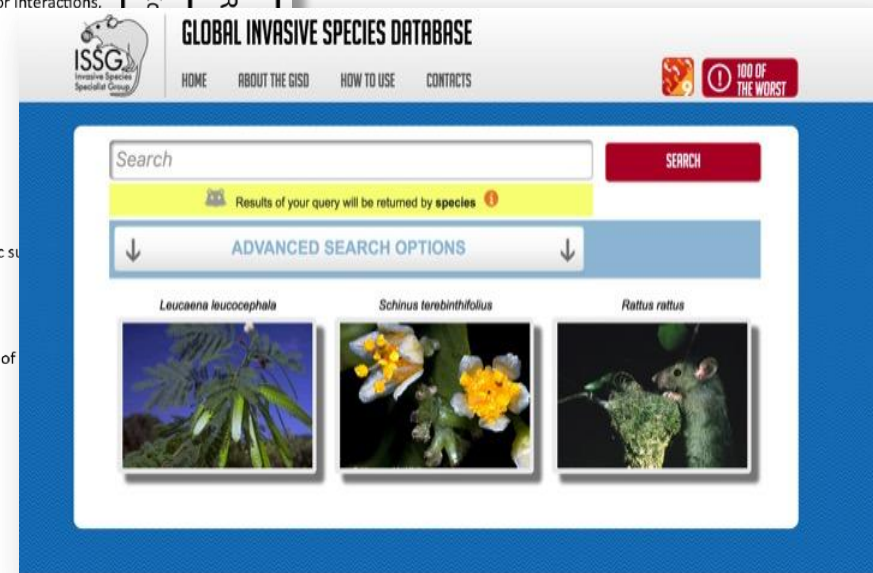
Blackburn, T. M., Essl, F., Evans, T., Hulme, P. E., Jeschke, J. M., Kühn, I., ... & Pergl, J. (2014). A unified classification of alien species based on the magnitude of their environmental impacts. *PLoS biology*, 12(5), e1001850.

Hawkins, C. L., Bacher, S., Essl, F., ... (2015). Framework and guidelines for implementing the proposed IUCN Environmental Impact Classification for Alien Taxa (EICAT). *Diversity and Distributions*, 21(11), 1360-1363.

Classificazione EICAT (2)

Sulla base dei meccanismi di impatto IUCN

Impact mechanism	Impact outcomes	
1. Competition	Modification of hydrology/water regulation or purification and quality/soil moisture	ENVIR
2. Predation	Primary productivity alteration	
3. Hybridisation	Modification of nutrient pool (e.g. soil N availability) and fluxes (e.g. litter decomposition)	
4. Disease transmission	Modification of natural benthic communities	
5. Parasitism	Modification of food web (includes trophic cascades, plant-pollinator interactions, natural enemies - biocontrol)	
6. Poisoning/Toxicity	Reduction in native biodiversity	ECONOMIC OUTCOMES
7. Bio-fouling	Unspecified ecosystem modification	
8. Grazing/Herbivory/Browsing	Habitat degradation	
9. Rooting/Digging	Habitat or refugia replacement/loss	
10. Trampling	Physical disturbance	
11. Flammability	Modification of fire regime	
12. Interaction with other invasive species	Modification of successional patterns	
13. Other	Soil or sediment modification: erosion	
	Soil or sediment modification: accretion/bioaccumulation	
	Soil or sediment modification: modification of structure	
	Soil or sediment modification: modification of pH, salinity or organic substance	
	Other (specify)	
	Population size decline	
	Species range change (i.e. contraction, expansion, shift)	
	Reduces/inhibits the growth of other species	
	Alteration of genetic resources: changes in gene pool/selective loss of	
	Indirect mortality	
	Plant/animal health	
	Interference with reproduction	
	Damage to agriculture (food, fuel and fibre)	
	Damage to forestry (food, fuel and fibre)	
	Damage to aquaculture/mariculture/fishery	
	Reduce/damage livestock and products (food, fibre, labour...)	
	Human health (diseases, allergies, injuries, toxicity)	
	Human nuisance	
	Modification of landscape	
	Damage to infrastructures	
	Damage to ornamentals (gardens, golf courses...)	
	Modification of cultural, educational, aesthetic, religious and ornamental values	
	Alteration of recreational use and tourism	
	Impact on trade/international relations	
	Limited access to water, land and other	
	Other economic impact (damages to properties)	

