

Impatti su ecosistemi e biodiversità

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Impatti, mitigazione e adattamento una scommessa globale sul clima che verrà

La biodiversità della terra

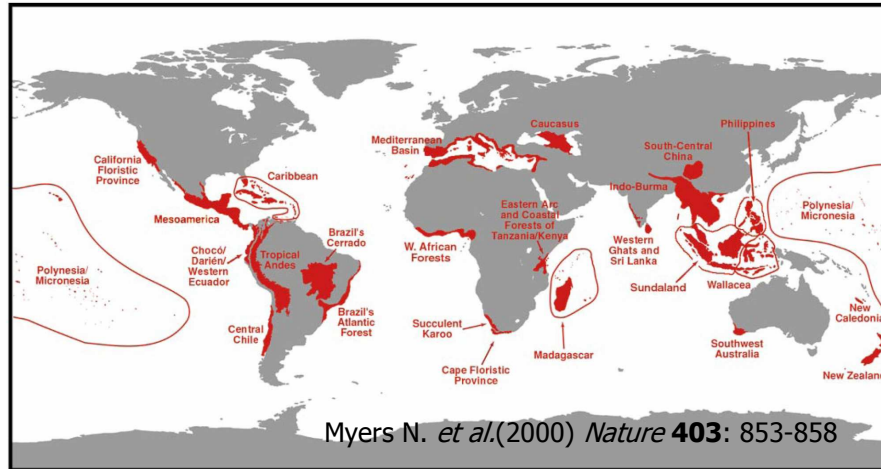
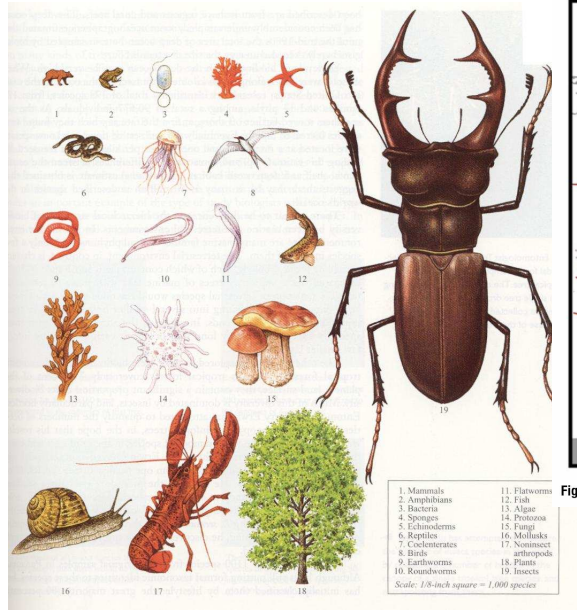


Figure 1 The 25 hotspots. The hotspot expanses comprise 30–3% of the red areas.

<http://www.biodiversityhotspots.org/xp/Hotspots>

specie catalogate:
1,8 milioni

specie stimare:
3-30 milioni

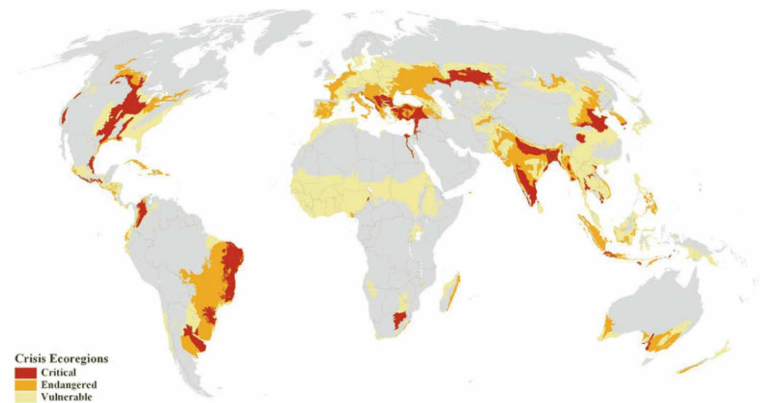
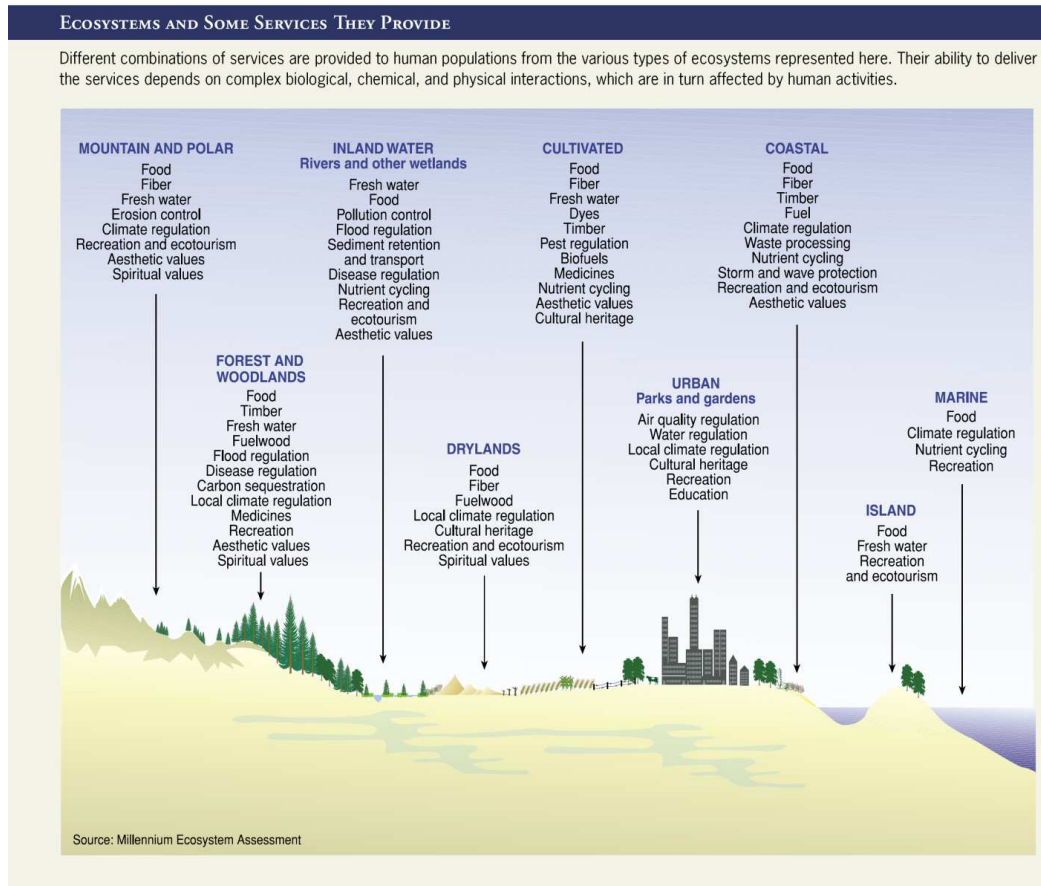


