https://shiny.cefe.cnrs.fr/en_eolpop/

EolPop: a tool to quantify the impact of collisions on bird populations

Part of the "MAPE" Research Program: Reduction of Bird Mortality in Operating Wind Farms

Thierry Chambert

Mathilde Deleaux, Olivier Duriez, Aurélien Besnard

(CEFE, CNRS, Montpellier, France)

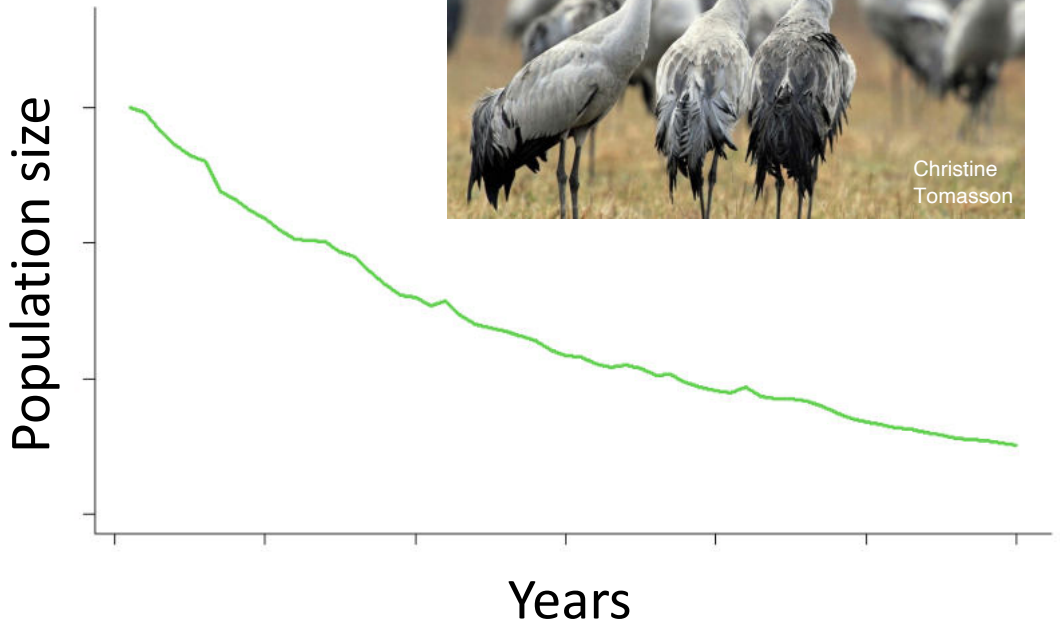
Webinar : Wind & Wings

November 2022

Impact on bird *populations*

Individual fatalities

Impact on bird *populations*



Individual fatalities

Demographic impact

(May et al. 2019)

Impact on bird *populations*

Individual fatalities

Depends also on:

- Initial population size
- Initial population trend
- Species characteristics (survival, fecundity)

