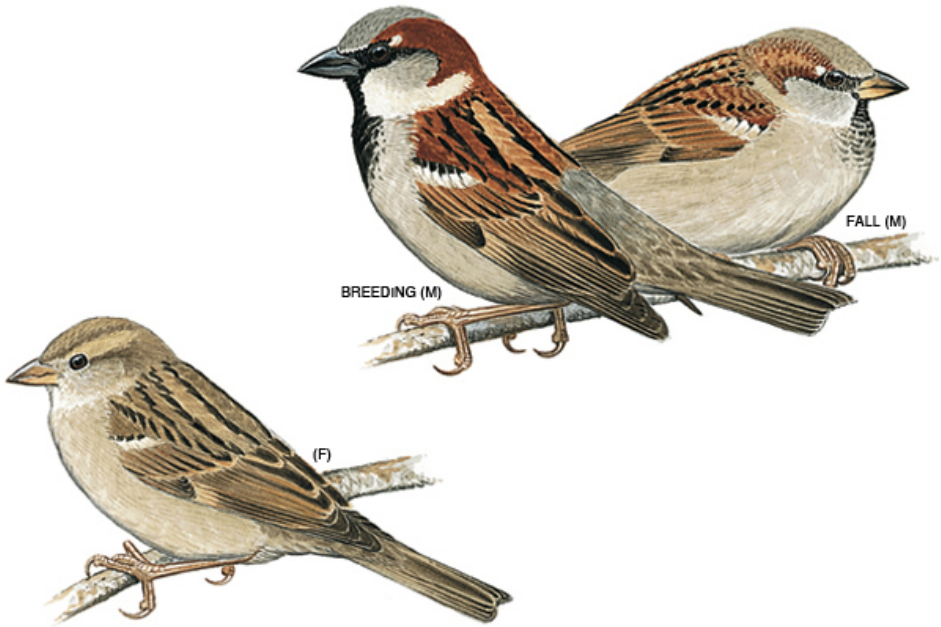


ESRM 350

Invasive Species

Autumn 2016

“It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is most adaptable to change”*

- Leon C. Megginson, LSU Professor

*Often misattributed to Charles Darwin

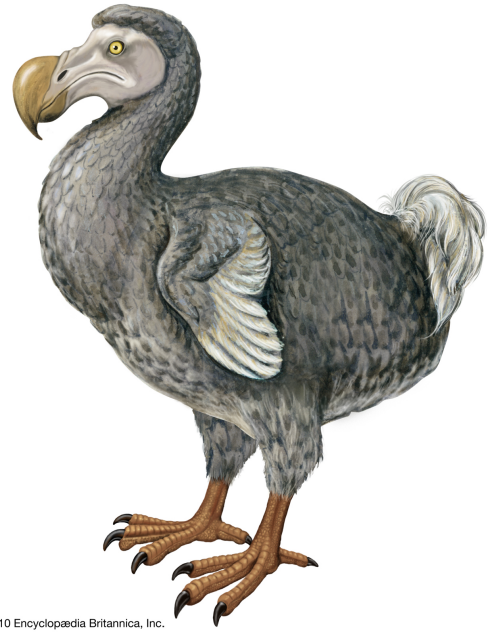
‘Exotic’ and ‘Invasive’ Species

- **Exotic species**
  - a species with one or more populations that have established outside of its native range
  - aka non-native species, alien species, introduced species
    - the term ‘introduced’ should be reserved to cases where humans are the vector for a species’ range expansion
- **Invasive species**
  - non-native organisms (excluding humans) that become established in a location outside their natural range and cause, or have the potential to cause, environmental, social or economic change