Figure 4 Map of crisis ecoregions. Vulnerable, Endangered, and Critically endangered, ecoregions were classified as described in text and shown in Fig. 3.

Hoekstra, J. M. *et al. Ecol. Lett.* 8, 23–29 (2005)

I servizi degli ecosistemi



Millennium ecosystem assessment

<http://www.millenniumassessment.org/en/index.aspx>

Gli ecosistemi forniscono "servizi" :

- **di supporto**

- riciclano i sali nutrienti
- generano e conservano i suoli e rinnovano la loro fertilità
- proteggono gli uomini dai raggi ultravioletti

- **di fornitura**

- danno cibo, fibre, legname
- provvedono all'impollinazione delle piante

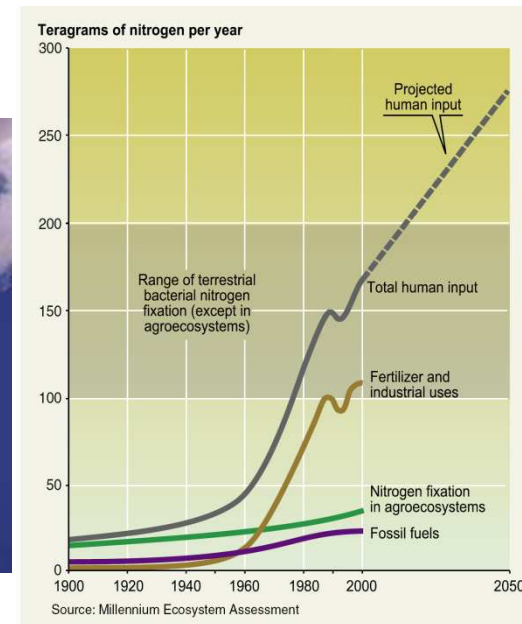
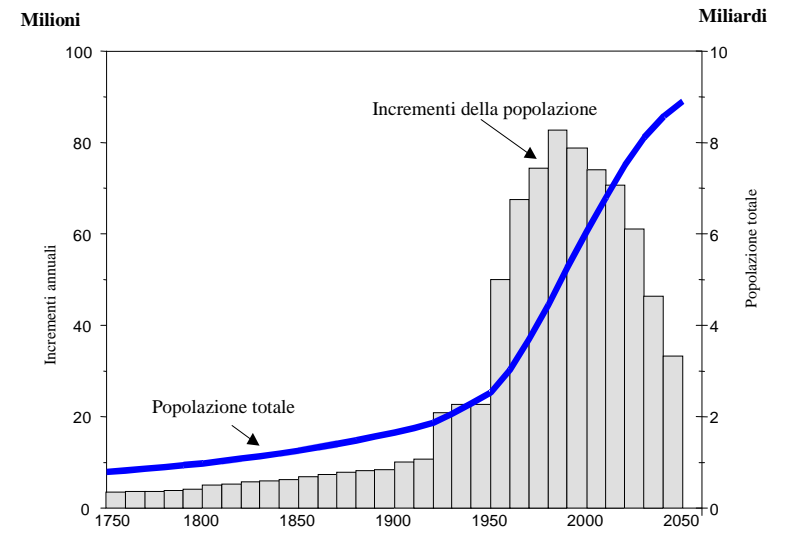
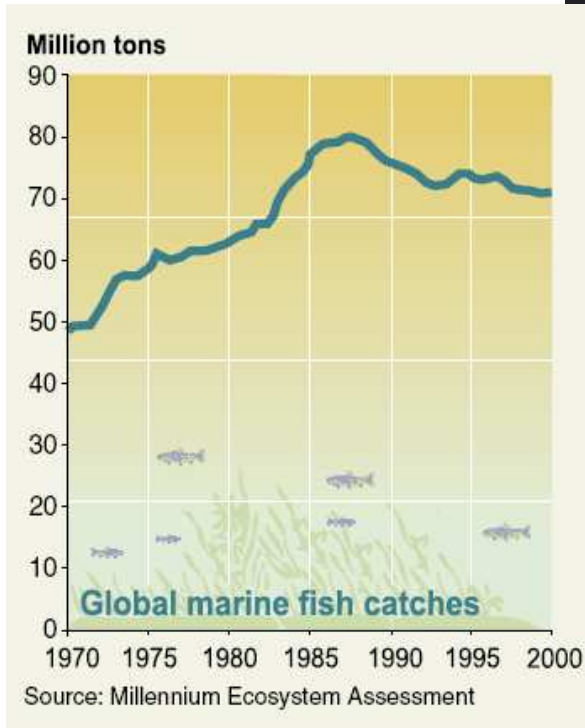
- **di regolazione**

- moderano gli estremi climatici e i loro impatti
- purificano aria e acqua
- regolano gli organismi vettori di malattie
- proteggono le rive dei fiumi e le coste dall'erosione, stabilizzano i versanti
- controllano gli organismi nocivi per l'agricoltura
- mitigano siccità e piene
- detossificano e decompongono i rifiuti