Population size

Years

Demographic impact

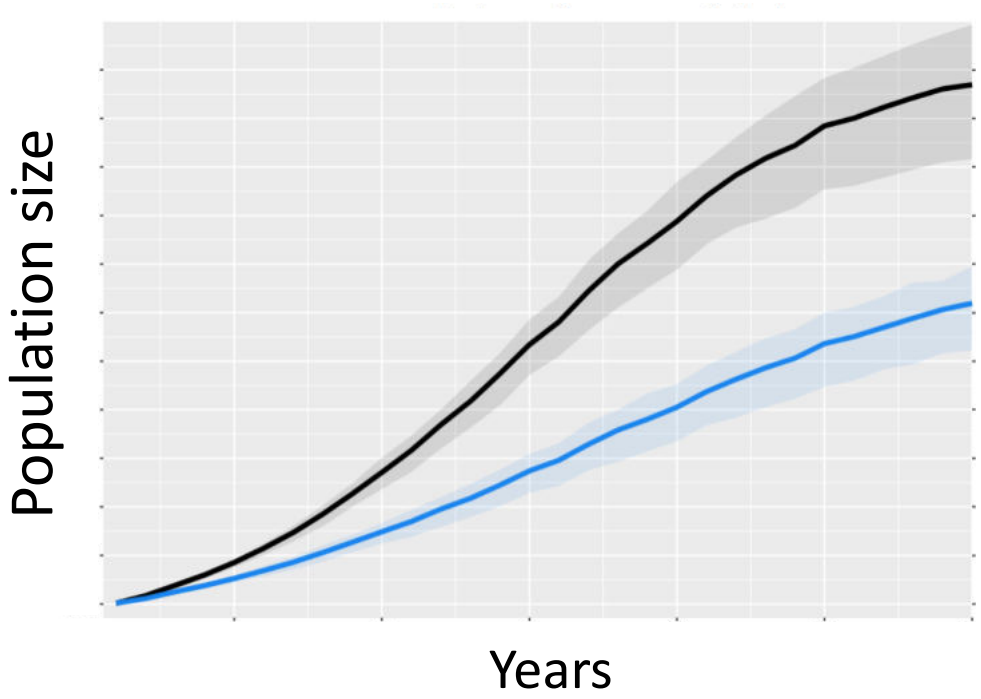
(May et al. 2019)

https://shiny.cefe.cnrs.fr/en_eolpop/

EolPop

(Shiny interface)

Based on population projections (simulations)



Demographic model

- Age classes
- Natural variability (stochasticity)
- Density dependence
  (only for growing populations)

Statistical approach

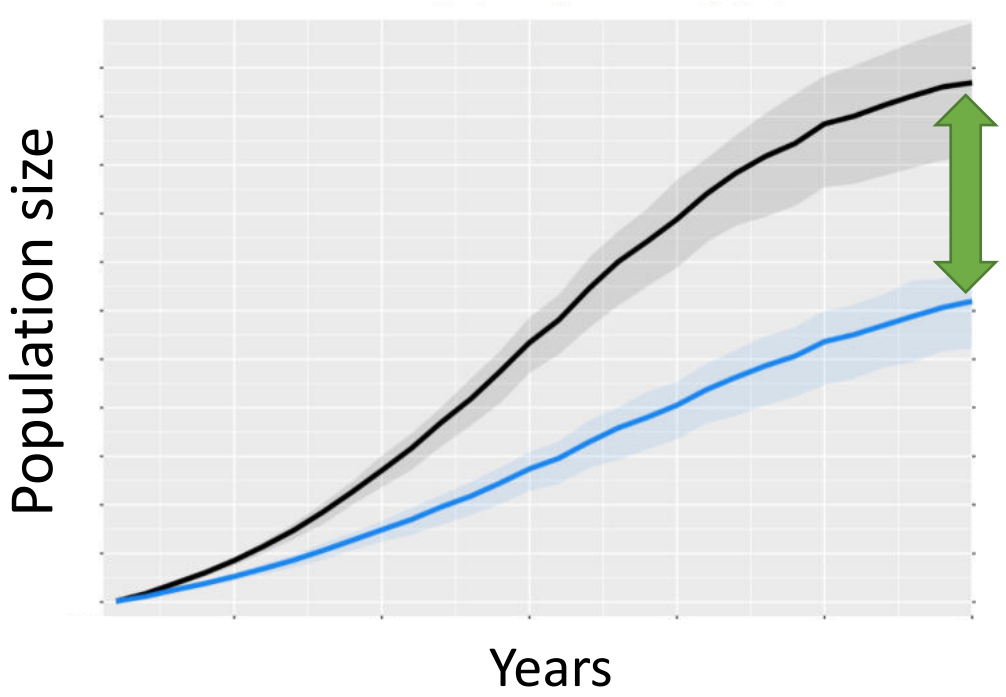
- Parameter uncertainty

https://shiny.cefe.cnrs.fr/en_eolpop/

EolPop

(Shiny interface)