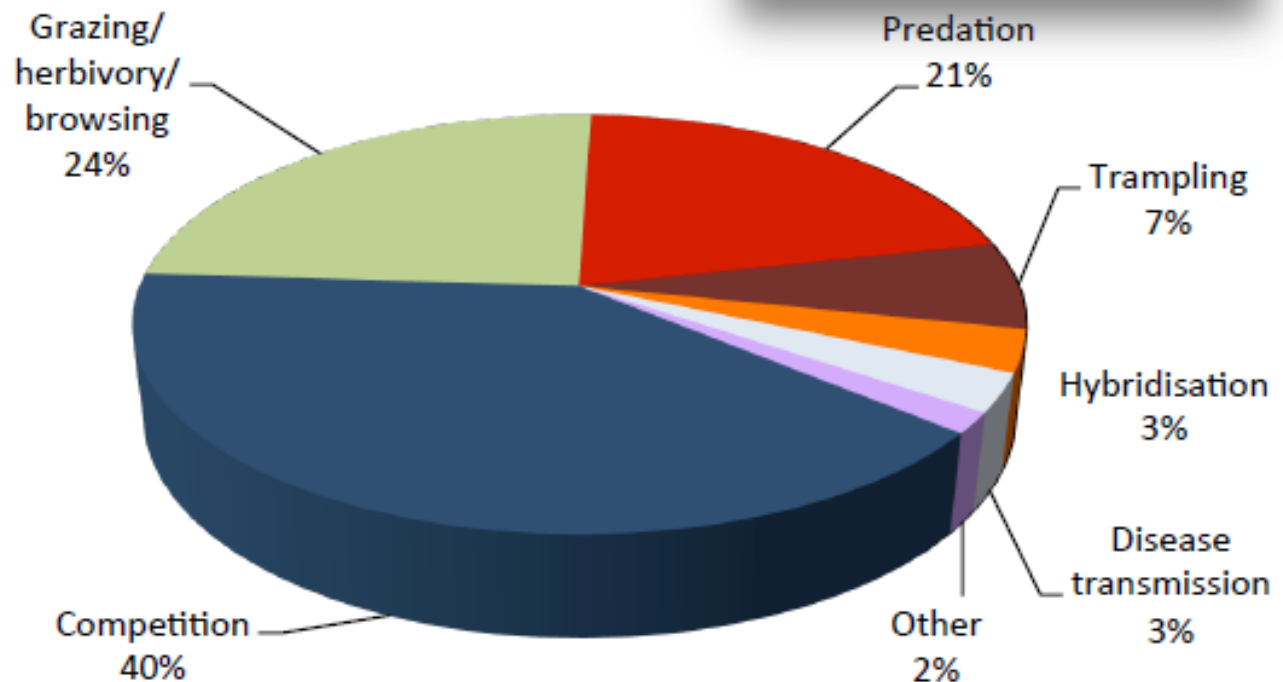


Blackburn, T. M., Essl, F., Evans, T., Hulme, P. E., Jeschke, J. M., Kühn, I., ... & Pergl, J. (2014). A unified classification of alien species based on the magnitude of their environmental impacts. *PLoS biology*, 12(5), e1001850.

Classificazione EICAT (3)

