



Predation and long term impact of feral cats on seabirds in the tropical western Indian Ocean

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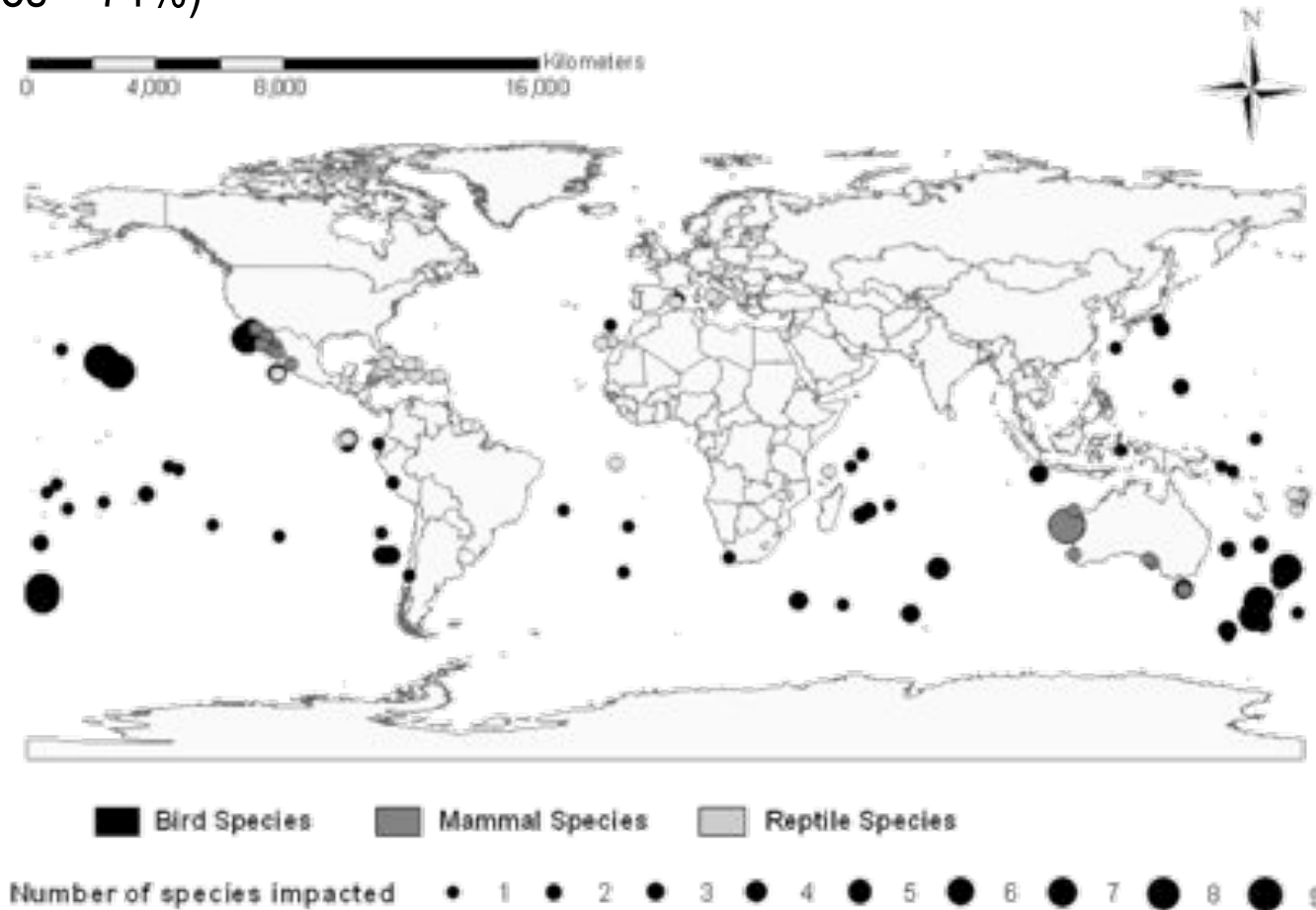
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Cat impact on oceanic islands

- 174 endangered vertebrate species from 124 islands impacted by feral cats (124 bird species = 71%)



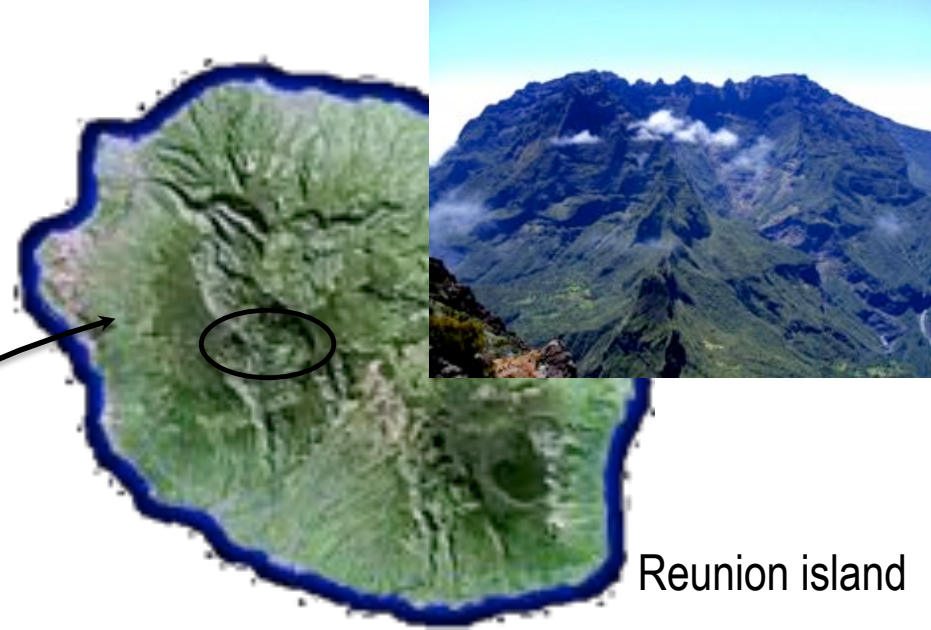
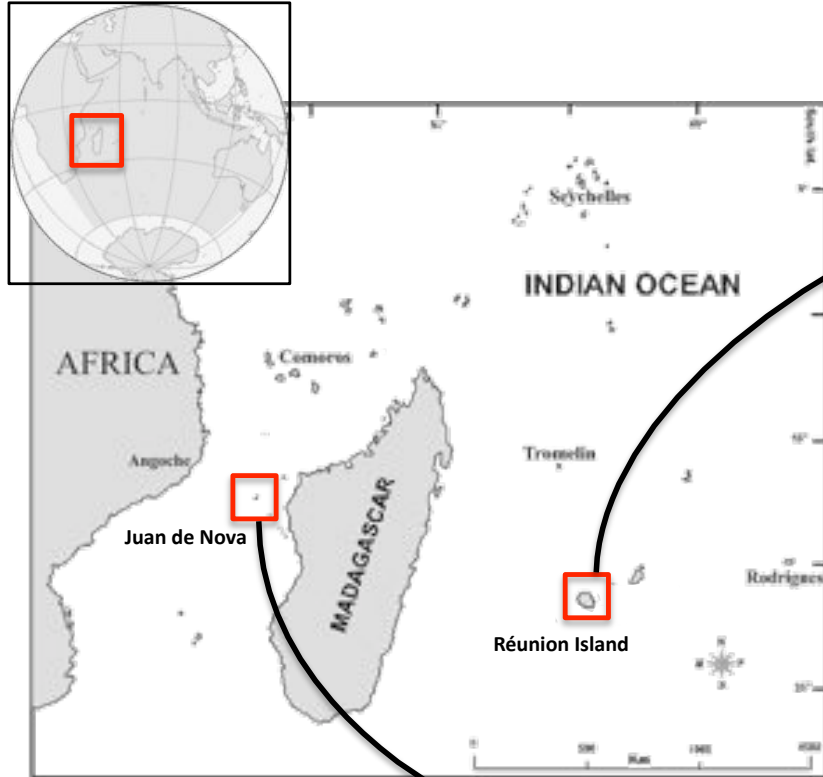
(Medina et al *submitted*)