- **culturali**

- hanno un valore estetico, spirituale, ricreativo

L'impatto globale dell'uomo

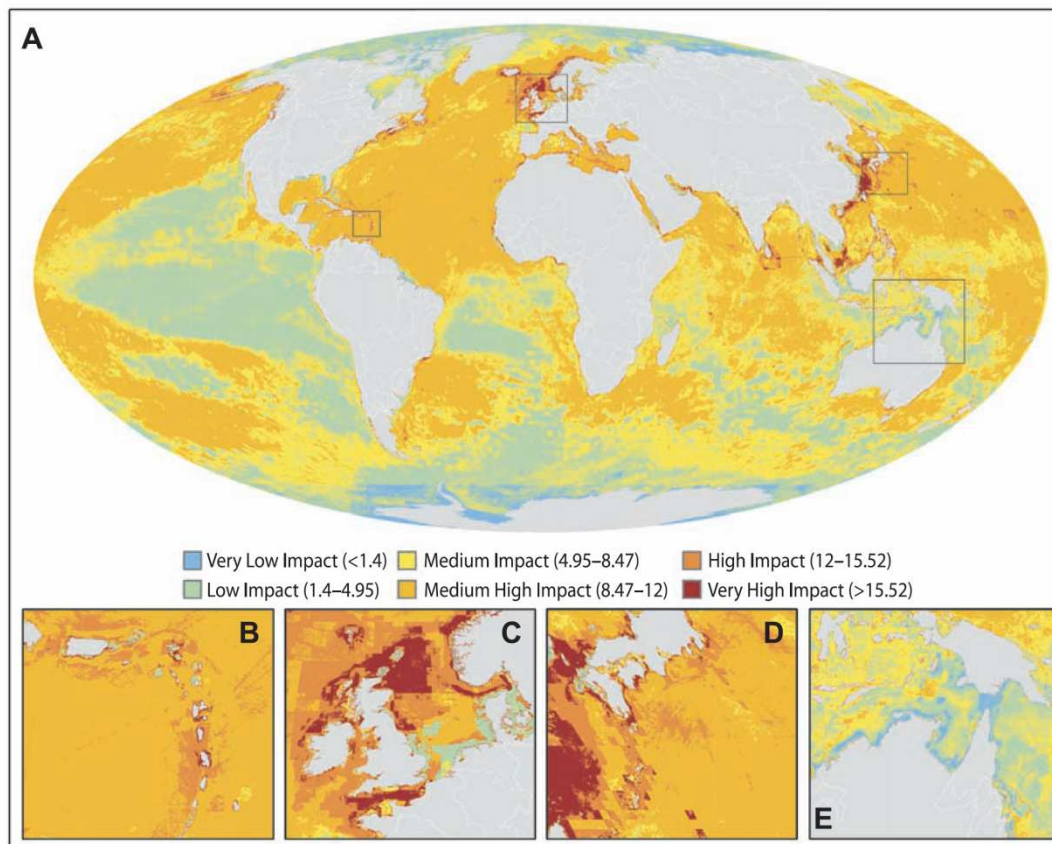
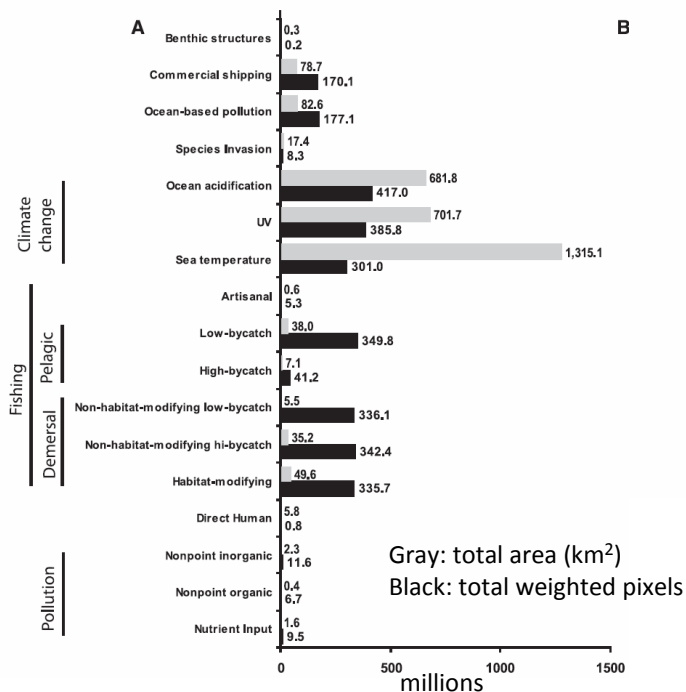


...e l'impatto locale



L'impatto cumulato sugli oceani

Fig. 1. Global map (A) of cumulative human impact across 20 ocean ecosystem types. (Insets) Highly impacted regions in the Eastern Caribbean (B), the North Sea (C), and the Japanese waters (D) and one of the least impacted regions, in northern Australia and the Torres Strait (E).