Meccanismi di impatto 1/2

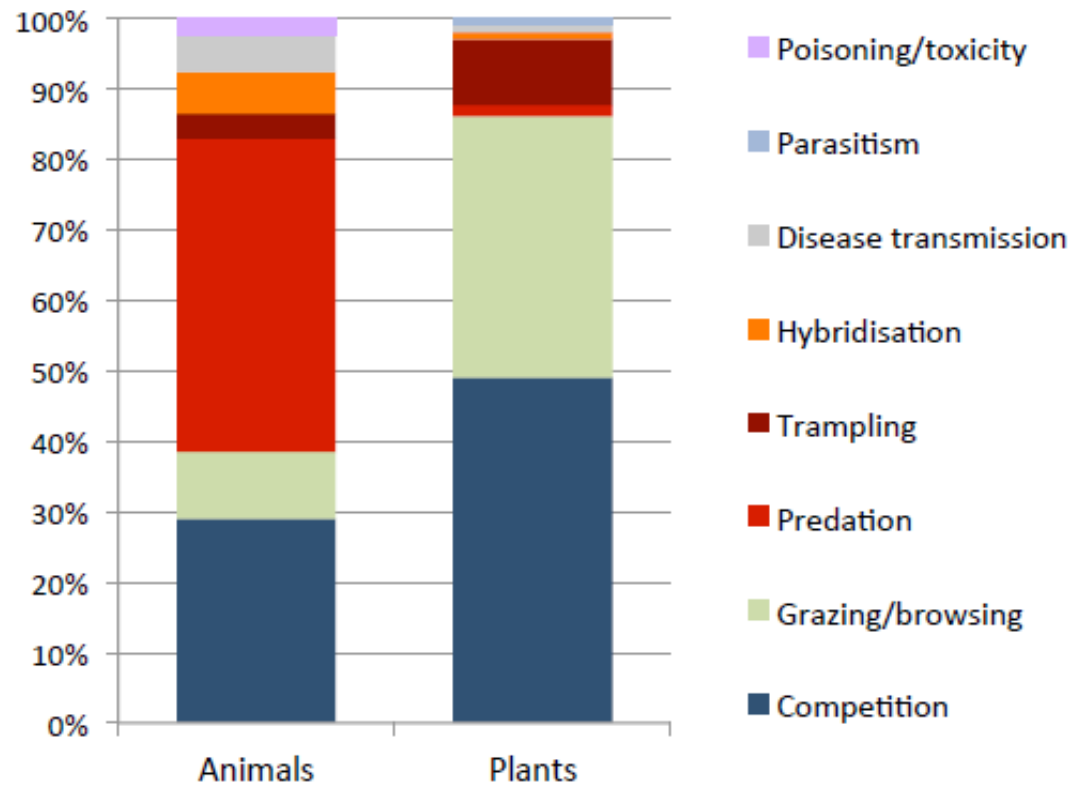
delle specie aliene invasive sulle specie a rischio di estinzione in Europa



Genovesi P., Carnevali L., Scalera R.(2015). The impact of invasive alien species on native threatened species in Europe. ISPRA M ISSG, Rome.

Classificazione EICAT (4)

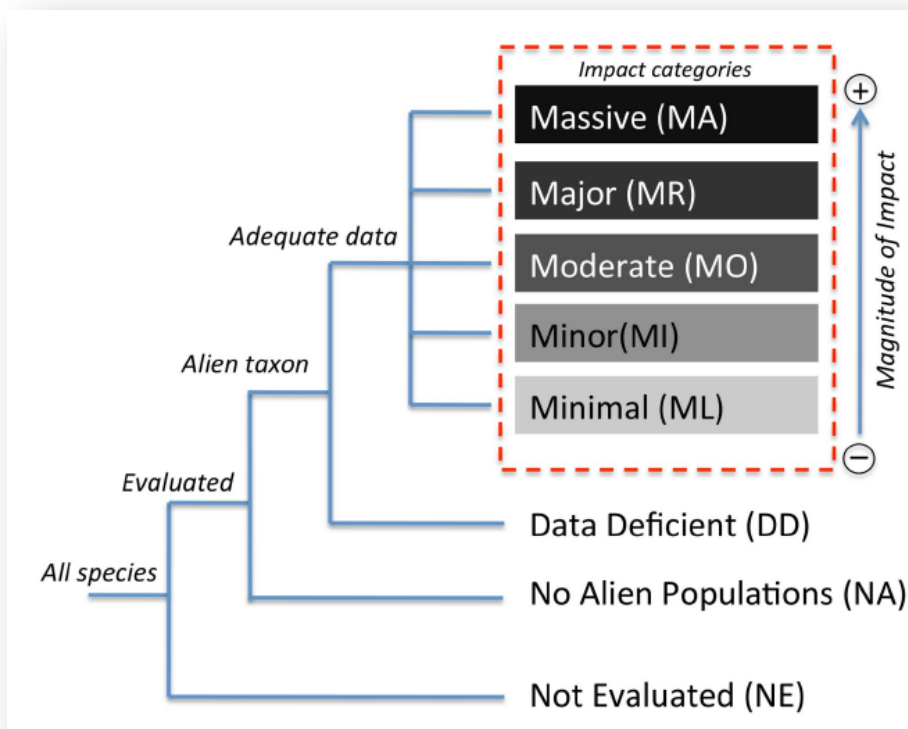
Meccanismi di impatto 2/2



Genovesi P., Carnevali L., Scalera R.(2015). The impact of invasive alien species on native threatened species in Europe. ISPRA M ISSG, Rome.

