A Tribute to B.J. Le Boeuf

Science from me:
The importance of undertanding instability in ecology

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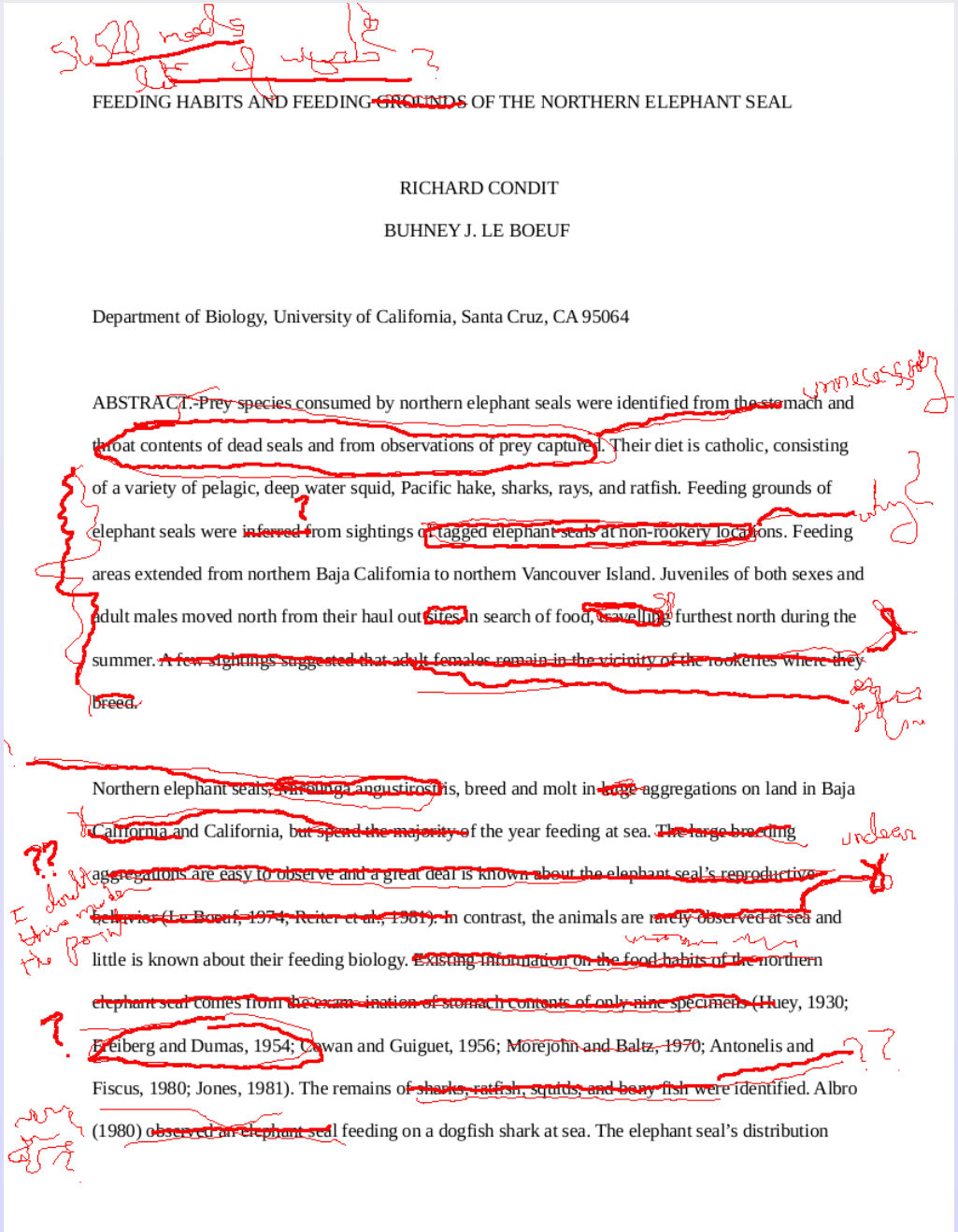
Things I learned from Burney Le Boeuf

Writing

Grant proposals
Wine
Abalone

Things I learned from Burney Le Boeuf



FEEDING HABITS AND FEEDING GROUNDS OF THE NORTHERN ELEPHANT SEAL

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ABSTRACT: Prey species consumed by northern elephant seals were identified from the stomach and throat contents of dead seals and from observations of prey captured. Their diet is catholic, consisting of a variety of pelagic, deep water squid, Pacific hake, sharks, rays, and ratfish. Feeding grounds of elephant seals were inferred from sightings of tagged elephant seals at non-rookery locations. Feeding areas extended from northern Baja California to northern Vancouver Island. Juveniles of both sexes and adult males moved north from their haul out sites in search of food, travelling furthest north during the summer. A few sightings suggested that adult females remain in the vicinity of the rookeries where they breed.