Cat impact on oceanic islands

- 174 endangered vertebrate species from 124 islands impacted by feral cats (124 bird species = 71%)
- Cats responsible for the extinction of at least 33 bird species on oceanic islands (Lever 1994)
- South western tropical indian ocean : impact on 8 endangered bird species from 5 islands (Seychelles, Mauritius, Reunion)
- **Cause of high vulnerability : lack of anti-predatory strategy**

Study sites

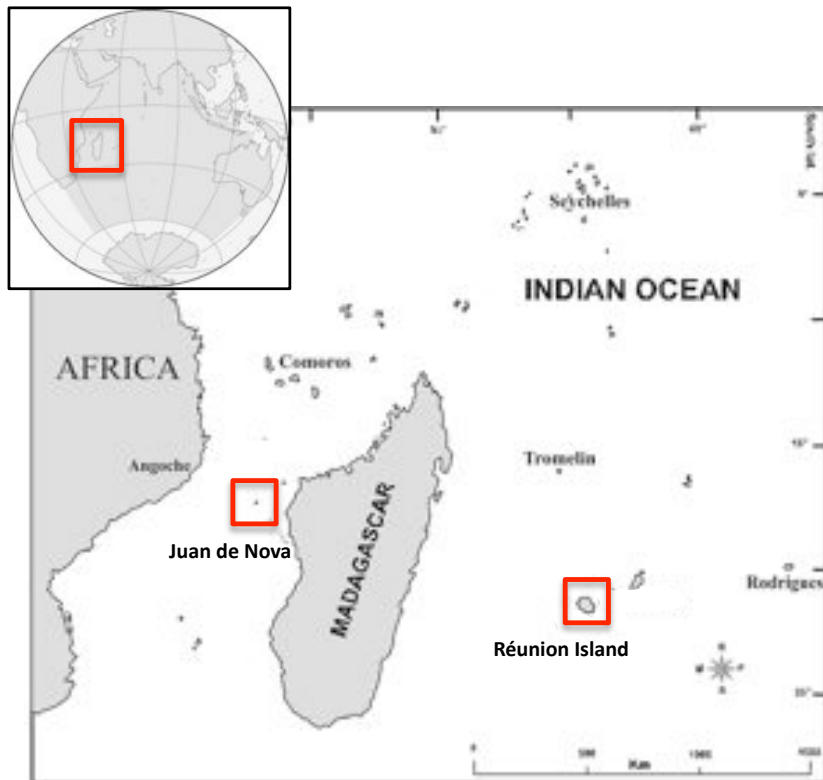


Reunion island



Juan de Nova

Species of concern



CR

EN



Barau's petrel



Sooty tern



Crested tern



Cat impact on seabirds



**Top predator
(introduced)**



Native prey





Cat impact on seabirds

- Predation by cats on both adults and chicks
- 10 cats would kill ≈ 900 Barau's petrels during breeding season in Reunion island (Faulquier et al 2009)
- A single cat kills ≈ 6 terns per day in Juan de Nova (Peck et al 2008)
- Evidence of « surplus killing »



**Top predator
(introduced)**



Native prey

Multi-invaded system



- Communities are composed of many interacting trophic levels and species

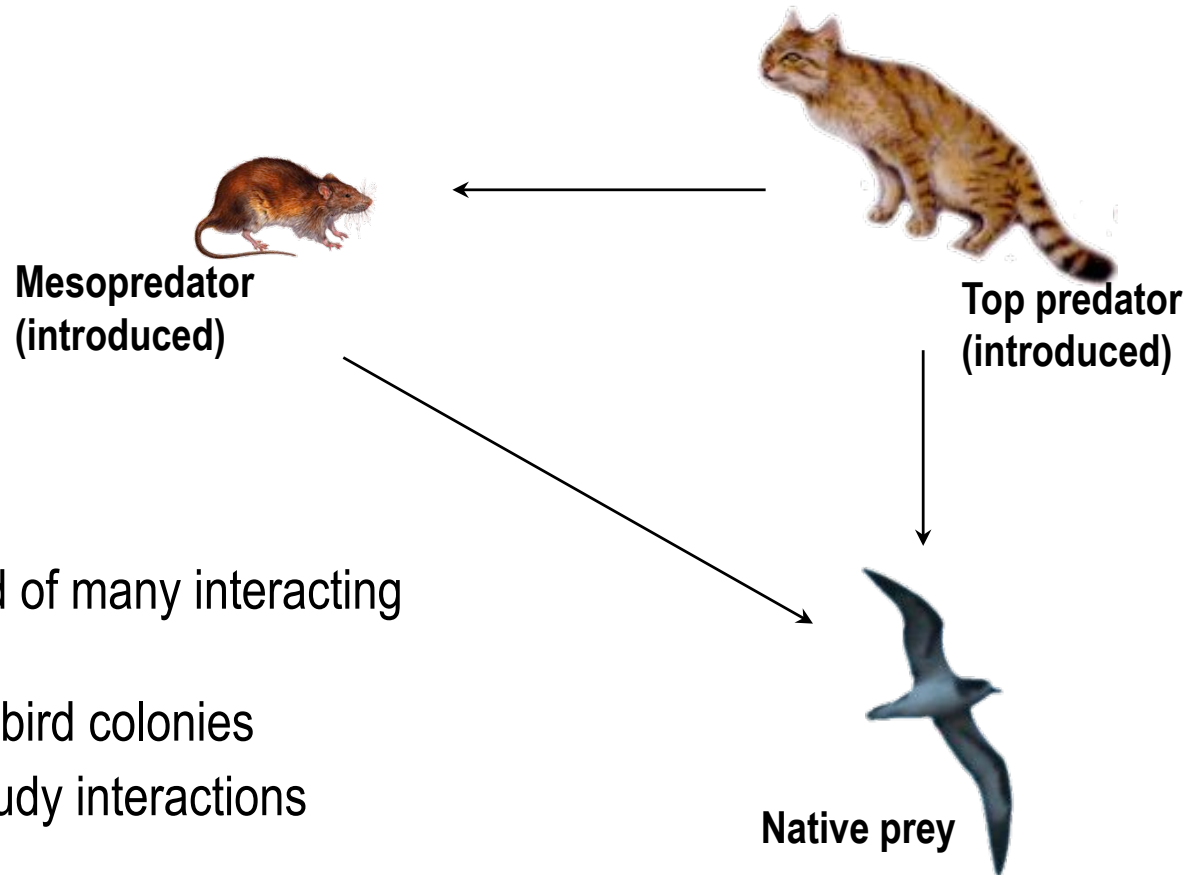


**Top predator
(introduced)**



Native prey

Multi-invaded system



- Communities are composed of many interacting trophic levels and species
- Rats have also invaded seabird colonies
- We thus consider for this study interactions among the system :
 - Top predator (CAT)
 - Mesopredator (RAT)
 - Prey (SEABIRD)