Vellend et al. (2007) *TREE*; Didham et al. (2007) *TREE*

Invasives: A Major Threat to Biodiversity

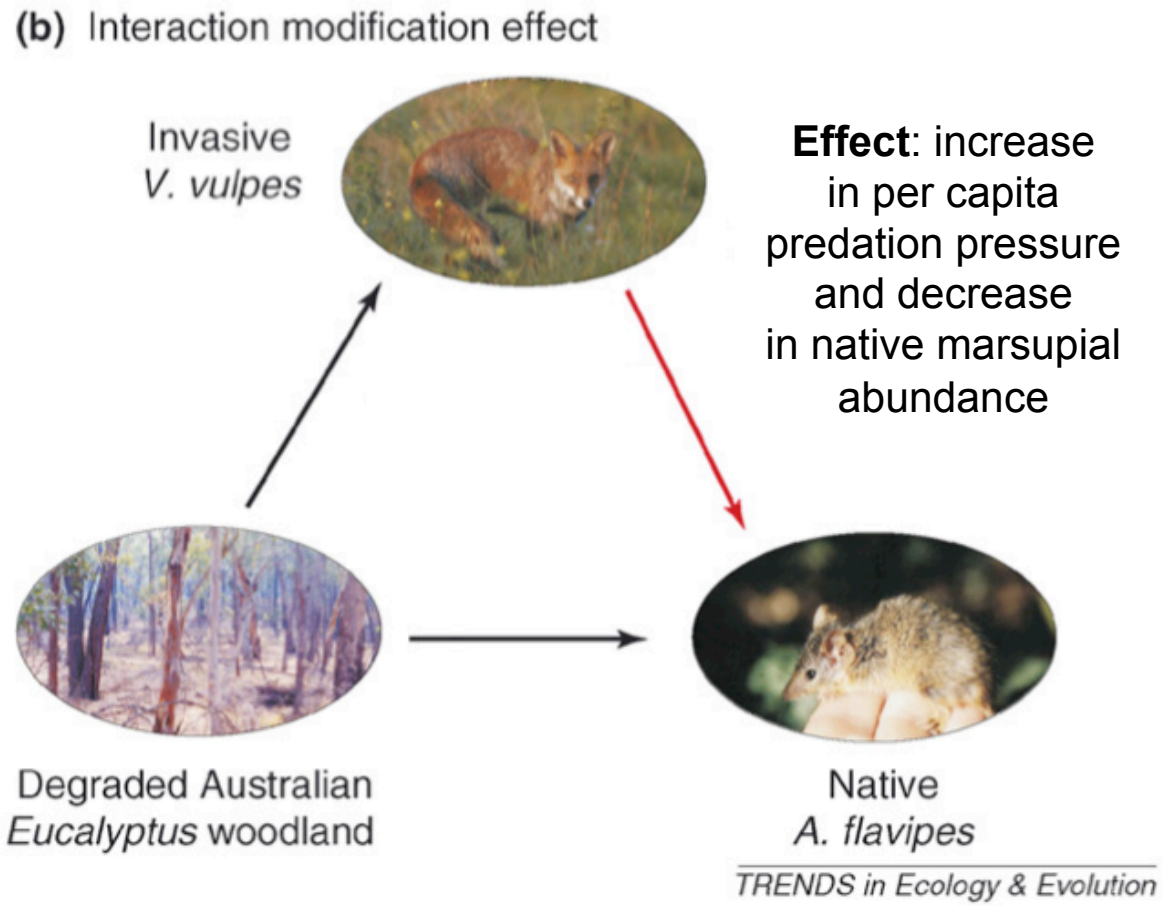
- Invasive species
  - Have contributed to 40% of all animal extinctions for which the cause is known since the 17th century



- The dodo (*Raphus cucullatus*)
  - Flightless bird endemic to Indian Ocean island of Mauritius (3 ft tall, 40 lbs)
  - Extinct by mid-17th century
  - Humans destroyed forest habitat
  - Ground nests destroyed by *invasive* cats, rats, and pigs

Czech and Krausman (1997)

Habitat Modification and Invasive Species Effects



Didham et al. (2007) *TREE*

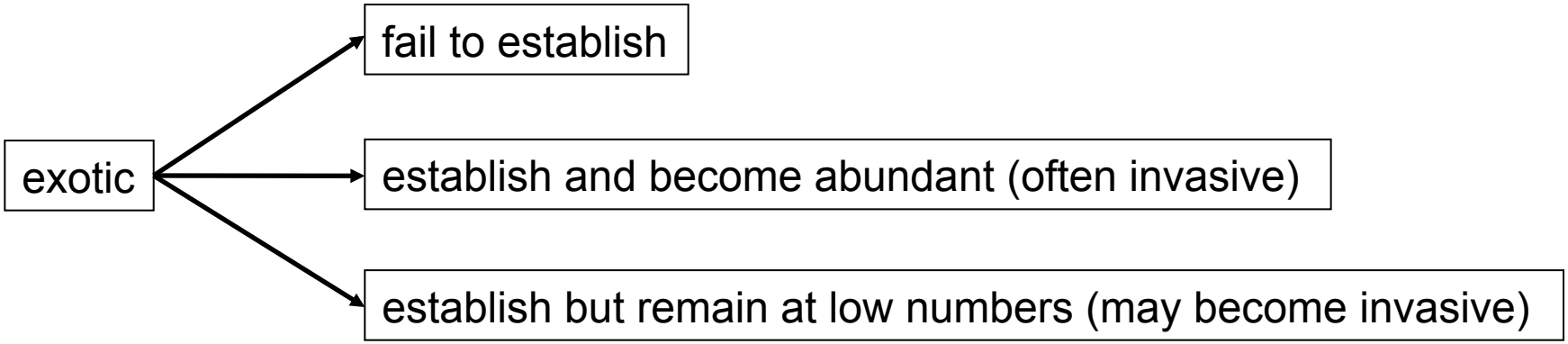
Ecology of Invasions

- Most exotic species do not survive and establish themselves
  - lack necessary adaptations
  - unfamiliar with prey (or any resources), predators

Sih et al. (2010) *Oikos*

Ecology of Invasions

- Of those that establish, few trigger economic or environmental changes
  - only about 15% of establishments
  - i.e., most exotic species do not become invasives



Sih et al. (2010) *Oikos*

Characteristics of Invasives

- Abundant with large native range
- Tolerant of a wide range of environmental conditions
- Generalist diet
- Originate from areas with diverse biota
  - why?