Northern elephant seals, Mirounga angustirostris, breed and molt in large aggregations on land in Baja California and California, but spend the majority of the year feeding at sea. The large breeding aggregations are easy to observe and a great deal is known about the elephant seal's reproductive behavior (Le Boeuf, 1974; Reiter et al., 1981). In contrast, the animals are rarely observed at sea and little is known about their feeding biology. Existing information on the food habits of the northern elephant seal comes from the examination of stomach contents of only nine specimens (Huey, 1930; Freiberg and Dumas, 1954; Cowan and Guiguet, 1956; Morejohn and Baltz, 1970; Antonelis and Fiscus, 1980; Jones, 1981). The remains of sharks, ratfish, squids, and bony fish were identified. Albro (1980) observed an elephant seal feeding on a dogfish shark at sea. The elephant seal's distribution

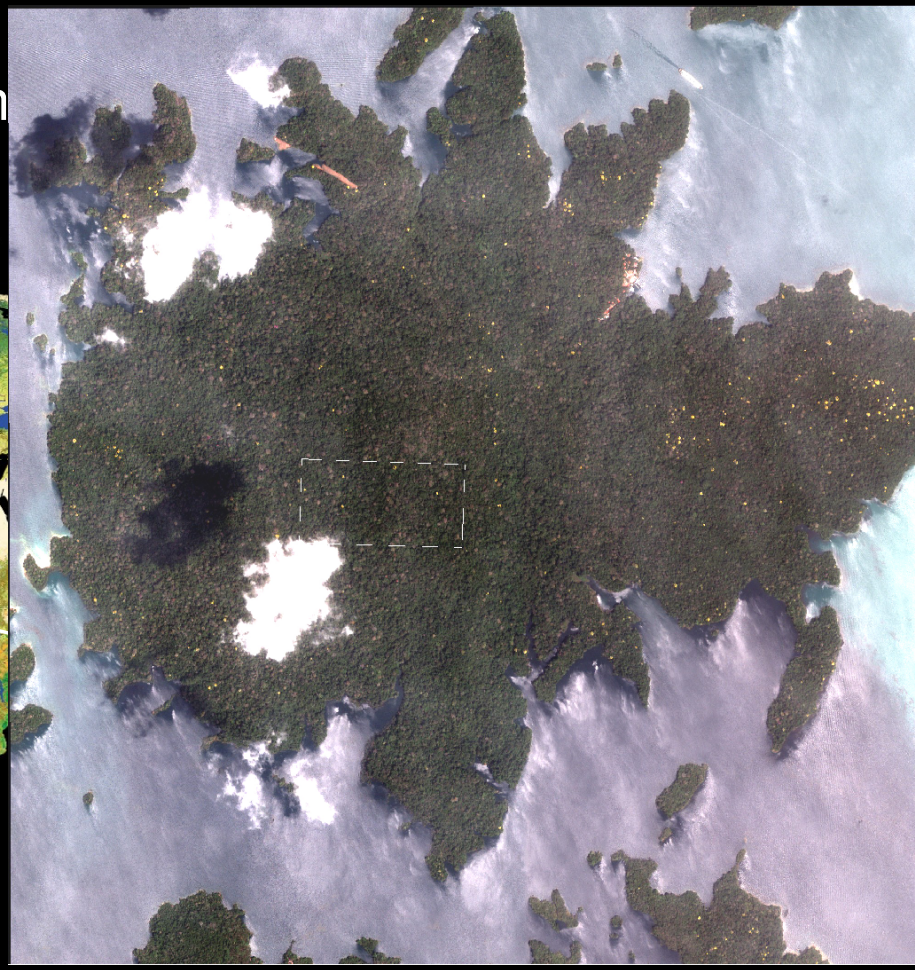
An artist's rendition of 1981-2 writing collaboration with Burney

Acknowleding lack of stability in ecology

A theme merging tree and seal work

Diversity and abundances in trees
Regulation of elephant seal populations

SIGEO-CTFS: A network of forest cen



33 completed plots have data in a common database format on one of 4 servers

-- 3,802,654 trees (ie 3.80×10^6)

-- 9,073,531 measurements (ie 9.07×10^6) in 89 plot censuses

Importance of Steve Hubbell's the neutral theory

- is not neutrality

Importance of Steve Hubbell's the neutral theory

- is not neutrality
- it's the focus on
  - species input as cause of diversity
  - extinction
  - stochastic populations of individuals

Tracking populations through time: Forest Trees

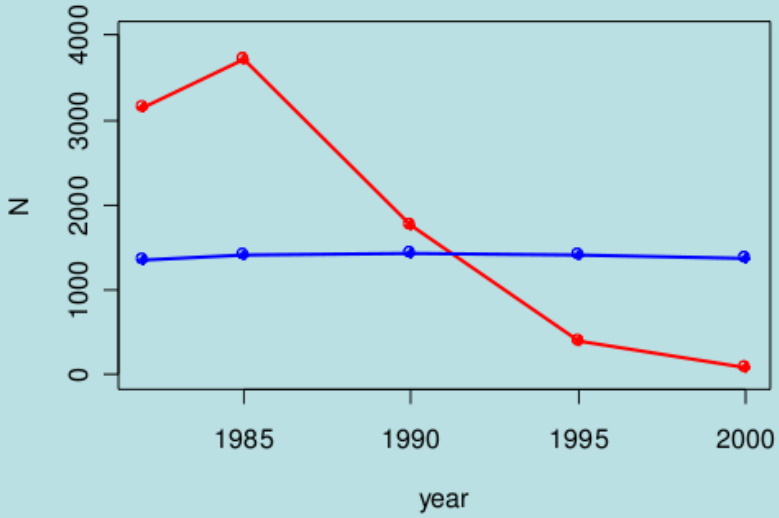
Are tree populations stable through time?