Cat impact in a multi-invaded system



**Mesopredator
(introduced)**

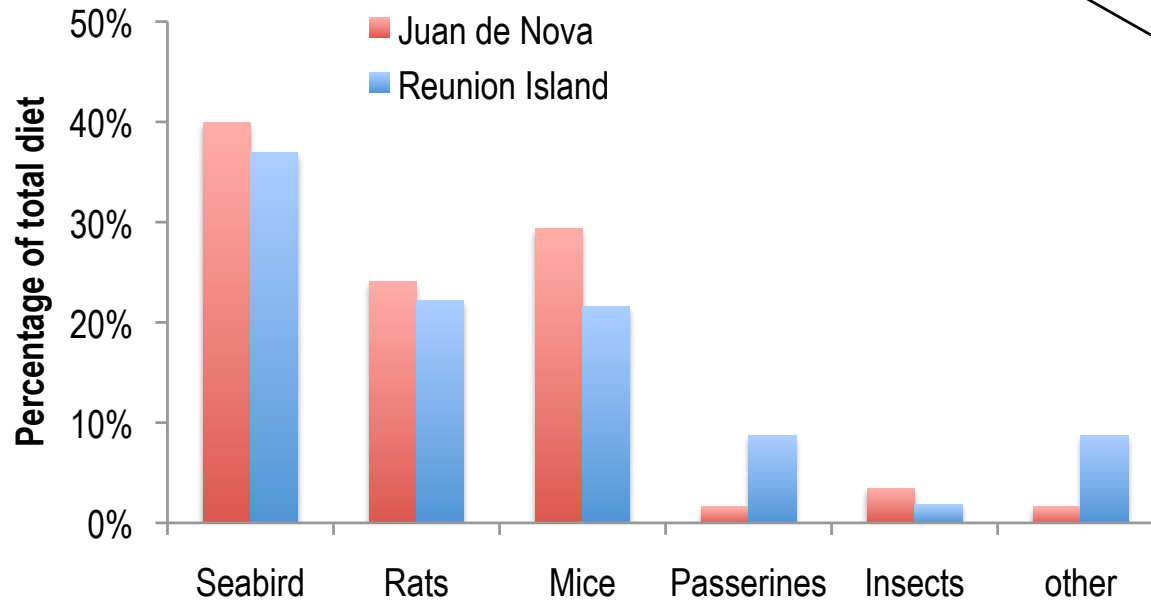


**Top predator
(introduced)**

Food preference



Native prey

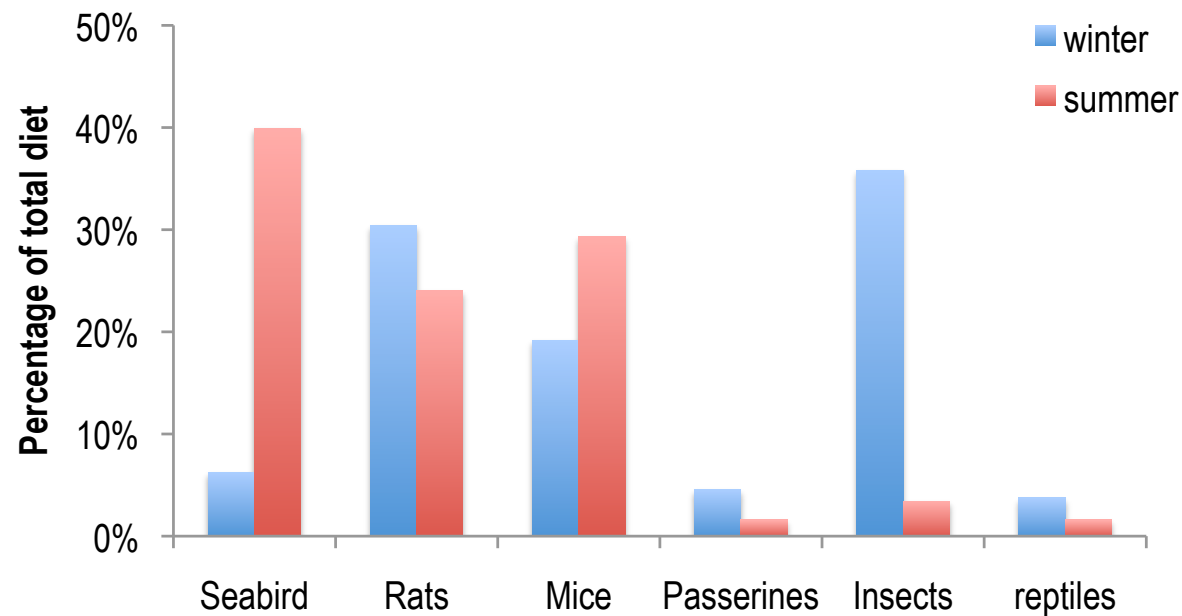


Cat scats analysis (2007-2009)



Hyperpredation process

- **Hyperpredation** occurs when an indigenous prey species experiences an increase in predation pressure caused by an exotic predator that is sustained by an abundant exotic prey.



Cat scats analysis (*Juan de Nova, 2007-2009*)

Removing cats from multi-invaded systems?



- Cats threaten seabird populations viability



Top predator
(introduced)



Native prey

Removing cats from multi-invaded systems?



Mesopredator (introduced)