Classificazione EICAT (5)

5 categorie di impatto da massimo a minimo



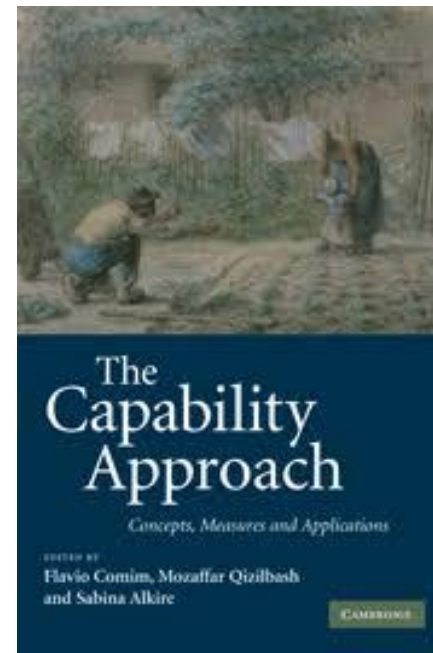
- **Massiccio (MA)** – la specie aliena causa estinzione locale delle specie e cambi **IRREVERSIBILI** nella composizione della comunità;
- **Elevato (MR)** – causa cambi **REVERSIBILI** (in caso di rimozione dell'aliena) nella composizione della comunità;
- **Moderato (MO)** – causa il declino della popolazione ma non un cambio della composizione della comunità;
- **Basso (MI)** – riduzione della fitness ma non della densità di popolazione nè nella composizione della comunità;
- **Minimo (ML)** – nessun effetto sulla fitness degli individui delle specie autoctone

Classificazione SEICAT (1)

Non solo impatti ambientali ma anche socio-economici.