--Determine how much a population would change under random drift (random mortality and recruitment)

--Estimate a community-wide distribution of rates of population change as a measure of forest stability (correcting for random change)

--Compare stability of different forests

--Compare stability of rare and common species



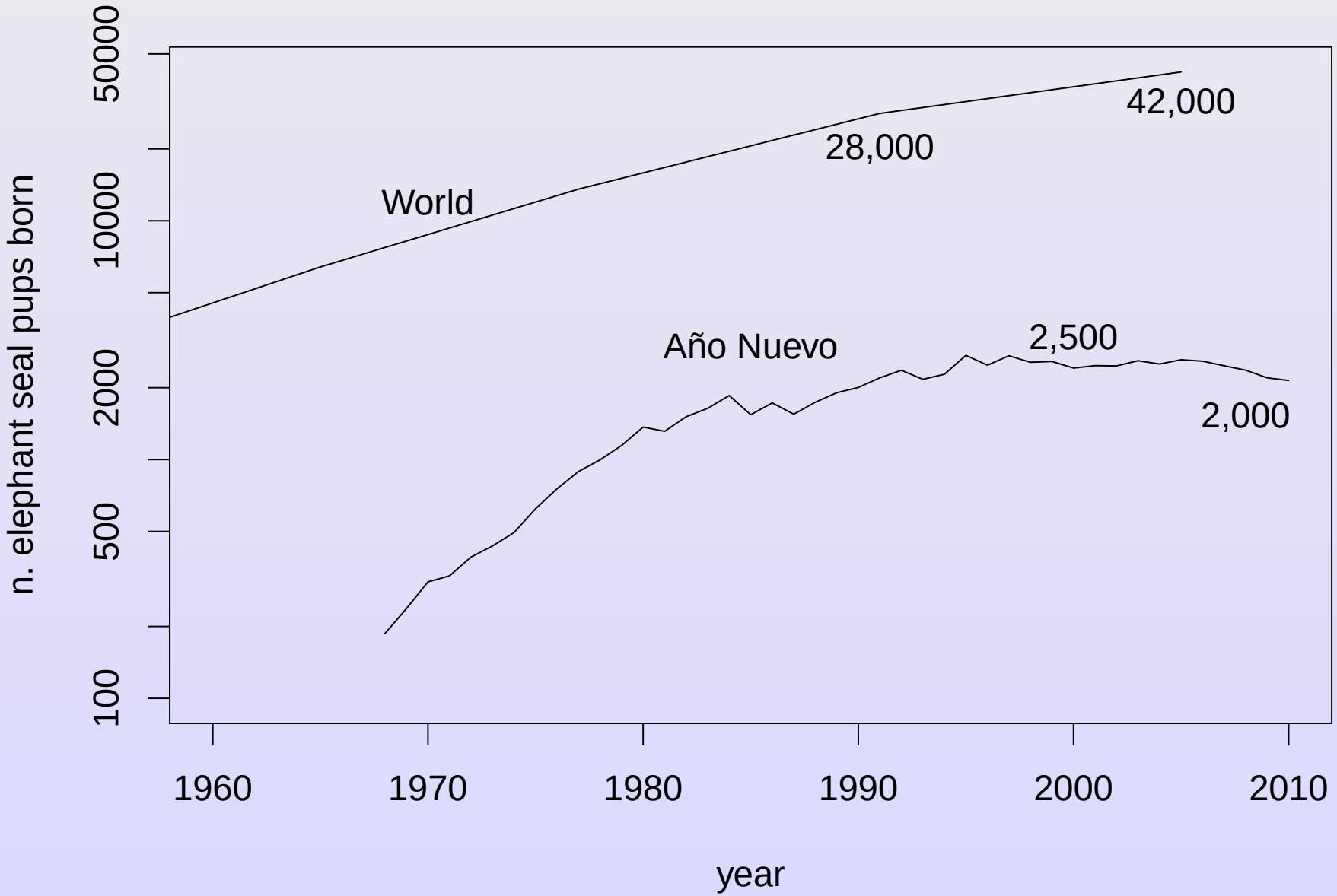
Prioria copaifera, BCI

$\lambda = 1.001$

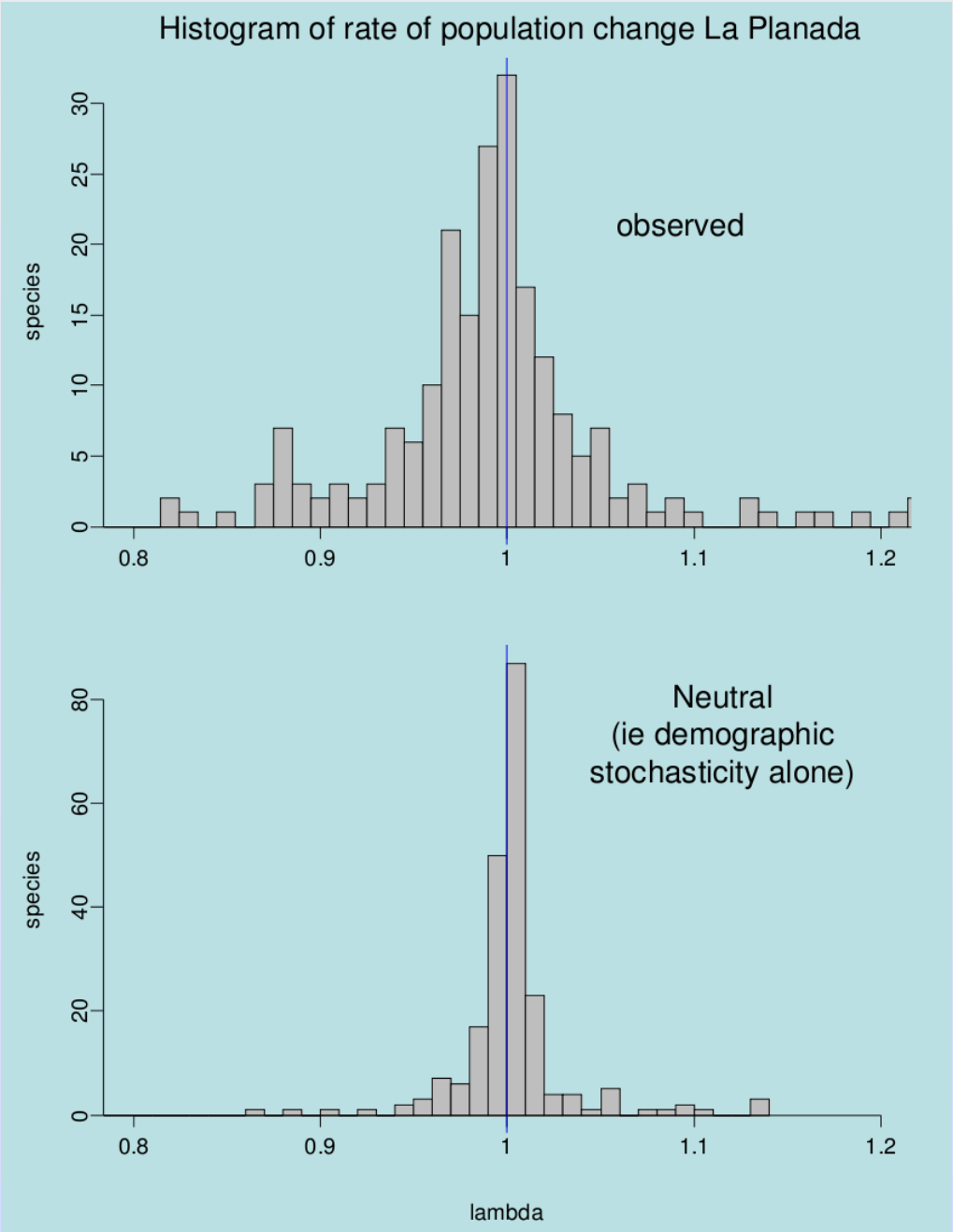
Piper cordulatum, BCI

$\lambda = 0.819$