Top predator
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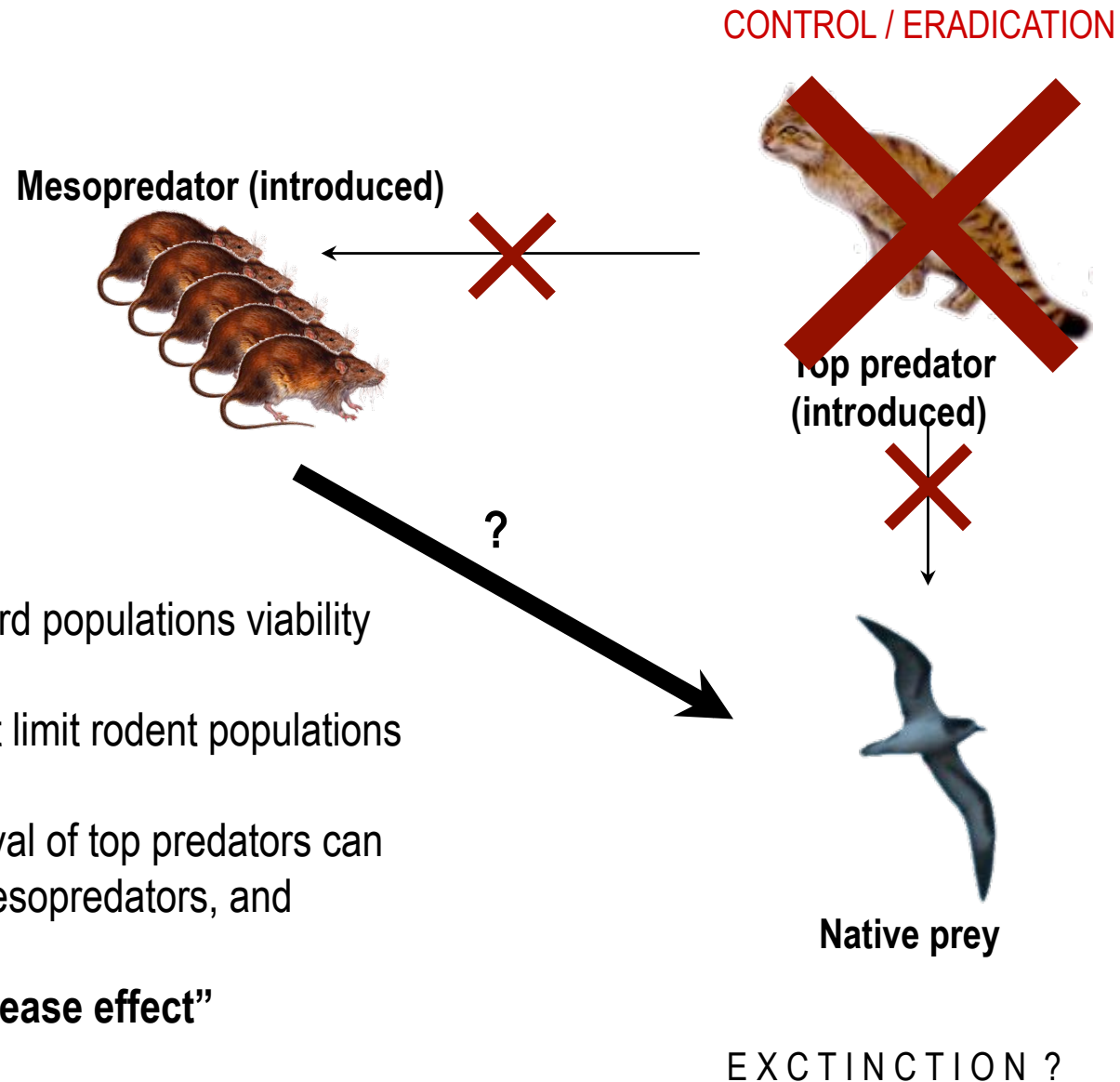


Native prey

- Cats threaten seabird populations viability
- However cats might limit rodent population



Removing cats from multi-invaded systems?



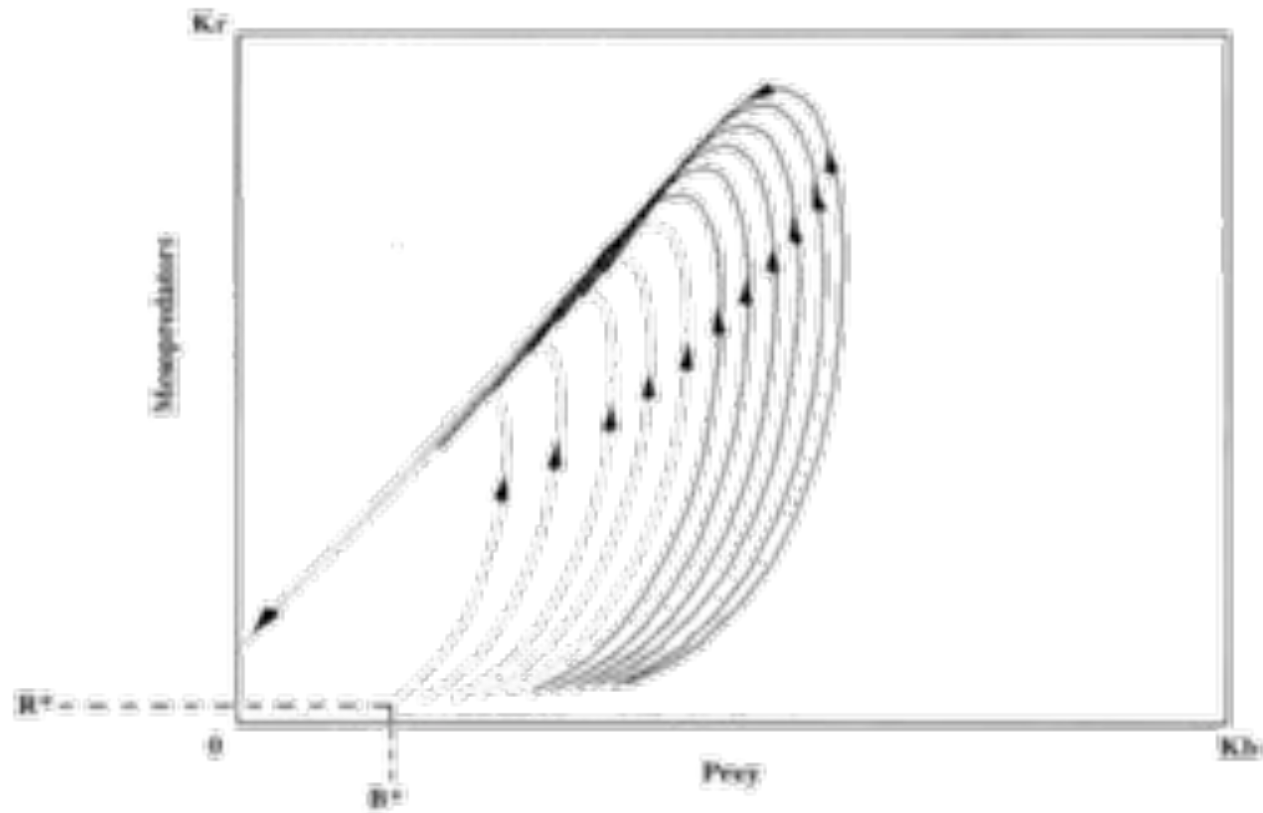
- Cats threaten seabird populations viability
- However cats might limit rodent populations
- Intuitively the removal of top predators can lead to increase in mesopredators, and decrease prey
= “mesopredator release effect”



Removing cats from multi-invaded systems?