Halpern B.S. *et al.* 2008. *Science* 319: 948-952

Indicatori globali

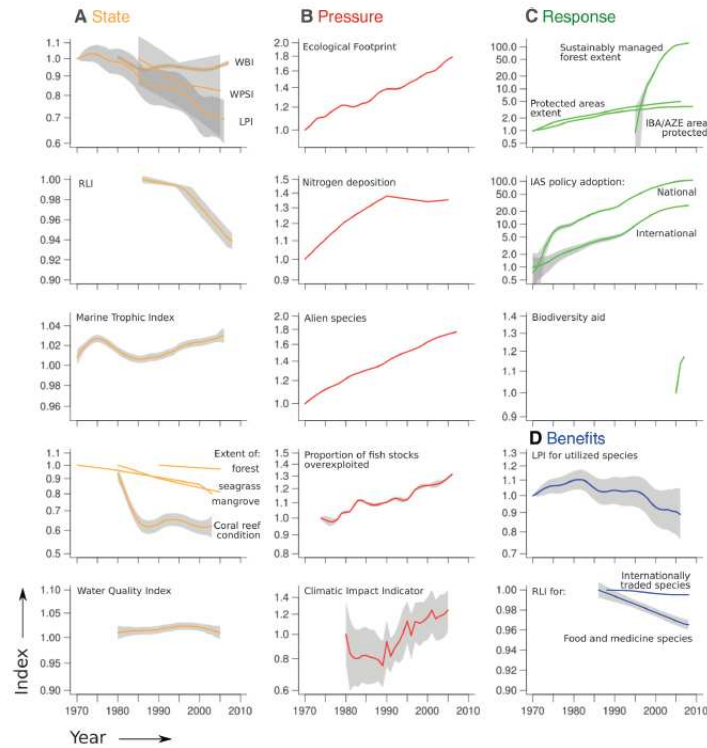
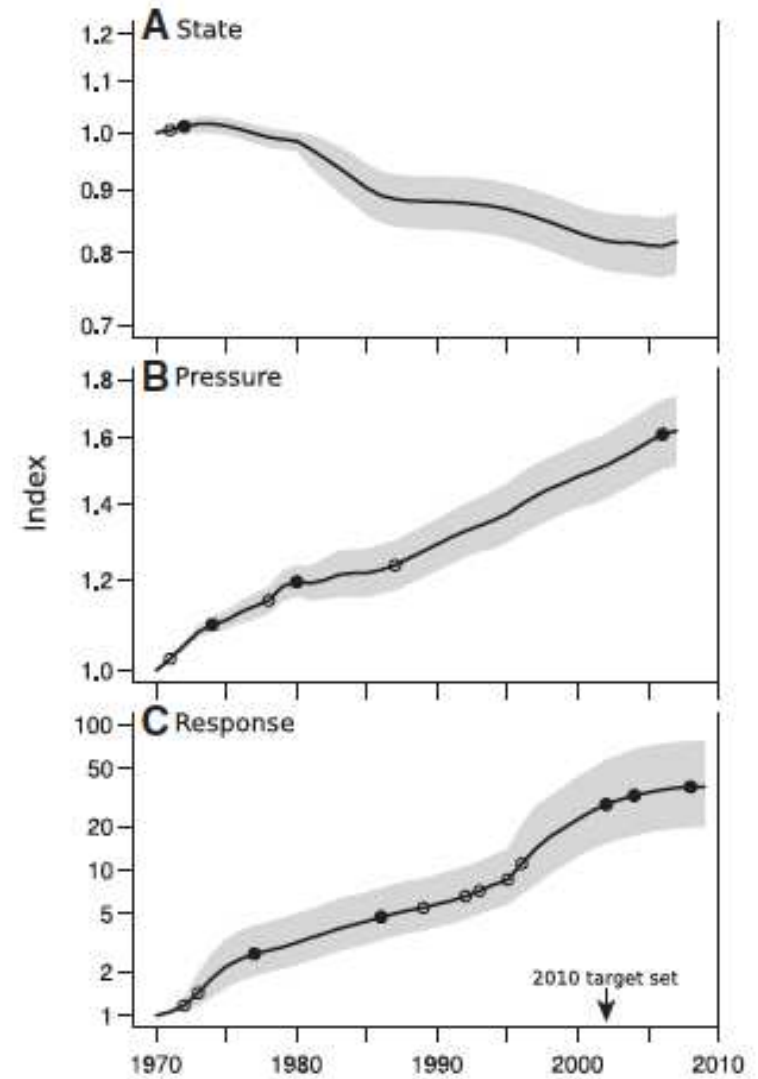
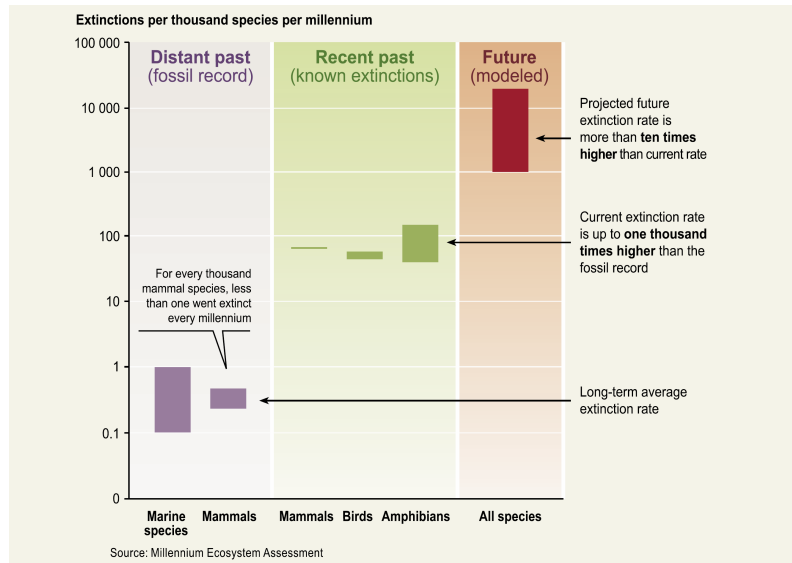


Fig. 1. Indicator trends for (A) the state of biodiversity, (B) pressures upon it, (C) responses to address its loss, and (D) the benefits humans derive from it. Data scaled to 1 in 1970 (or for first year of data if >1970), modeled (if >13 data points; see Table 1), and plotted on a logarithmic ordinate axis. Shading shows 95% confidence intervals except where unavailable (i.e., mangrove, seagrass, and forest extent, nitrogen deposition, and biodiversity aid). WBI, Wild Bird Index; WPSI, Waterbird Population Status Index; LPI, Living Planet Index; RLI, Red List Index; IBA, Important Bird Area; AZE, Alliance for Zero Extinction site; IAS, invasive alien species.