Based on population projections (simulations)



Comparative approach ➔ less sensitive to uncertainties

Comparison between 2 scenarios :

- **Without** wind farm (baseline scenario)
- **With** wind farm (➔ with fatalities)

Relative impact (at 30 years)

Cook & Robinson 2017

"CIU approach" : Counterfactual of Impacted to Unimpacted Population

Inputs

https://shiny.cefe.cnrs.fr/en_eolpop/

Choose type of analysis and species

Type of analysis

1

- (•) Single wind farm
- ( ) Cumulative impacts
- ( ) Hypothetical scenarios

2

Select a species

Bonelli's Eagle

3

Parameter entry

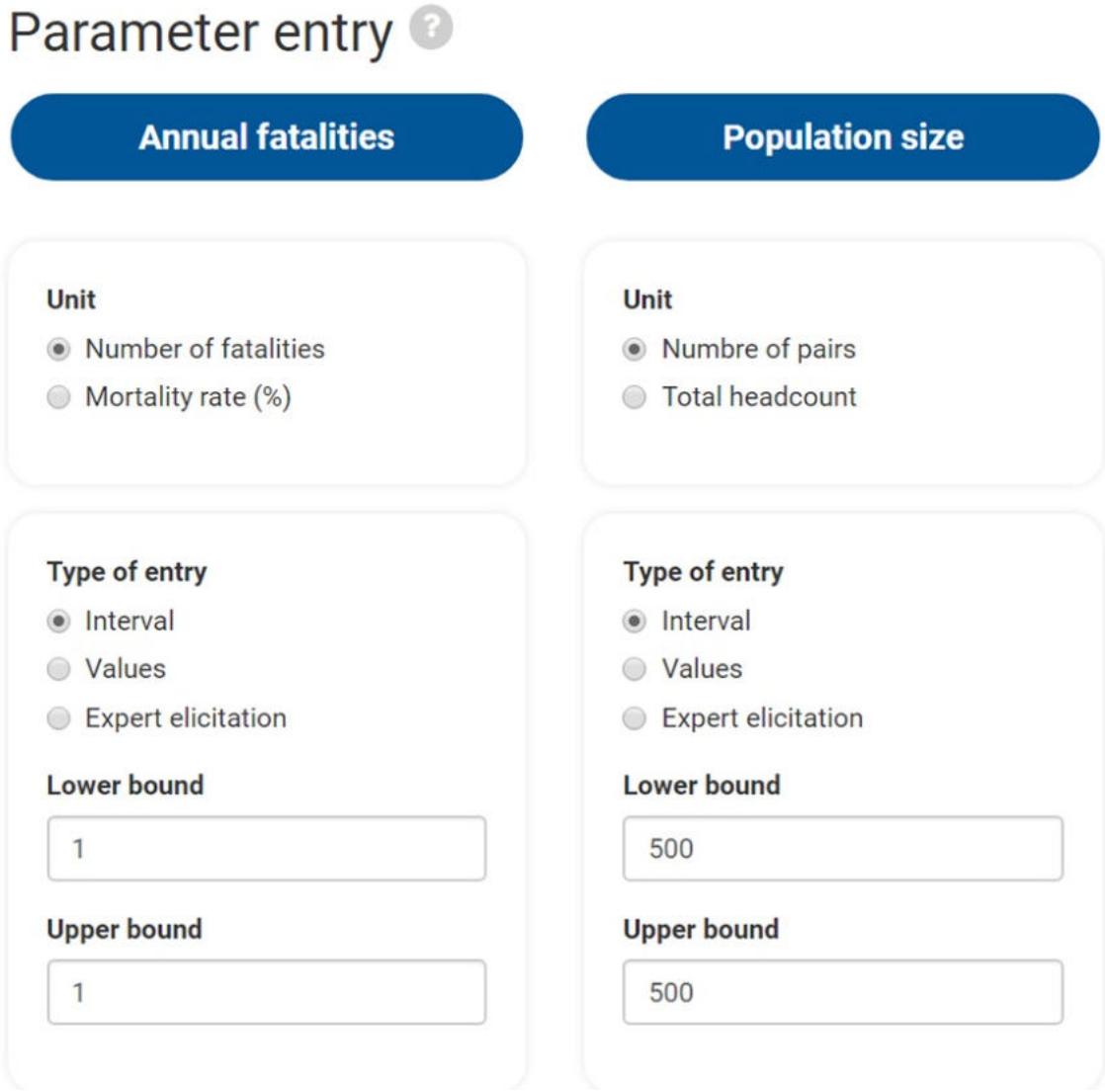
Annual fatalities | **Population size** | **Growth rate** | **Carrying capacity**