« **Cats protecting birds** »

(Courchamp et al 1999)





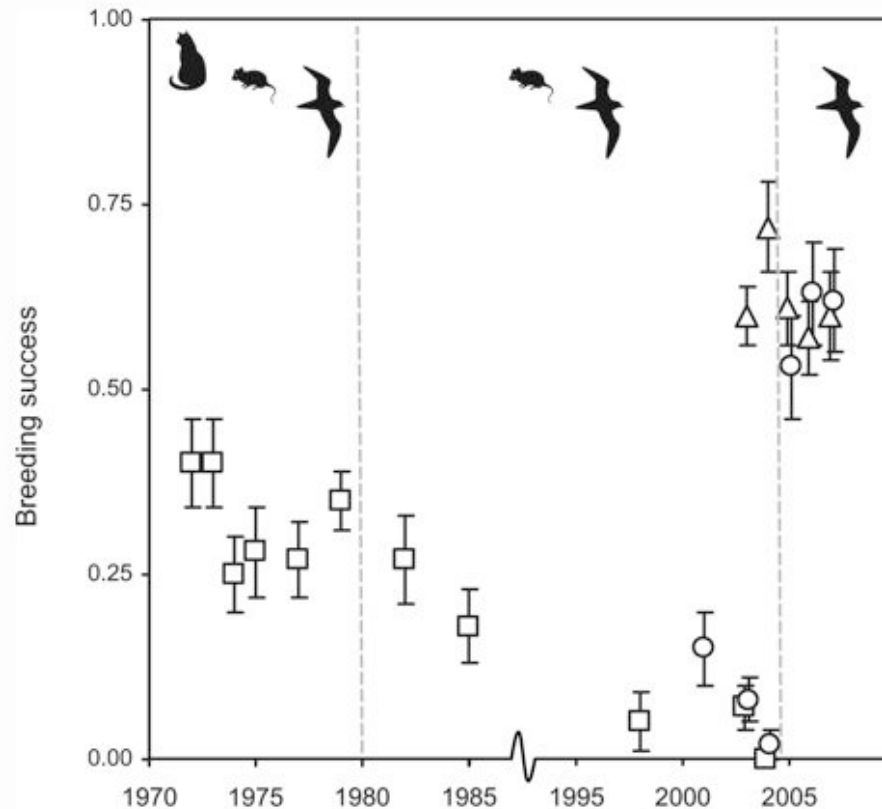
Removing cats from multi-invaded systems?

- For mesopredator release effect to be effective both requirements must be fulfilled :
 - 1) There is an increase (release) of the mesopredator following superpredator removal (i.e. top-down)
 - 2) The increased mesopredator has a greater impact than the impacts of superpredator and suppressed mesopredator combined



Removing cats from multi-invaded systems?

- This greater impact must be demonstrated on the overall population persistence and not adult survival or reproductive success alone



e.g. Breeding success of Cooks petrels during successive predator regimes on Little Barrier Island (Rayner et al 2007)



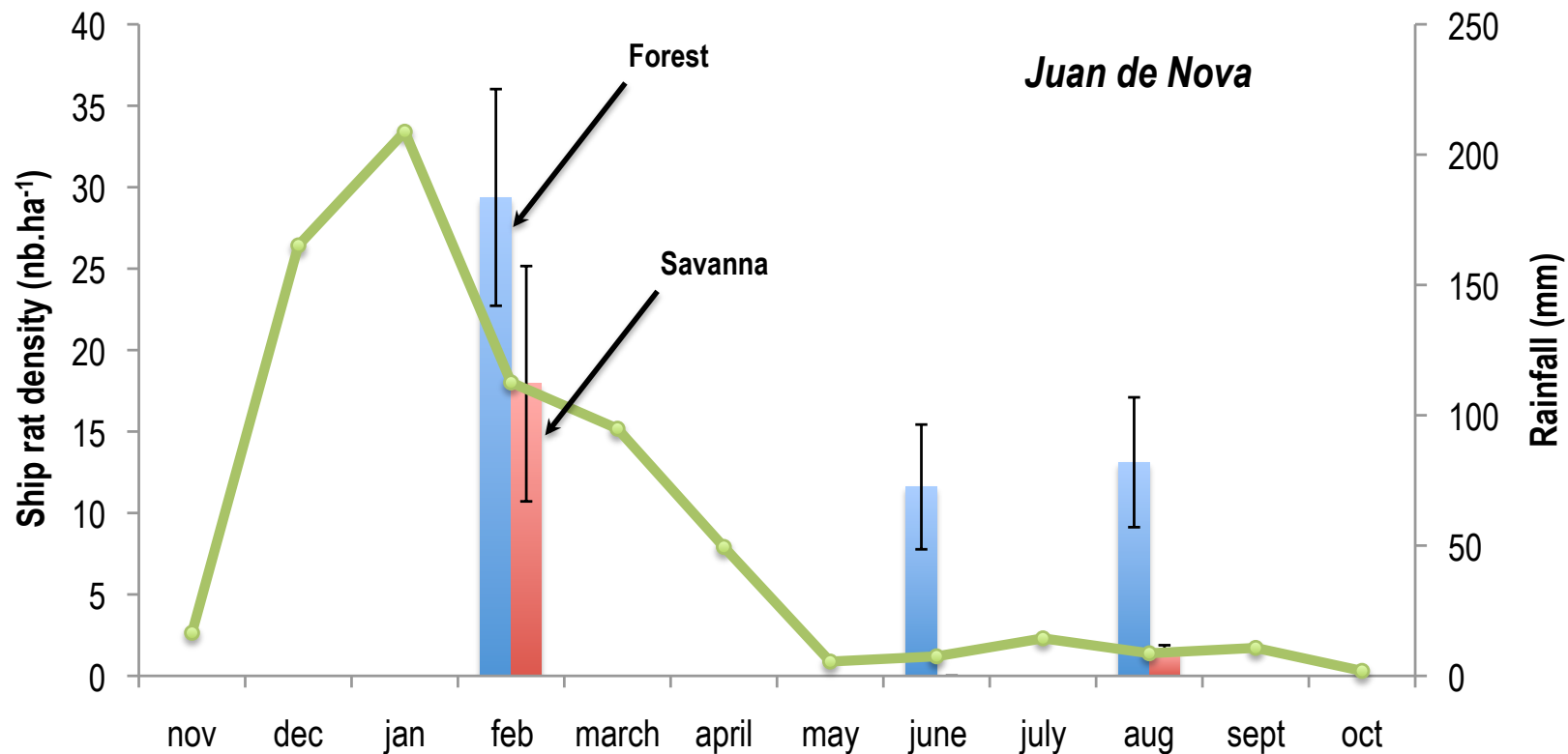
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Rat population dynamics driver