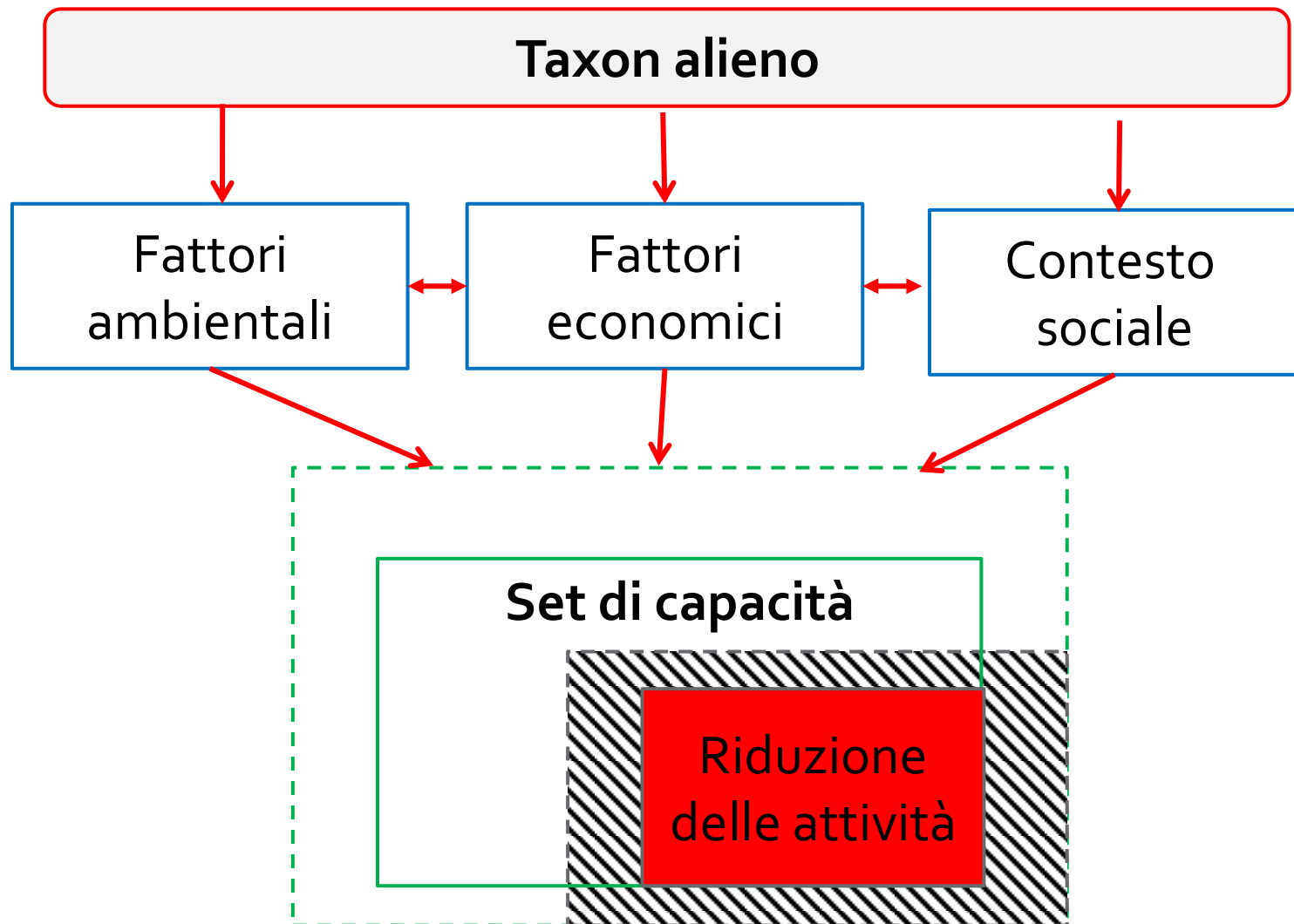
IUCN Socio-Economic Impact Classification for Alien Taxa (SEICAT)

Basato su un nuovo approccio:
Il benessere umano

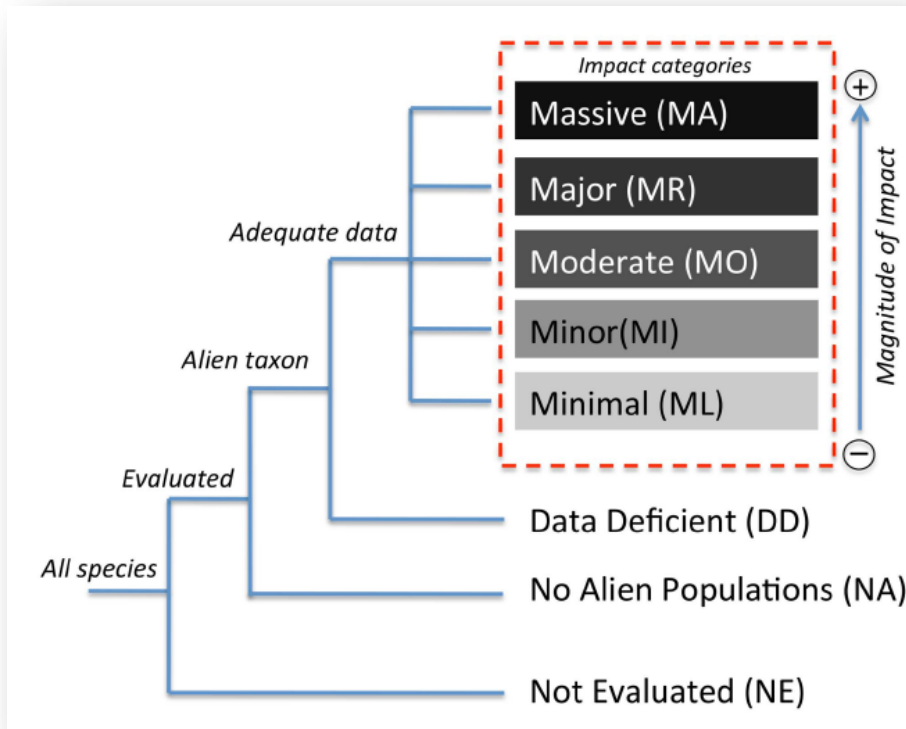


Bacher, S., Blackburn, T. M., Essl, F., Genovesi, P., Heikkilä, J., Jeschke, J. M., ... & Martinou, A. F. (2017). Socio-economic impact classification of alien taxa (SEICAT). *Methods in Ecology and Evolution*.