Vital rates

	Survival	Fecundity
Age 0	0.55	0
Age 1	0.62	0
Age 2	0.62	0.19
Age 3	0.84	0.49
Age 4	0.9	0.49

Parameter uncertainty

https://shiny.cefe.cnrs.fr/en_eolpop/



Parameter uncertainty

3 options of parameter entry:

- Interval (min – max)
- Estimation & SE
- Expert elicitation (table)

Launch simulations

https://shiny.cefe.cnrs.fr/en_eolpop/

Number of years

30

Number of simulations

1000

Run | Cancel | Check status | Clear results

https://shiny.cefe.cnrs.fr/en_eolpop/

Outputs

Two tables :

- **Estimated relative impact** (%), at time horizon
- **Probability of extinction**, at time horizon

https://shiny.cefe.cnrs.fr/en_eolpop/

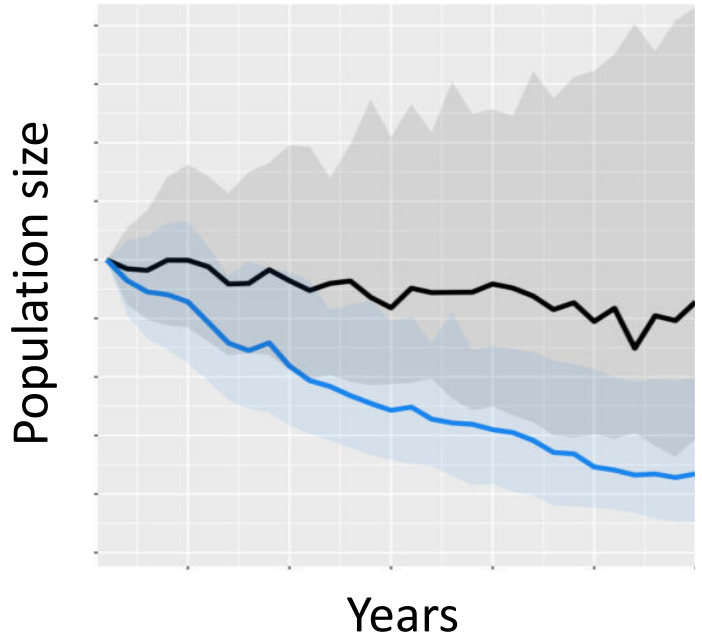
Outputs

Two tables :

- **Estimated relative impact** (%), at time horizon
- **Probability of extinction**, at time horizon

Several graphs :