Global Biodiversity: Indicators of Recent Declines Stuart H. M. Butchart, *et al. Science* 328, 1164 (2010); DOI: 10.1126/science.1187512



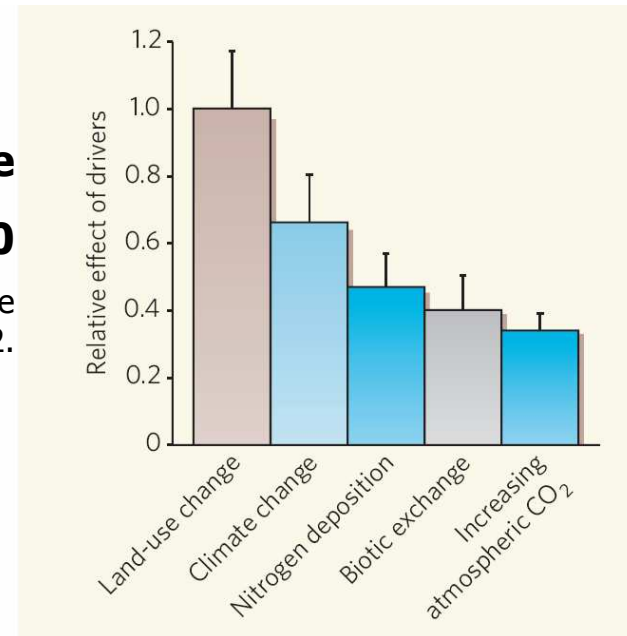
Tassi di estinzione

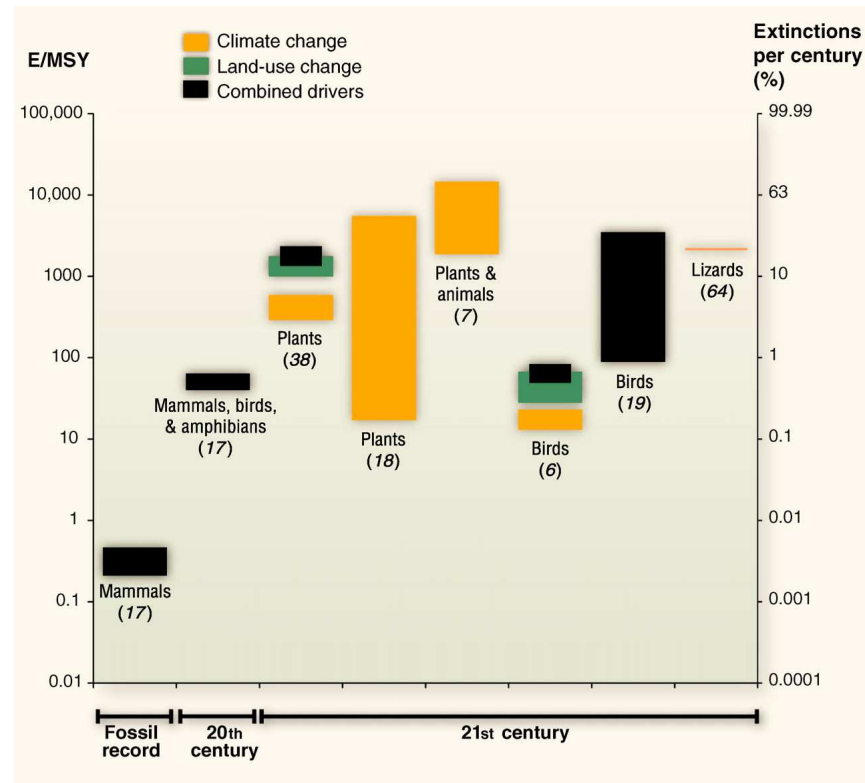
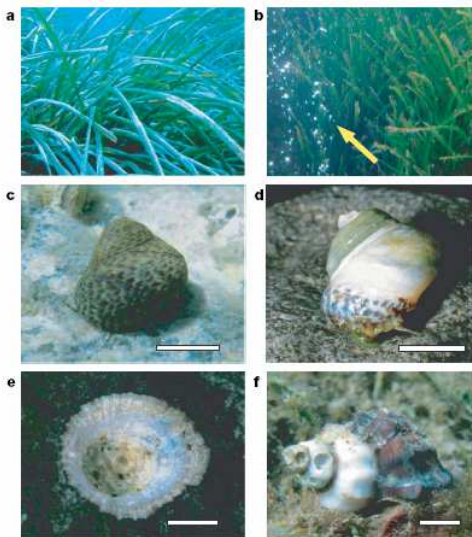
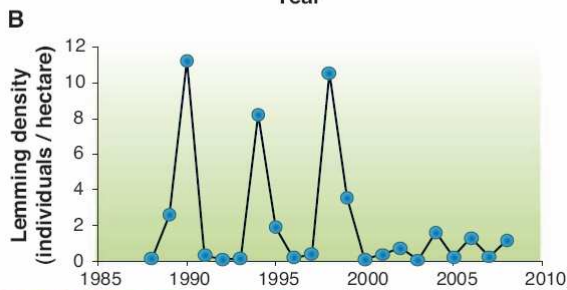
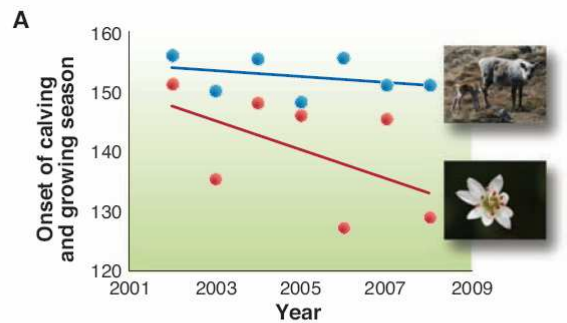


- Tempo di vita medio di una specie animale ricavata dai record fossili: **1-10 milioni di anni**
- Dai tassi di estinzione documentati nel secolo scorso si ricava una riduzione del tempo di vita media a **10.000 anni**
- Dai tassi di estinzione correnti si ricava un tempo di vita medio ulteriore per uccelli e mammiferi di **200-400 anni**

I principali fattori di estinzione al 2100

Thuiller W. 2007. Climate change and the ecologist, *Nature*, 448: 550-552.