Characteristics of Invasives

- Abundant with large native range
- Tolerant of a wide range of environmental conditions
- Generalist diet
- Originate from areas with diverse biota
  - why? equipped to compete
- Natural population controls not present
  - predators, disease, competition
- ***r*-selected** life history traits

The Burmese Python: Bane of The Everglades

Python molurus bivittatus

The Everglades Python Population: A Growing Problem

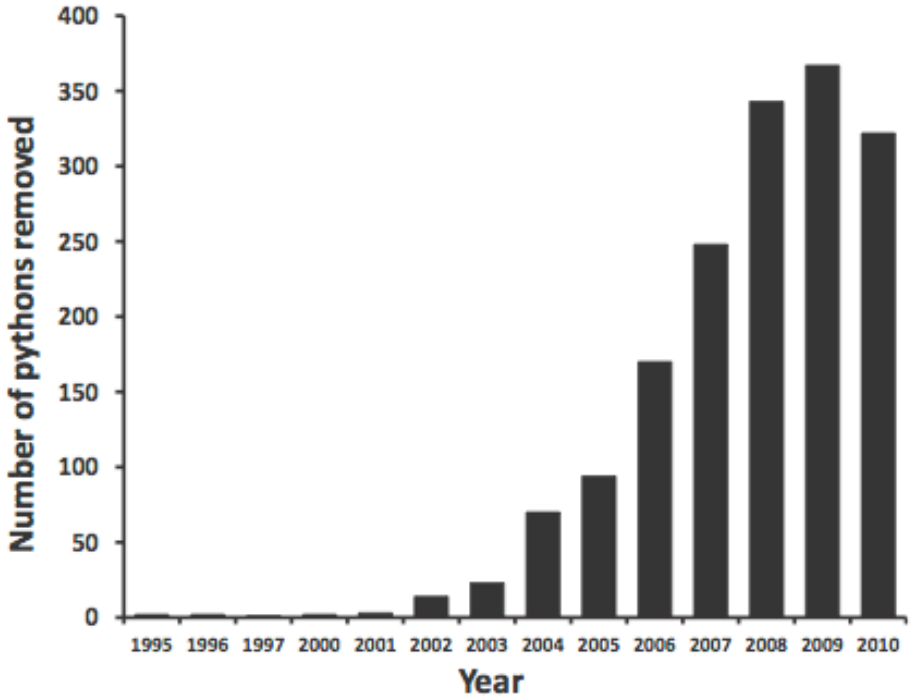
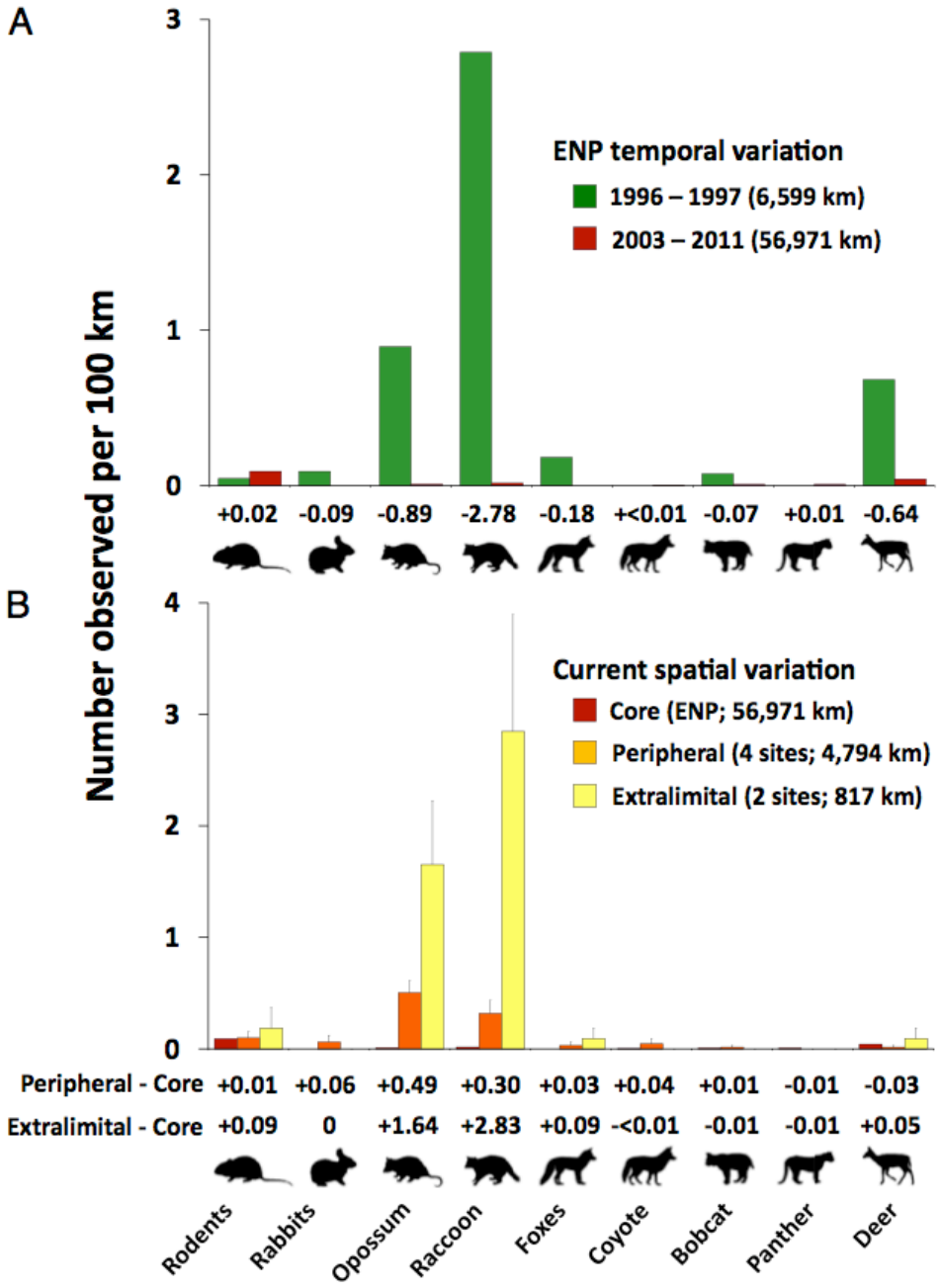