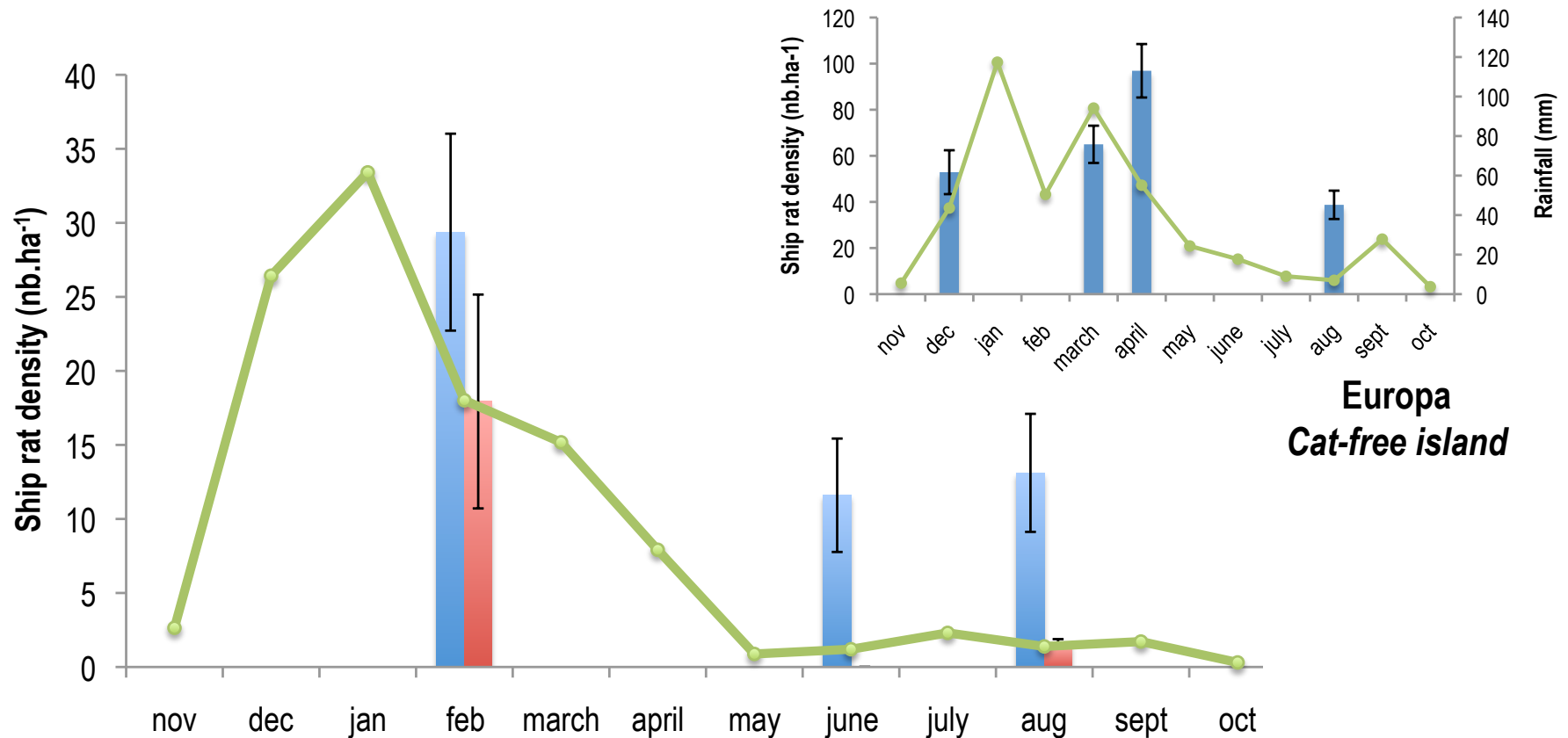
- Rats populations dynamics are mainly driven by bottom up processes (ressources input during wet season)
Same pattern in cat free island and cat invaded island
- Predation by cats may lower densities during winter (dry season) but can not prevent summer population outbreak





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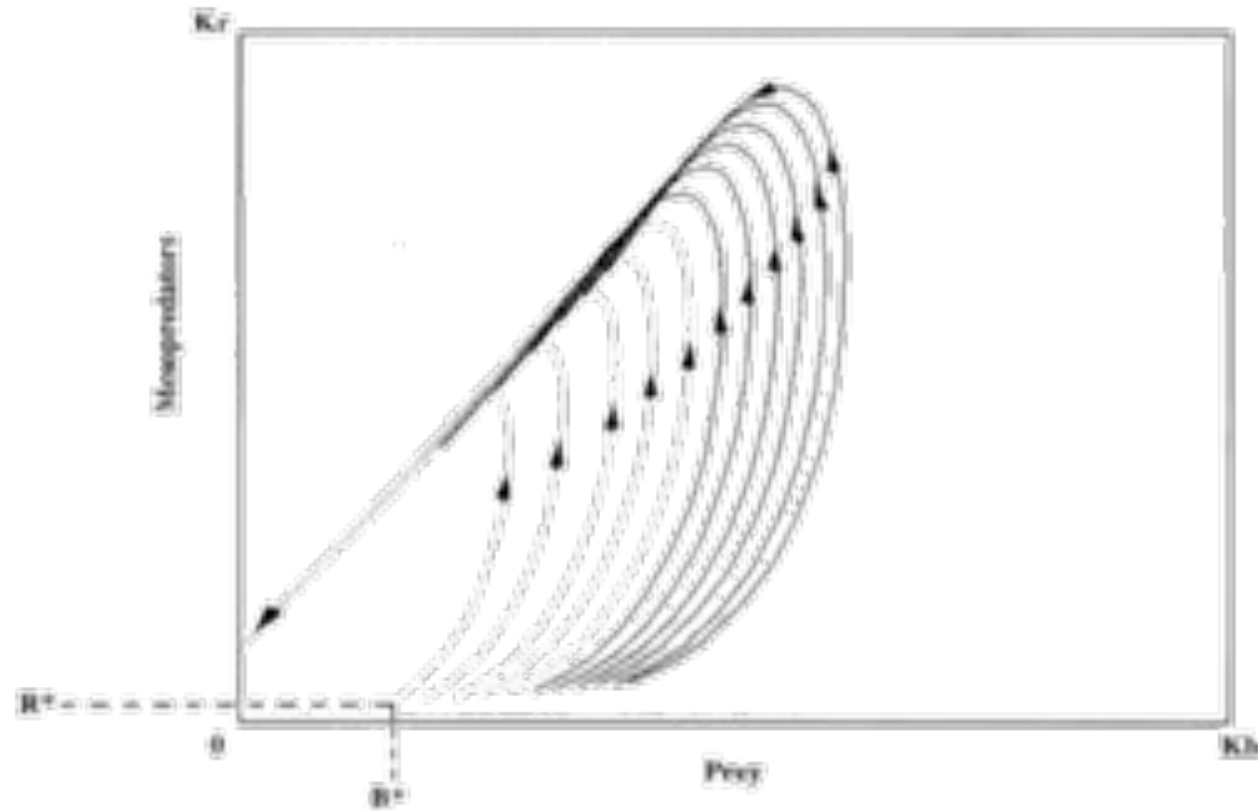


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Removing cats from multi-invaded systems?



« Cats protecting birds »
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- These predictions are based on differential equation models that do not take into account the age structure of the target species and the differences of sensitivity in the growth rate to changes in survival or breeding success