Tracking populations through time: Elephant seals

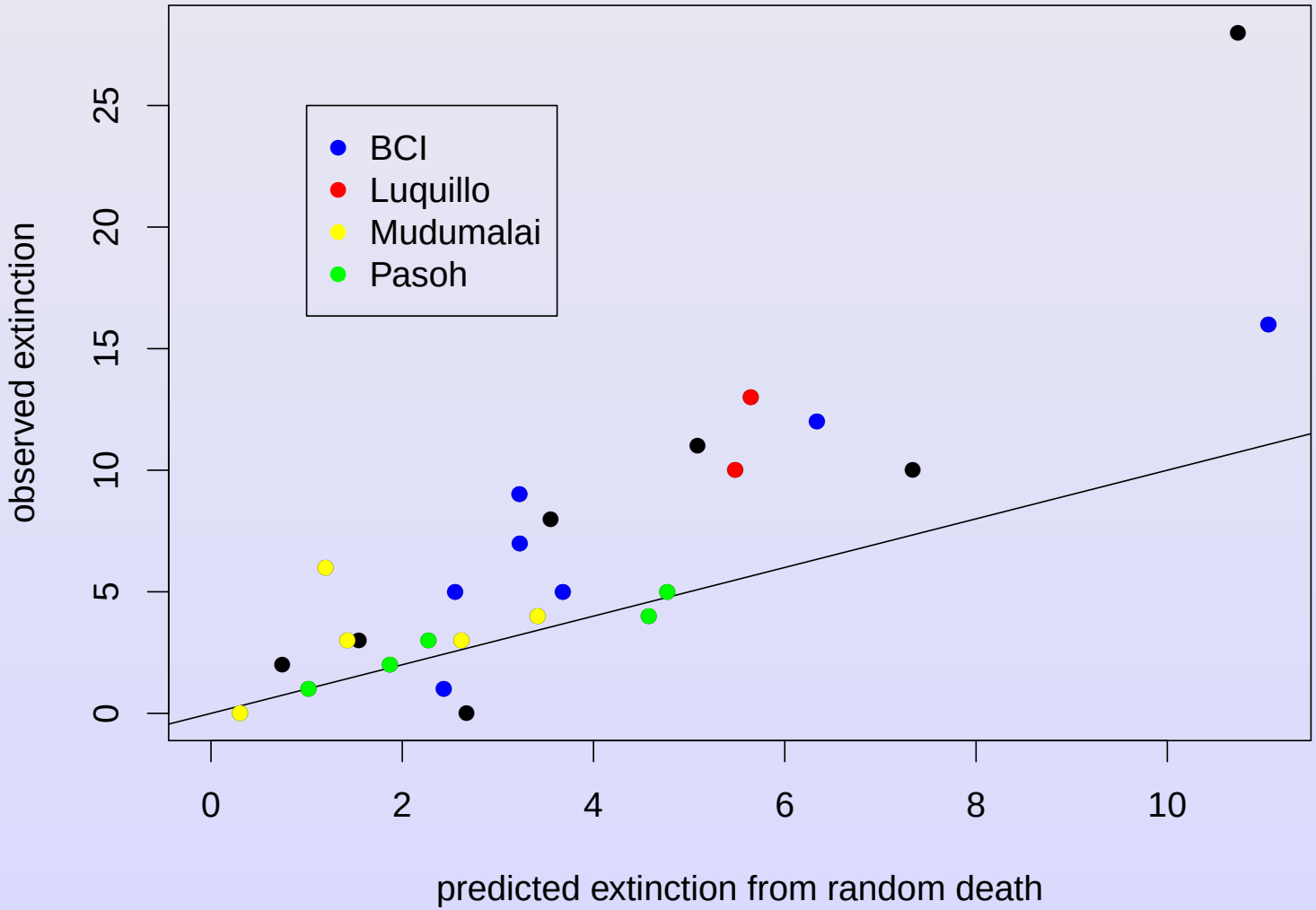


Tracking populations through time: Many species



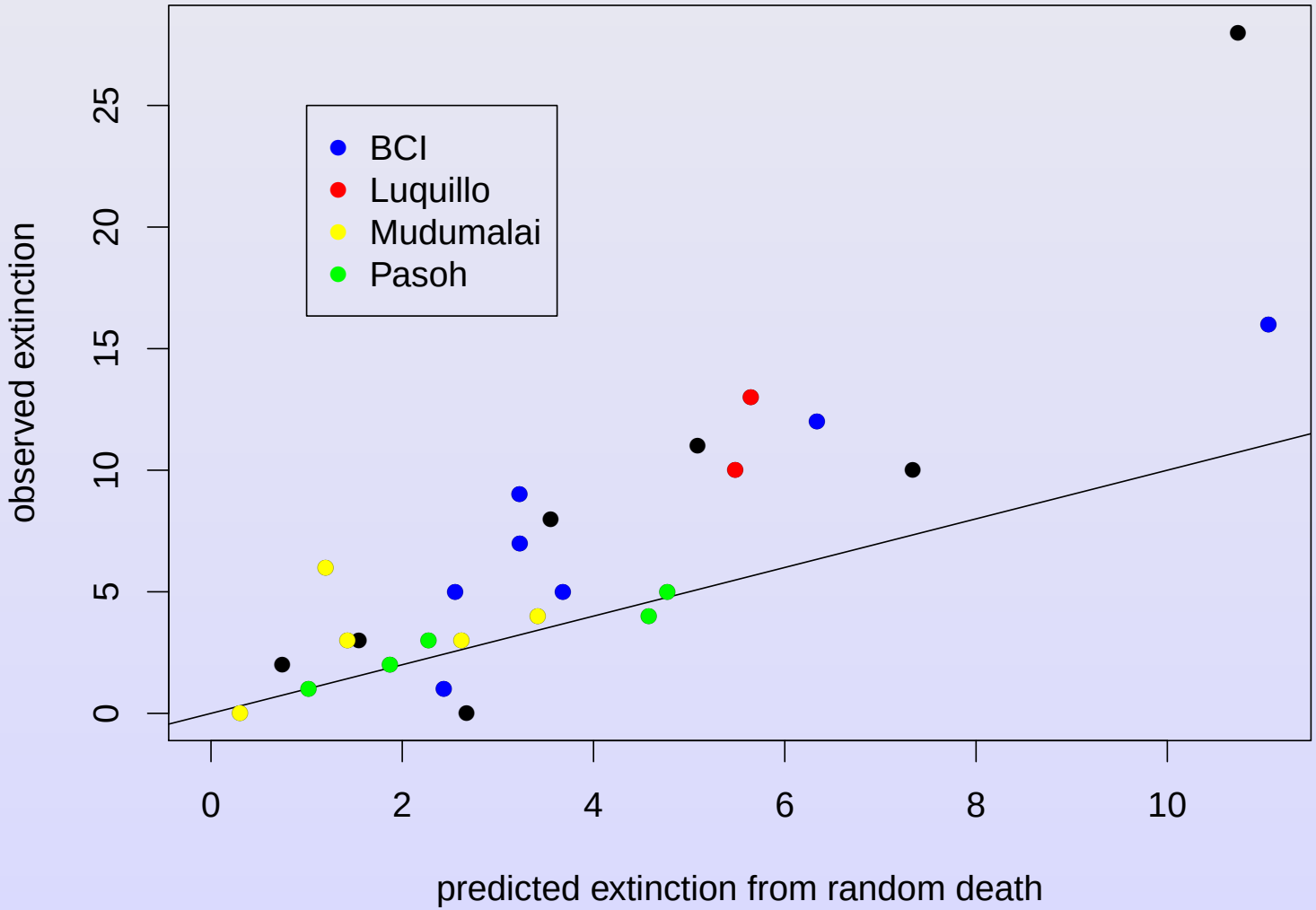
- Abundances fluctuate more than random
- Rare species are at risk