Classificazione SEICAT (2)



Classificazione SEICAT (3)

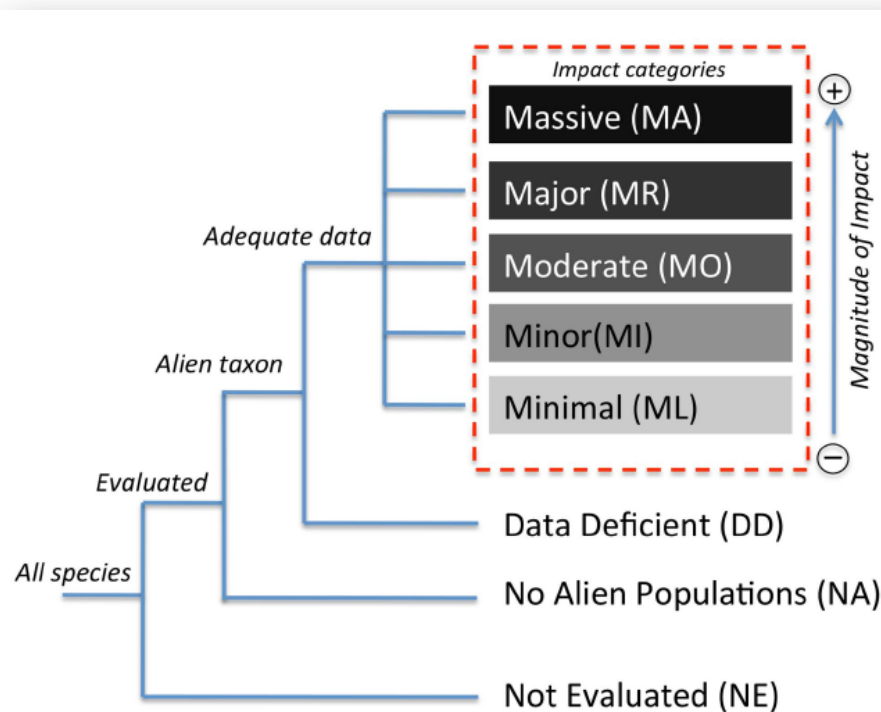


- **Massiccio (MA)** – scomparsa di almeno un'attività nell'area invasa dalla specie aliena, **irreversibile** (per almeno un decennio dalla sua rimozione).

Es. Tamarix e coltivazioni



Classificazione SEICAT (4)