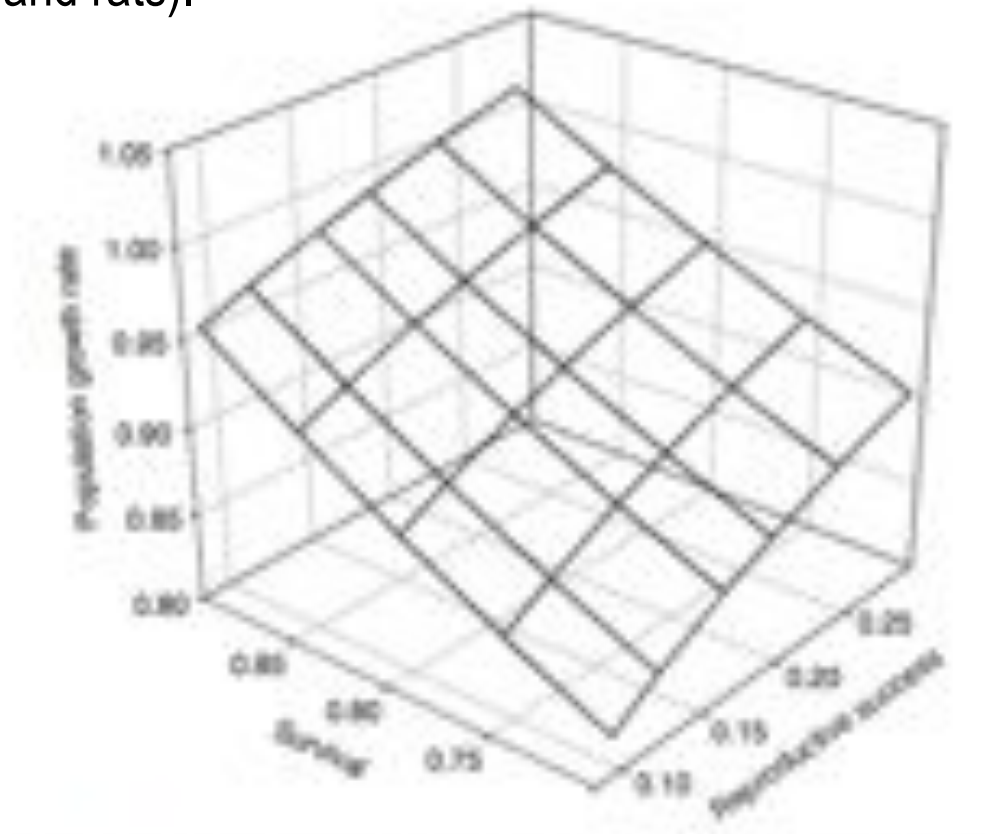
Predator impact on long-lived prey species

- Seabirds have evolved complex life-histories encouraging slow breeding (K-selected species)
 - Delayed maturity (1-10 years)
 - Low reproductive output (1 egg per season)
 - Juveniles generally remain at sea
 - Population growth rate $\approx 1\%.\text{year}^{-1}$
- Cats and rats do not predate seabirds equivalently
 - Rats generally predate eggs and chicks
 - Cats can predate both chicks and adults



Seabird population growth sensitivity

- Seabird population growth is much more sensitive to a change in adult mortality (predation by cats) than a change in reproductive success (predation by both cats and rats).

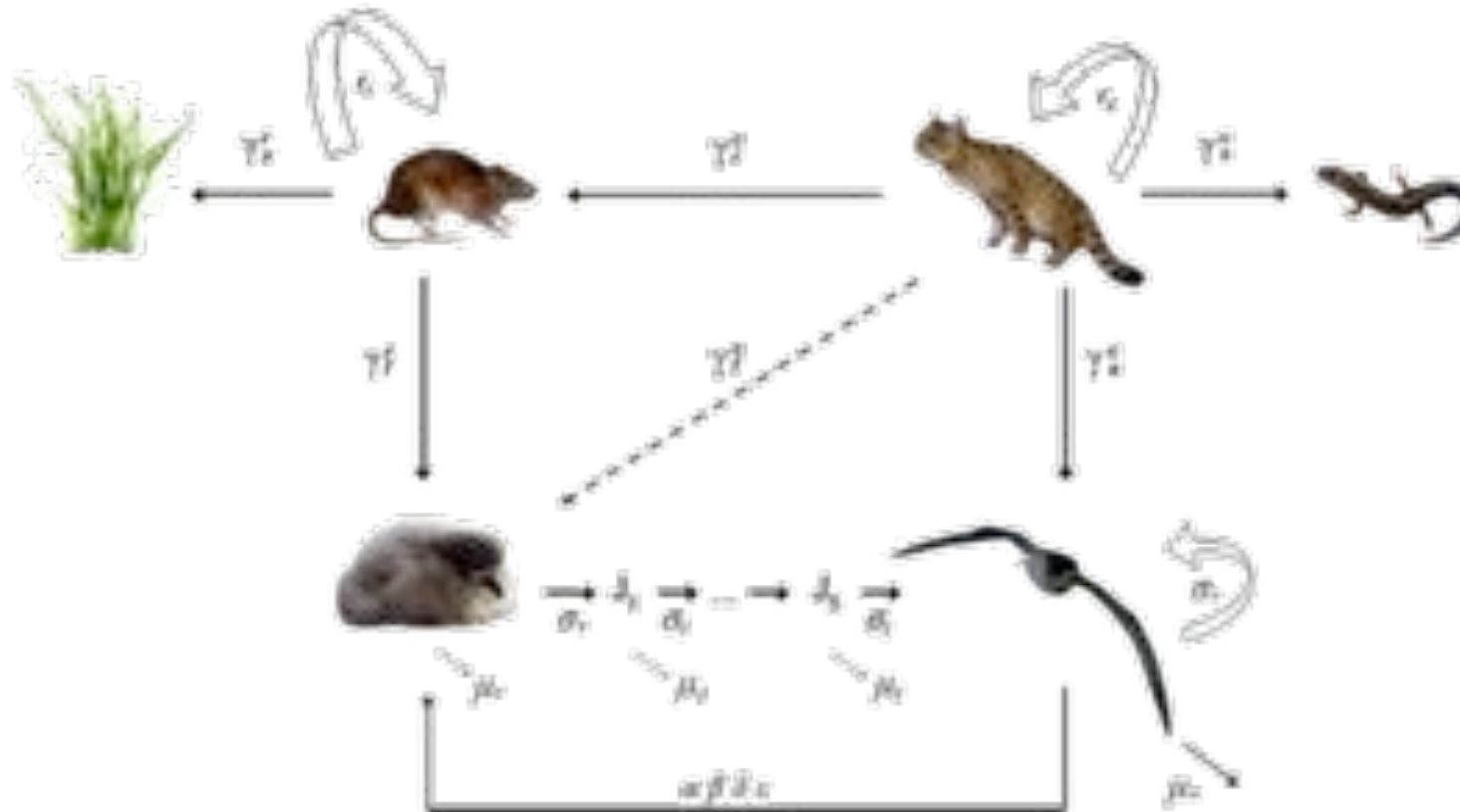


e.g. Sooty tern in Juan de Nova (Peck et al 2008)