Observing extinction (local extinction!)



- it must balance species input
- observed higher than chance expectation

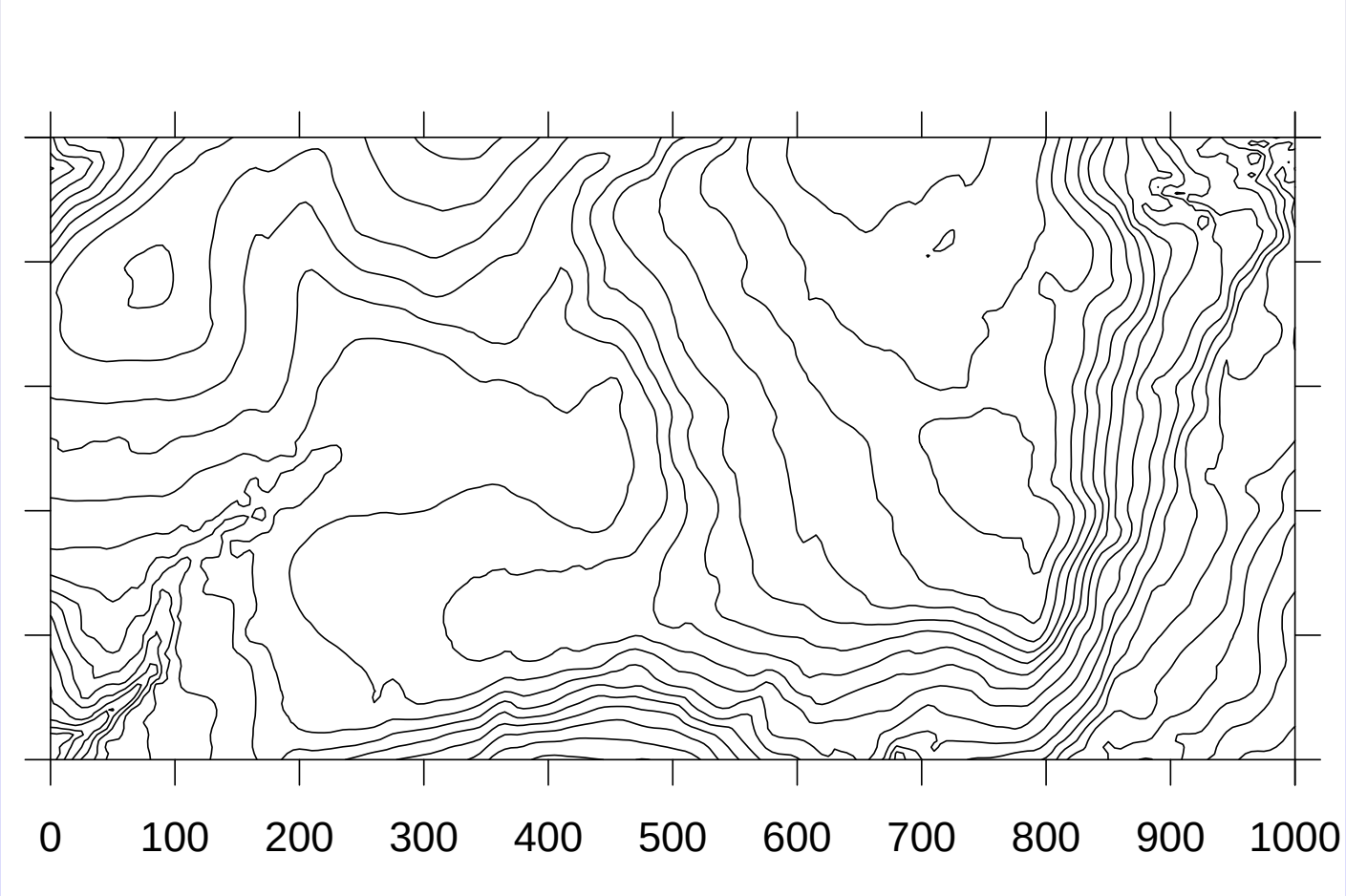
Observing extinction (local extinction!)