Predicted population trajectories



https://shiny.cefe.cnrs.fr/en_eolpop/

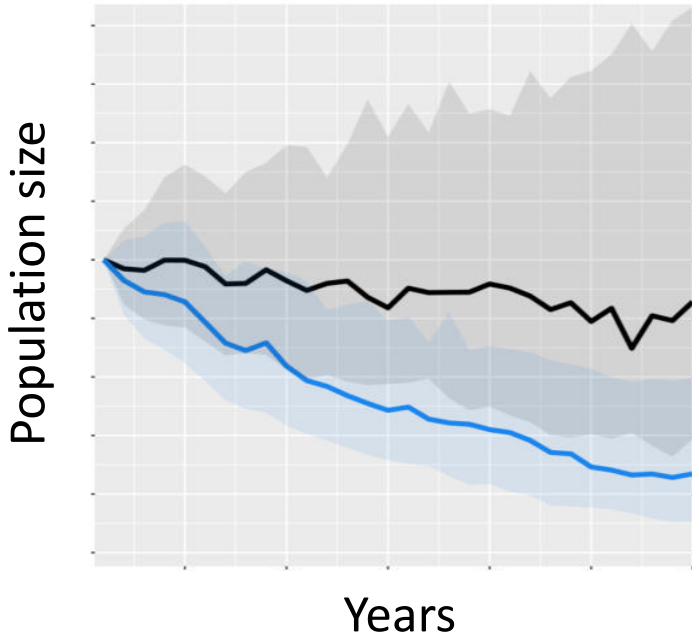
Outputs

Two tables :

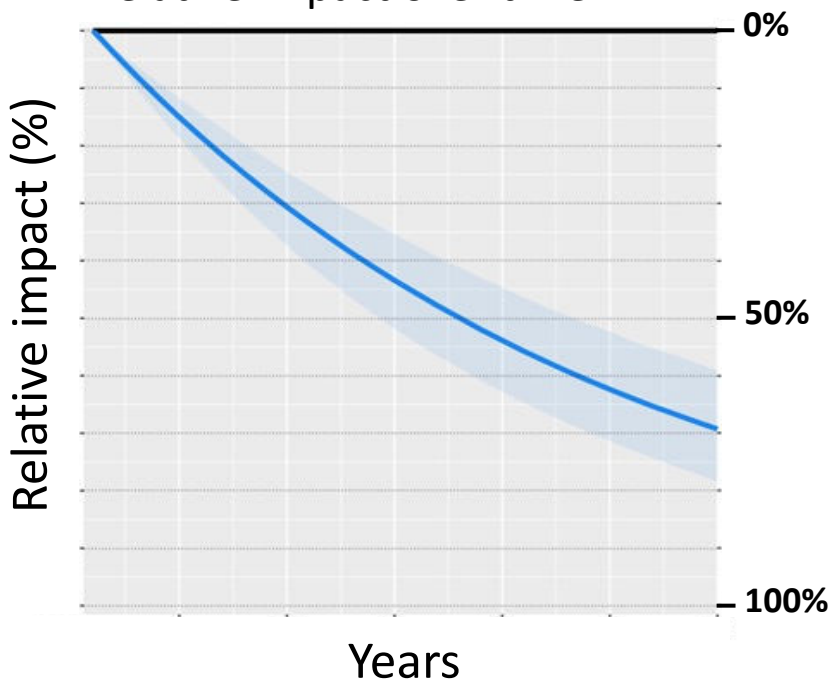
- **Estimated relative impact** (%), at time horizon
- **Probability of extinction**, at time horizon

Several graphs :