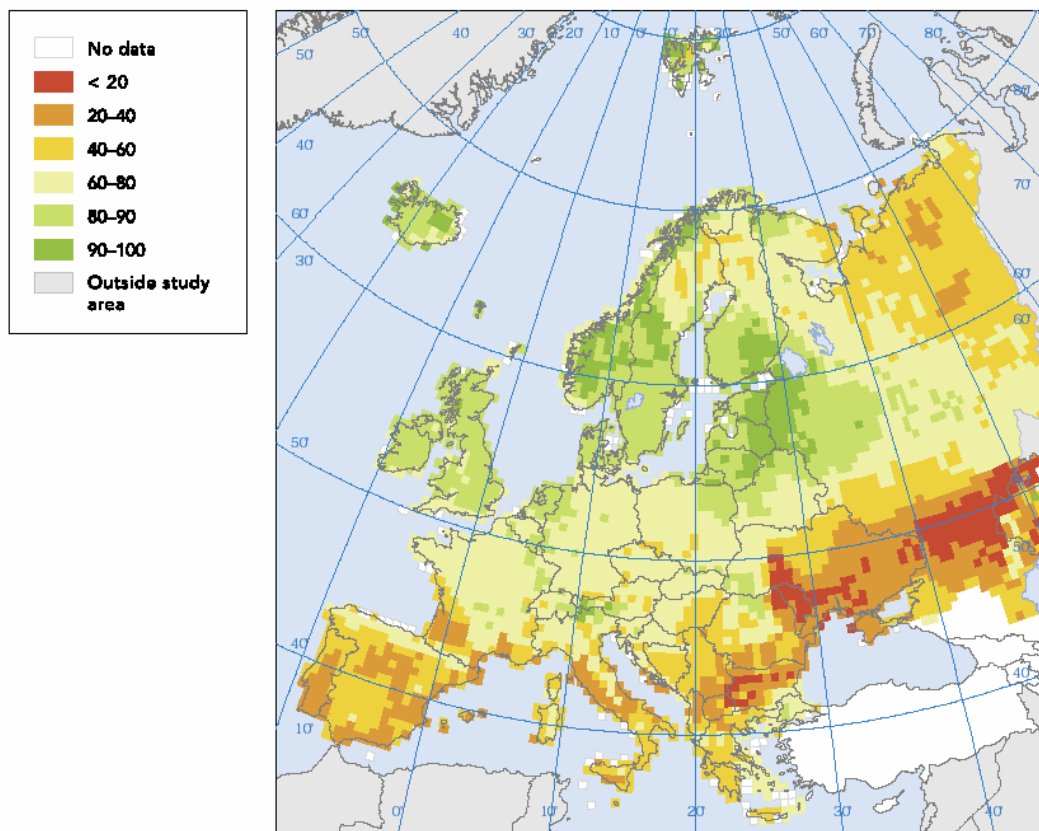




H M Pereira et al. Science 2010;330:1496-1501

Alcune proiezioni per il prossimo futuro

Map 3.8 Share of stable species in 2100, compared with 1990

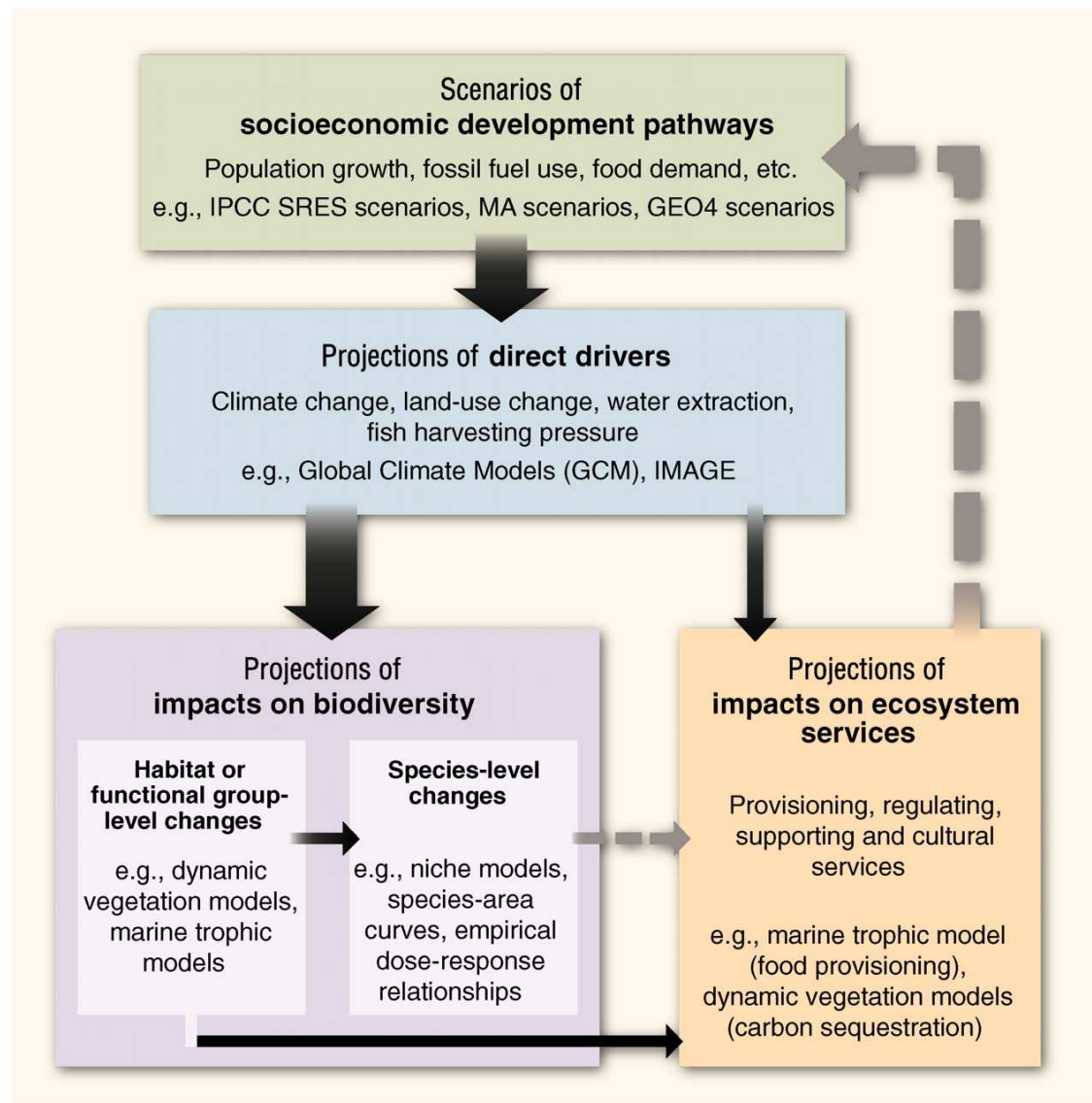


25% delle specie mondiali estinte entro il 2050 a causa dell'azione combinata del riscaldamento globale e della degradazione degli habitat

Thomas *et al.* (2004), Nature **427**:145-148

Note: Percentage of total number of species in 1990. The climate scenario used is a modest climate change scenario (global warming by 2100 is 3 °C and European warming is 3.3 °C).
Source: Bakkenes *et al.*, 2004.

Metodi e modelli per costruire scenari di biodiversità futura



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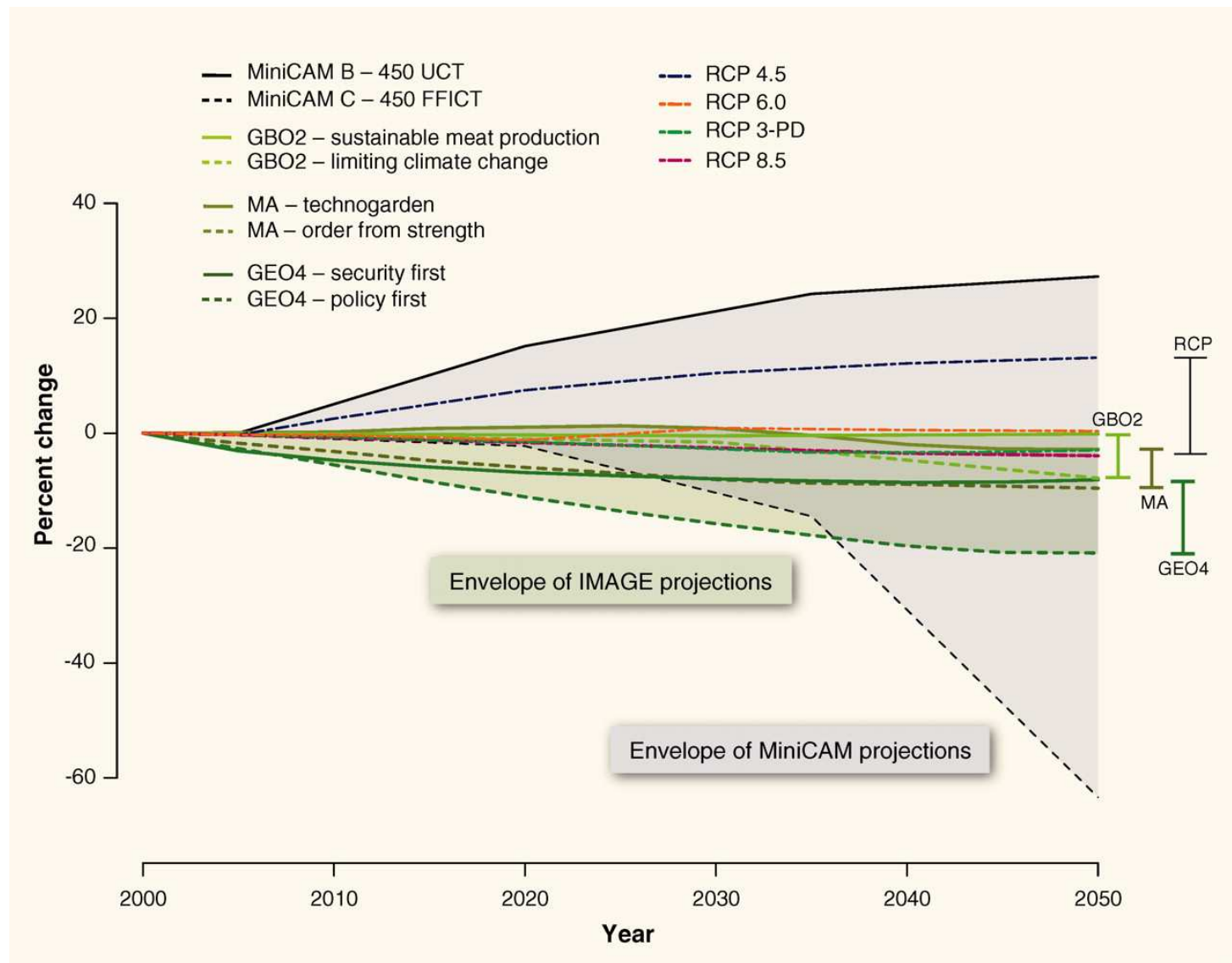
Table 1. Examples of biodiversity scenario studies highlighting methods used to calculate impacts of global change on several biodiversity metrics. Socioeconomic scenarios: Millennium Ecosystem Assessment (MA), Global Biodiversity Outlook 2 (GBO2), Global Environmental Outlook 4 (GEO4), IPCC Special Report on Emission Scenarios (IPCC SRES), International Assessment

for Agricultural Science, Technology and Development (IAASTD). Direct drivers: land-use change (LUC), climate change (CC), nitrogen deposition (N), water use, and fishing effort. Projections of direct drivers: indicates model that was used to simulate future changes in direct drivers (GCM, General Circulation Model, with specific climate model indicated in parentheses).