Modeling cat-rat-seabird interactions



- Model designed for age-structured prey population

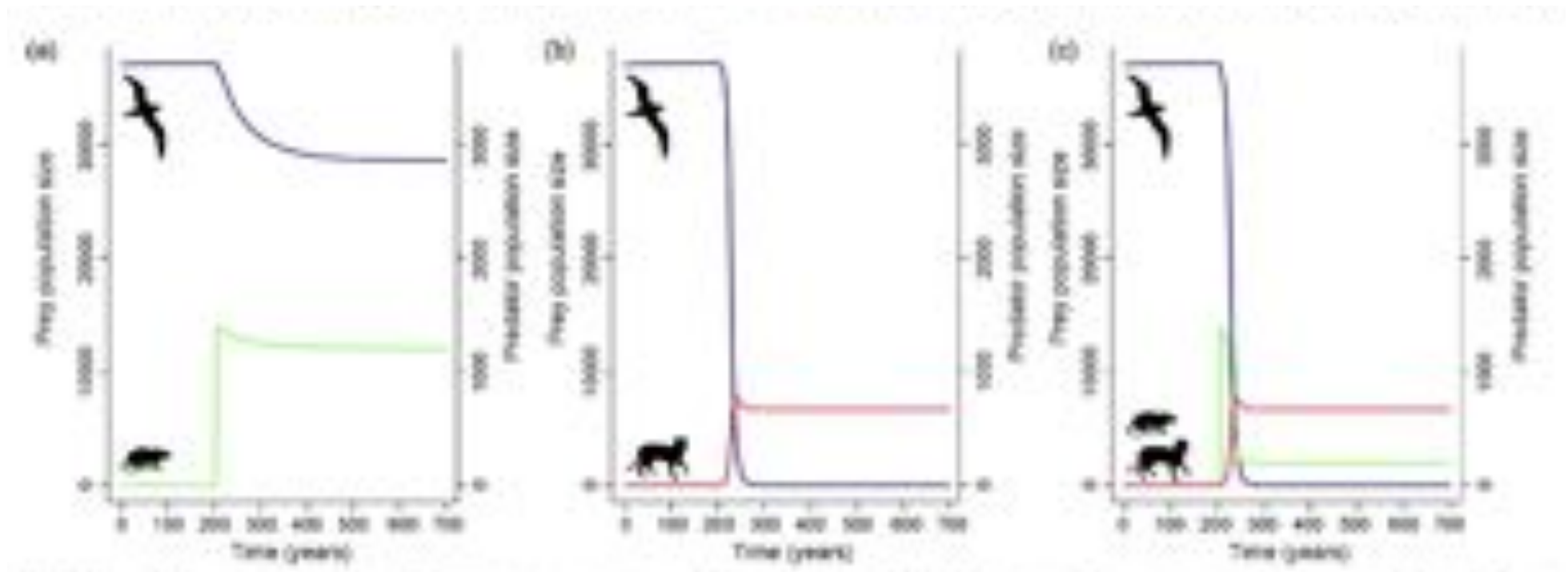


(Le Corre 2008 ; Russell et al 2009)



Modeling cat-rat-seabird interactions

- **Case study** : Conservation concern for Barau's petrel (Reunion island)



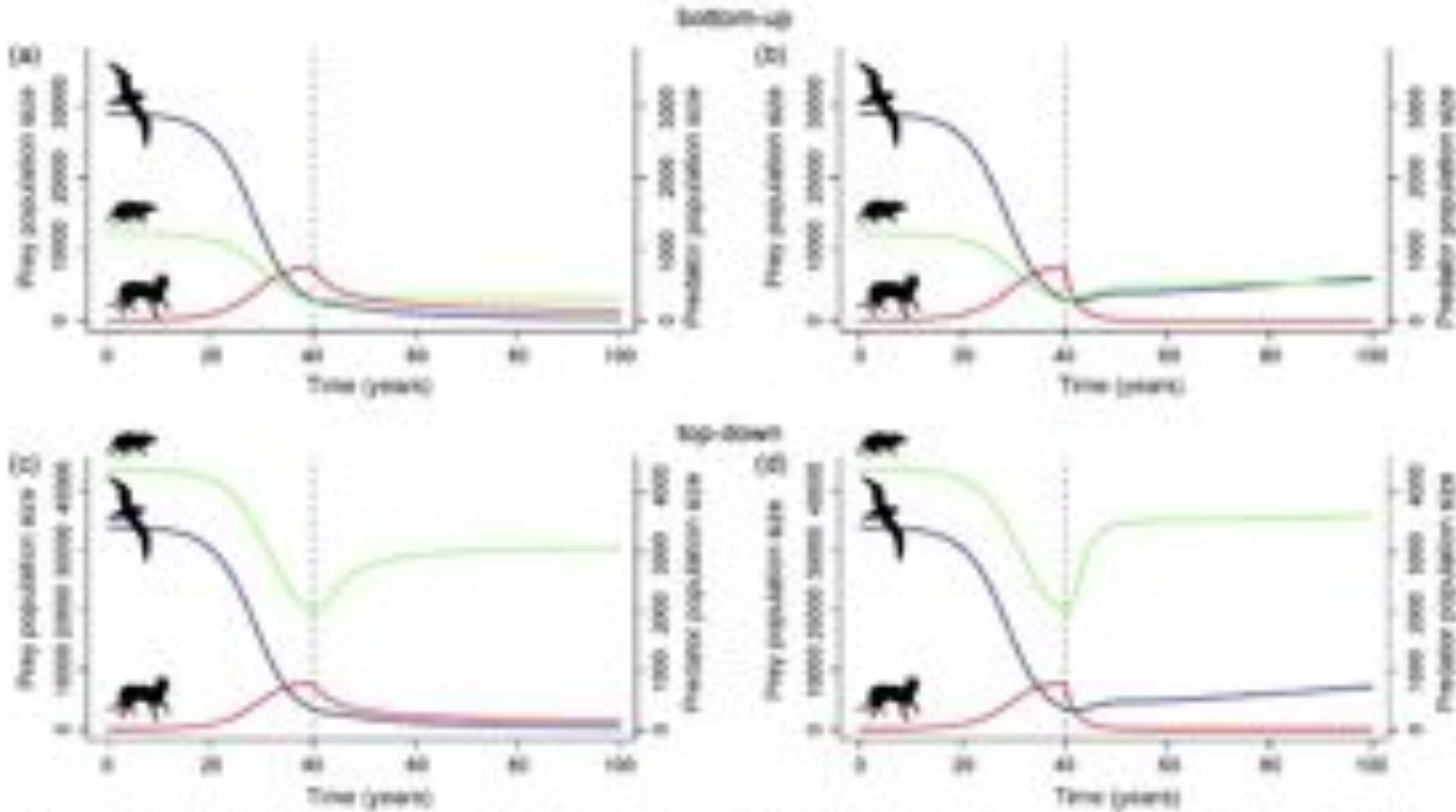
(Russell et al 2009)



Modeling cat-rat-seabird interactions

20% cat control

80% cat control



(Russell et al 2009)

Conclusions



- **Mesopredator release effect is unlikely for an age-structured prey population (e.g. seabirds)**

- **Conservation strategies adapted to island context**

Conclusions



Juan de Nova
5 km²
uninhabited



Feral cats

Eradication program (2006)

- 119 cats removed
- less than 5 remainers



Native prey



Conclusions



Reunion island
2500 km²
800,000 hab.



Feral cats

Recruitment rate
?



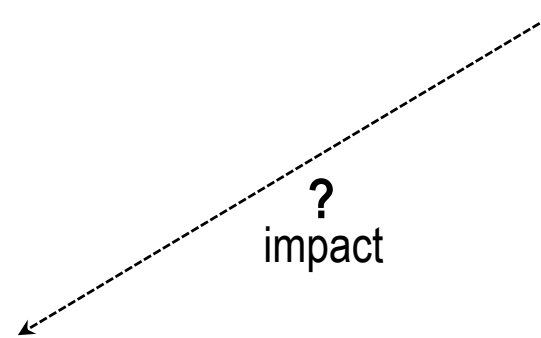
Domesticated cats

Control program (2010)

- control in colonies
- prevent access to colonies



Native prey



Thank you



Institutional partners

TAAF

FAZSOI

Parc National des Hauts de la Réunion

ONF

Support

Région Réunion

RUN SEA SCIENCE

Field workers

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Aurélien TROMBINI