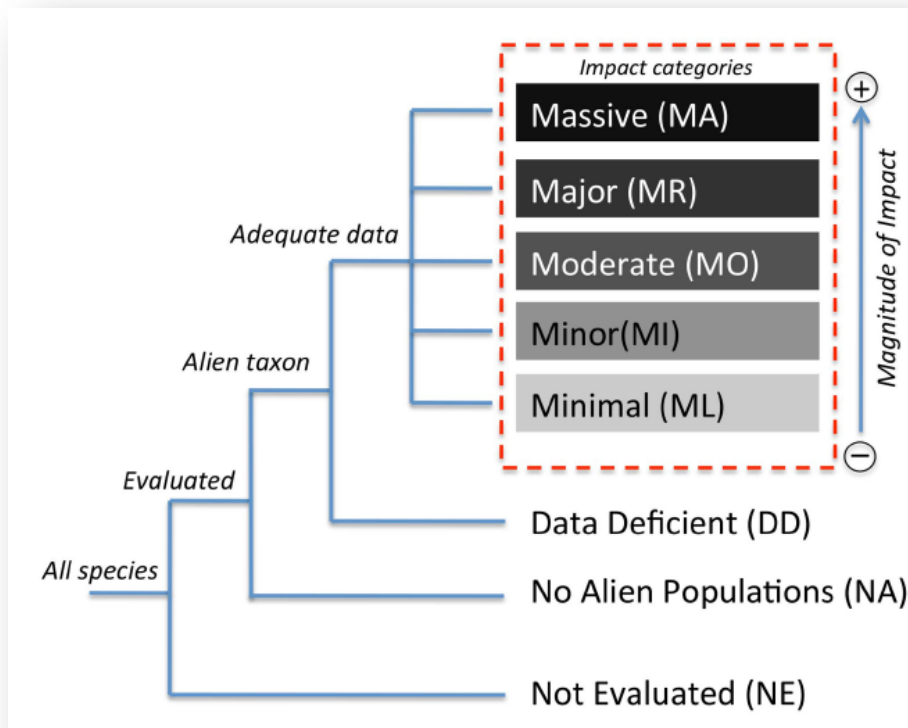


- **Elevato (MR)** – scomparsa di almeno un'attività nell'area invasa, in modo **reversibile** (entro un decennio dalla rimozione della specie aliena)

Es. Giacinto d'acqua in Benin prima del controllo



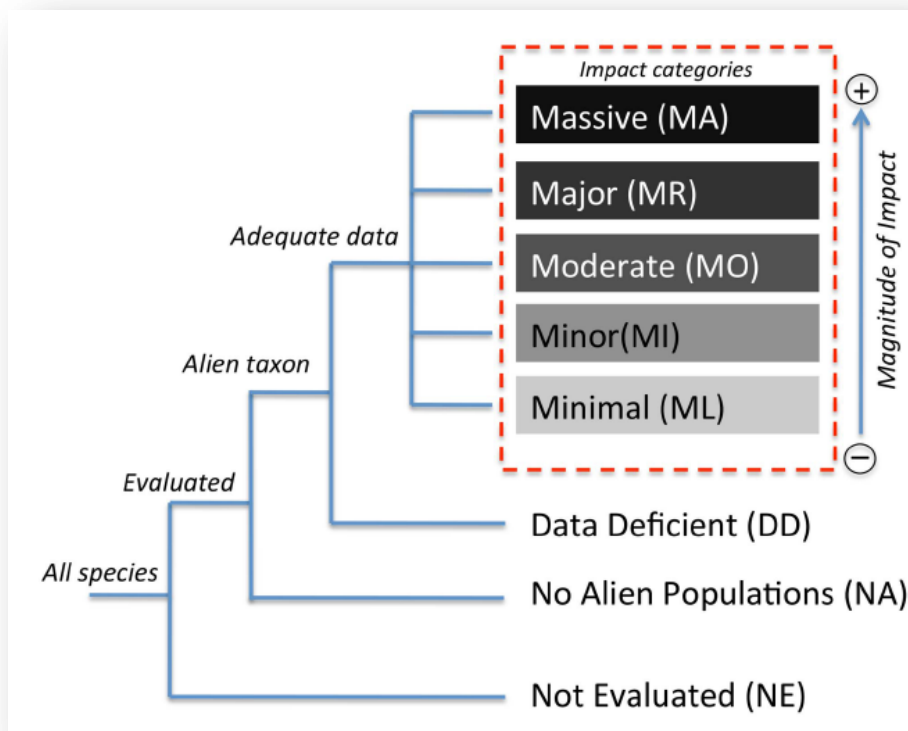
Classificazione SEICAT (5)



- **Moderato (MO)** – cambiamento nelle modalità di fruizione delle attività da parte delle persone fino al punto anche di abbandonarle



Classificazione SEICAT (6)



- **Massivo (MA)**
- **Elevato (MR)**
- **Moderato (MO)**
- **Basso (MI)** – effetto negativo sul benessere delle persone che non possono svolgere le normali attività, senza abbandono delle stesse;
- **Minimo (ML)** – nessun effetto negativo sul benessere umano

Classificazioni EICAT e SEICAT

Proprietà:

- Permettono dei paragoni tra taxa, impatti e regioni del mondo.
- Lavorano anche con base di dati minime.
- Si allineano a modelli internazionali esistenti (*Redlist* IUCN).
- Possono essere usate per l'identificazione delle specie a più alto impatto, la loro prioritizzazione e per la predizione su impatti futuri.