Study	Socioeconomic scenarios	Direct drivers	Projections of direct drivers	Projections of impacts on biodiversity	Metrics of biodiversity and ecosystem services	Year
<i>Terrestrial</i>						
(38)	MA	LUC, CC	IMAGE	Species-area relationships	Species extinctions (plants) and habitat loss	2100
(7)	IPCC SRES and others	CC	GCM (HadCM2)	Niche-based models. Range changes converted to extinction risk using species-area curves or IUCN status	Species extinctions (plants and animals)	2050
(6)	MA	LUC, CC	IMAGE	Habitat loss from current species ranges	Species extinctions (birds)	2100
(12)	GBO2	LUC, CC, N	IMAGE	Dose-response model (GLOBIO)	Species abundance changes	2050
(15)	IPCC SRES	CC	GCM (HadCM3)	Dynamic global vegetation models	Functional group range shifts (plants) and carbon sequestration	2100
<i>Freshwater</i>						
(22)	MA	Water use and CC	Water-GAP	Phenomenological model relating river discharge to fish species richness	Species extinctions (fishes)	2100
<i>Marine</i>						
(23)	GEO4, IAASTD	Fishing effort	Ecosim	Marine trophic model (Ecosim with Ecopath).	Functional group abundance changes and fish landings	2050
(43)	IPCC SRES	CC	GCMs (HadCM3, PCM)	Phenomenological model relating sea surface temperature to bleaching frequencies	Habitat loss of tropical corals	2100
(52)	IPCC SRES	CC	GCMs (GFDL CM 2.1)	Niche-based models.	Species range shifts (vertebrate and invertebrates)	2050

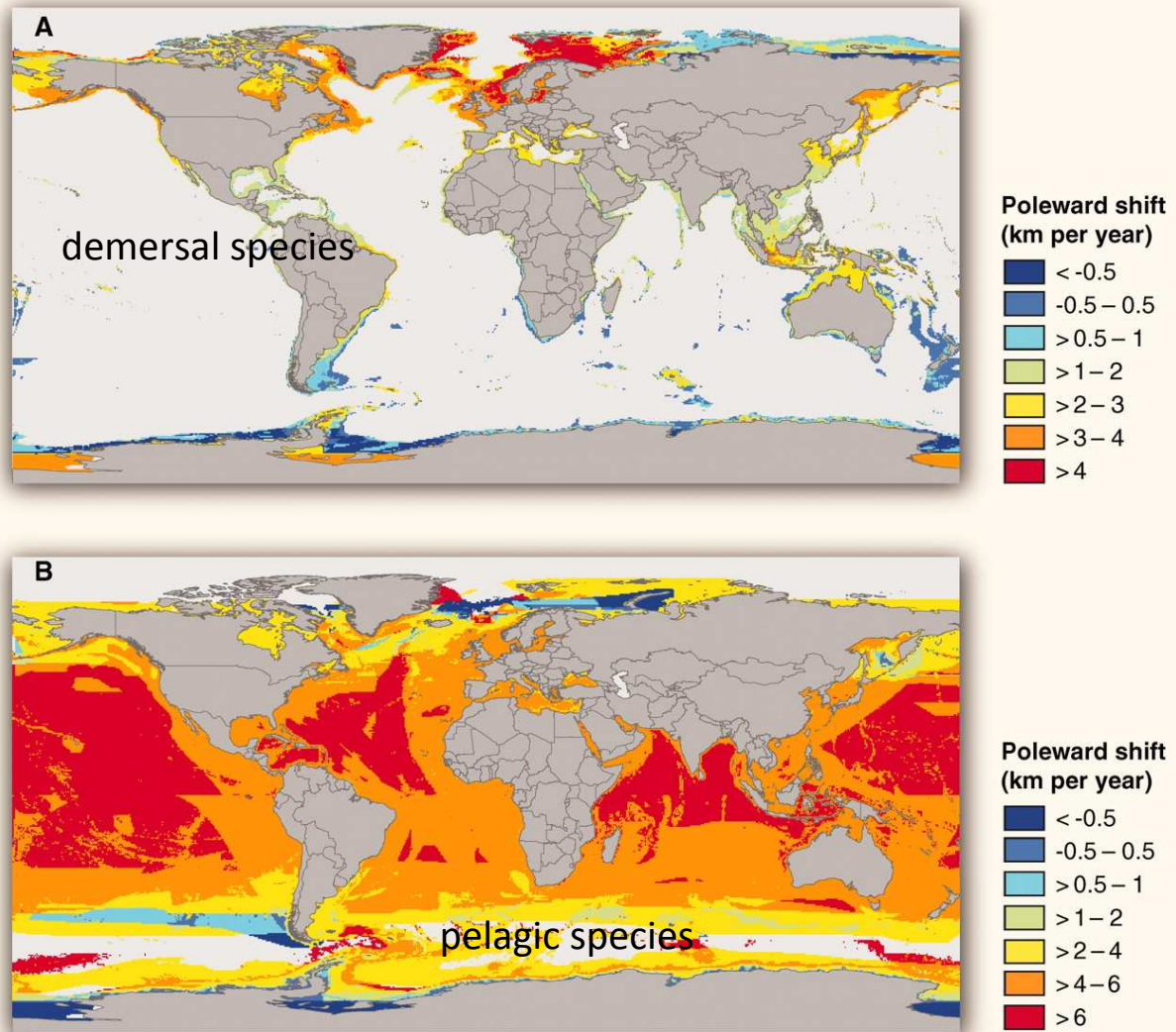
H M Pereira et al. Science 2010;330:1496-1501

Change in the extent of forests to 2050 in different global scenarios (63): MA scenarios (1), GBO2 scenarios (34), GEO4 scenarios (33), MiniCAM scenarios (39), and RCP scenarios for IPCC-AR5 (41).



H M Pereira et al. Science 2010;330:1496-1501

Projected rate of range shifts in marine organisms caused by climate change from 2005 to 2050 (52, 63) , under IPCC SRES A1B.



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