Predicted population trajectories



Relative impact over time



Case study

Lesser kestrel (*Falco naumanni*)
Southern France

54 fatalities observed between 2013 – 2021

Parameter inputs

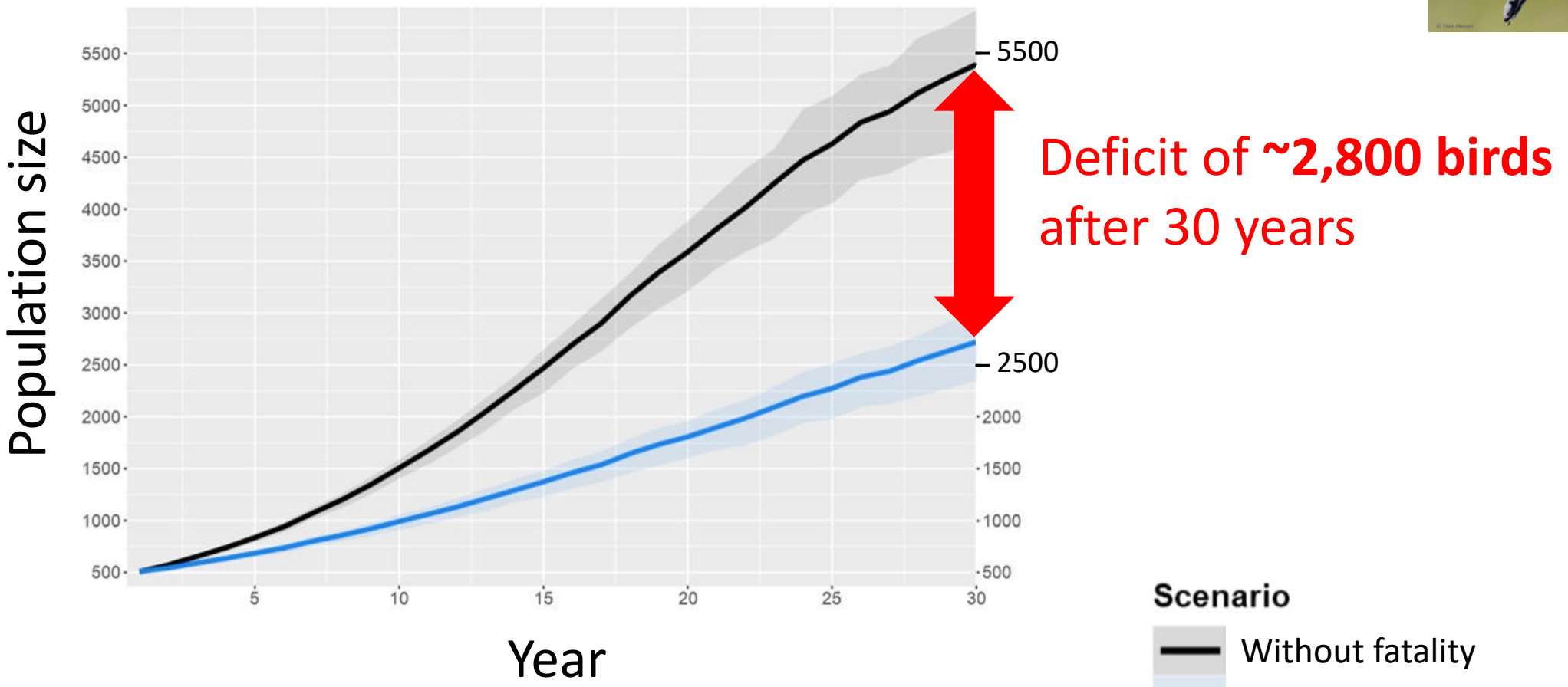
Annual mortality rate : **4,9%** (SE = 0,7%)

Population size (2021) : **292 pairs** (= 584 breeding individuals)