- they should be lower under stabilizing dynamics

Observing species input

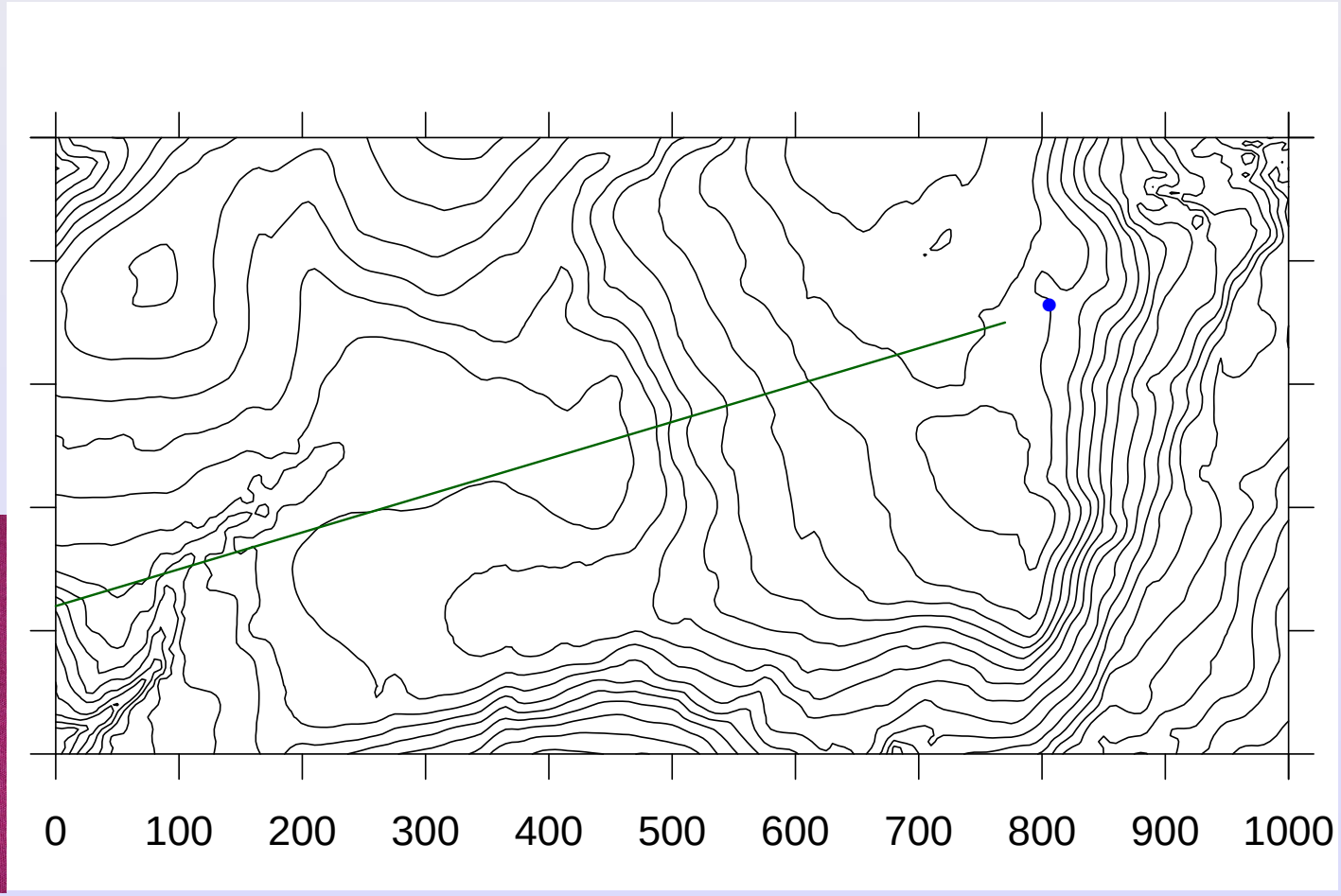
Rauvolfia littoralis in 1990



Observing species input

Rauvolfia littoralis in 1995

The species had never been seen anywhere on BCI before



Species turnover is routine

Take-home message:

Species turnover is observed and maintains diversity
Local stabilizing forces do not maintain diversity

Population fluctuation: elephant seals

The branding study at Año Nuevo (Le Boeuf, Reiter, Morris)