Fig. 2. Python removals from ENP and its environs from 1995–2010. Note that data include captures resulting from opportunistic encounters of pythons and thus are not corrected for effort. The slight decrease in numbers of pythons captured during 2010 may be the result of a severe freeze in South Florida during January of that year (43).

Dorcas et al. (2011) *PNAS*



- Everglades mammals
  - on the decline since pythons became established
  - especially in the park's core, where pythons are well established

Fig. 4. Temporal and spatial variation in mammal abundances in South Florida. (*A*) Temporal variation in mammal-encounter rates in ENP, as reflected in distance-corrected road survey counts (live and roadkill) before (1996–1997) and after (2003–2011) pythons became common. Numbers below bars represent the change in number of observations/100 km for each species or group. (*B*) Current (2008–2011) spatial variation in mammal-encounter rates as reflected in distance-corrected road survey counts in core (southern ENP), peripheral, and extralimital regions of python range; data for one of the two extralimital sites were taken from Holbrook and Chesnes (21). Pythons have been recorded in the core region for at least a decade and in peripheral locations more recently. Numbers below bars represent the change in number of observations/100 km for each species or group for peripheral locations vs. core python habitat (*Upper*) and extralimital sites vs. core python habitat (*Lower*). Errors bars represent SEM.

Dorcas et al. (2011) *PNAS*

- Nutria (*Myocastor coypus*)
  - also known as the coypu
  - small (5-9 kg), semi-aquatic rodent
  - indigenous to South America
- Diet
  - herbivorous
  - feed on stems and roots of riparian vegetation
- Reproduction
  - polyestrous
  - up to 3 litters per year
  - up to 13 offspring per litter
  - fecund!

Range

Fig. 2. Range of the nutria introduced in North America.

Introduced to USA in 1930s for fur farming, then escaped into nearby wetlands

Introduced range in USA includes the Pacific Northwest

A True Invasive

- Why?
  - Adaptable
    - can alter its foraging behavior to exploit novel food sources
    - e.g., becomes diurnal if daytime food is available
  - Voracious
    - wasteful feeders: destroy vegetation while consuming a small part of each plant (10%)
  - Fecund
    - one female can produce as many as 39 young/year
  - Aggressive
    - displace native competitors (beavers)
  - Damage riparian areas


Damage: cleared vegetation


Damage: erosion, mud slides into water


Damage: riparian burrows, shoreline collapse