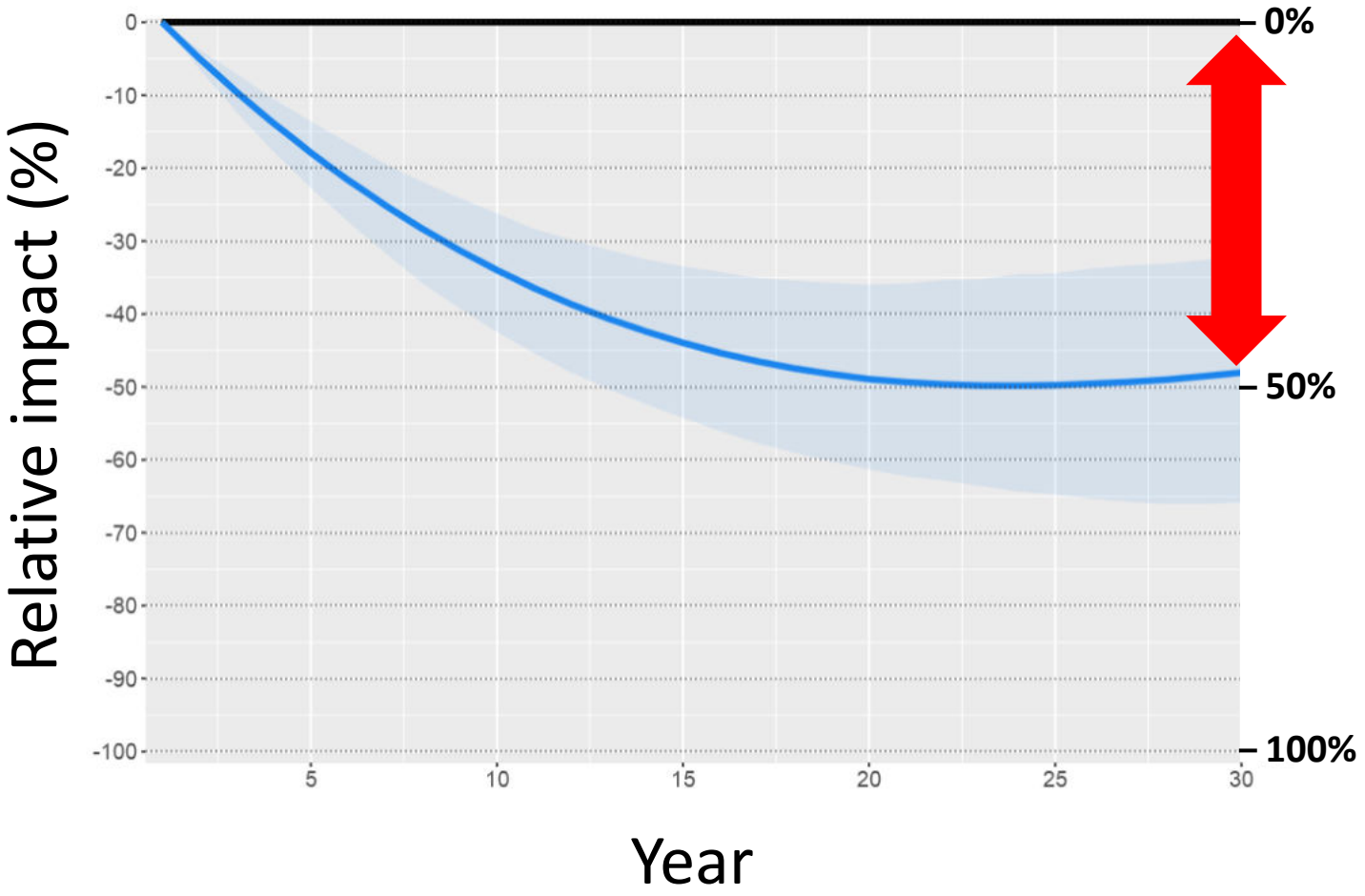
Annual growth rate (without collisions): **9% to 14%** **(growing)**

Carrying capacity : **2,000 to 10,000 breeding individuals**
(1,000 to 5,000 pairs)

Predicted trajectories



Relative impact



Impact (30 years) : **48%**

95% C.I. : [**32% ; 66%**]

Pr. of extinction (30 years) = 0

Concluding remarks

Eolpop

- Intended for people in charge of EIAs:
  Environmental consulting firms, State authorities
- Freely available : https://shiny.cefe.cnrs.fr/en_eolpop/

Next steps

- Define legal thresholds of impacts
- To help interpretation and decision making

https://shiny.cefe.cnrs.fr/en_eolpop/

Thank you