- 1985-1987 cohorts
- 372 weaners branded
- Unlike tags, brands are near permanent

Branded elephant seals

Branded elephant seals

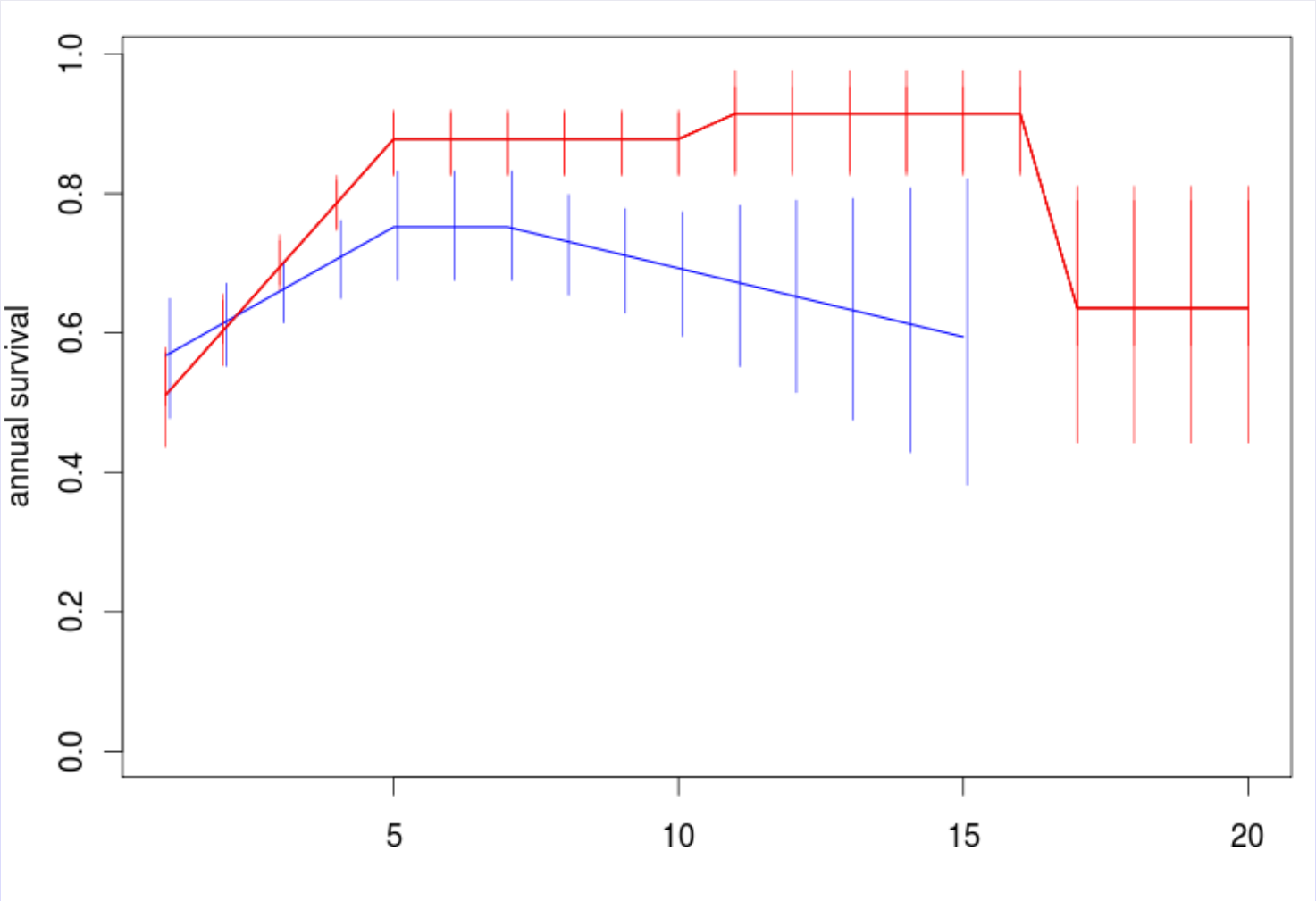
Population regulation: elephant seals

Le Boeuf and Reiter 20 years ago found low juvenile survival

- 50% die in first year
- Insufficient to maintain Año Nuevo population

Branded cohort survival

Confirms Le Boeuf assertion that Año Nuevo sustained by immigrants



- High female survival
- Senescence evident
- Low juvenile survival

Conclusions

Research agenda of mine...

- Año Nuevo population of elephant seals not stable
- Mainland populations will not persist (too warm?)
- What about Peninsula Valdes?
- Instability key in understanding fluctuations of tree populations
- Importance of dispersal in maintaining populations in trees and seals

Conclusions

... following Le Boeuf's ideas and methods

- Año Nuevo population of elephant seals not stable
- Mainland populations will not persist (too warm?)
- What about Peninsula Valdes?
- Instability key in understanding fluctuations of tree populations
- Importance of dispersal in maintaining populations in trees and seals