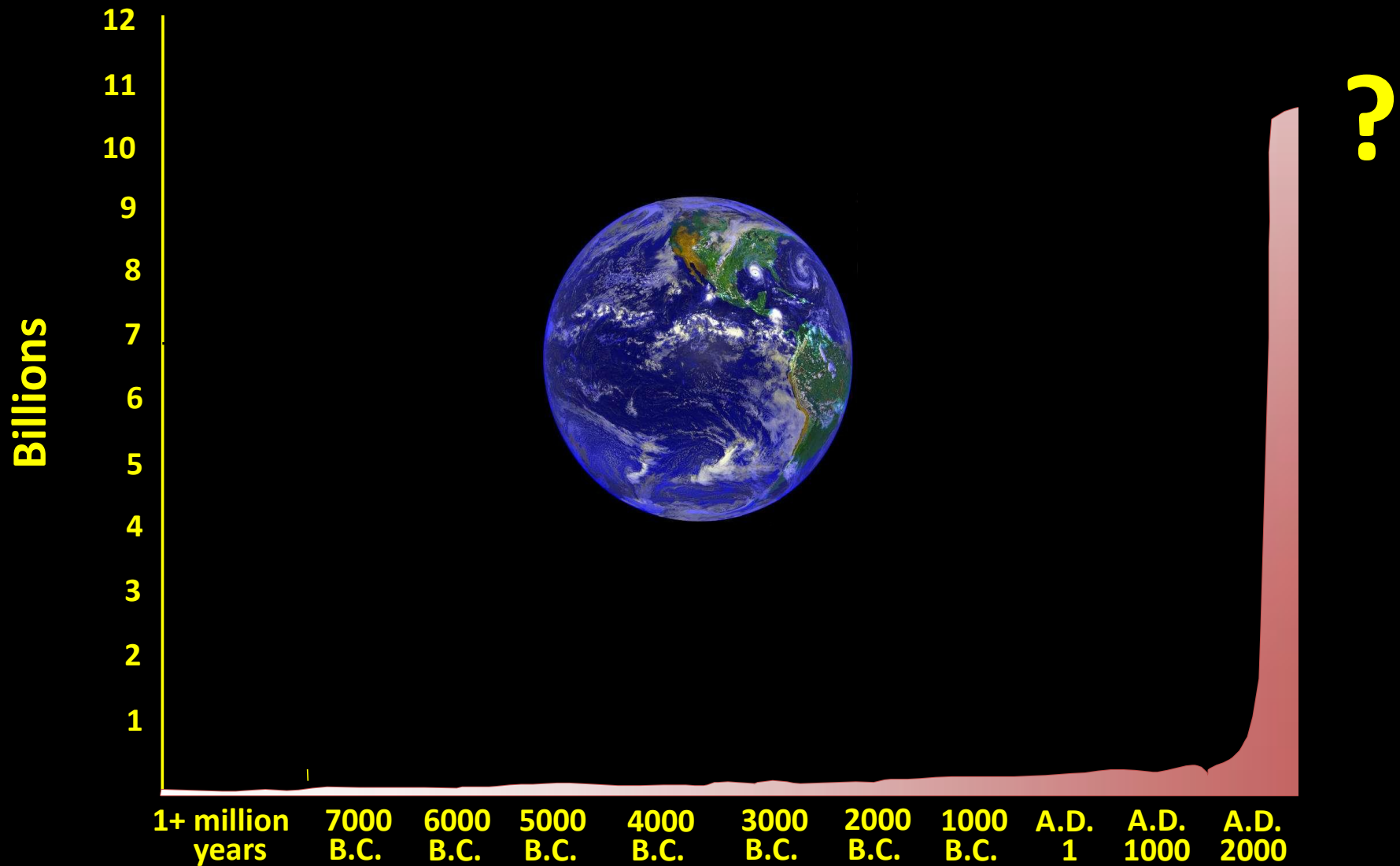


Applied Ecology

Steve Redpath, University of Aberdeen



Human population





Germany: The Melander family of Bargteheide

Food expenditure for one week: 375.39 Euros or \$500.07

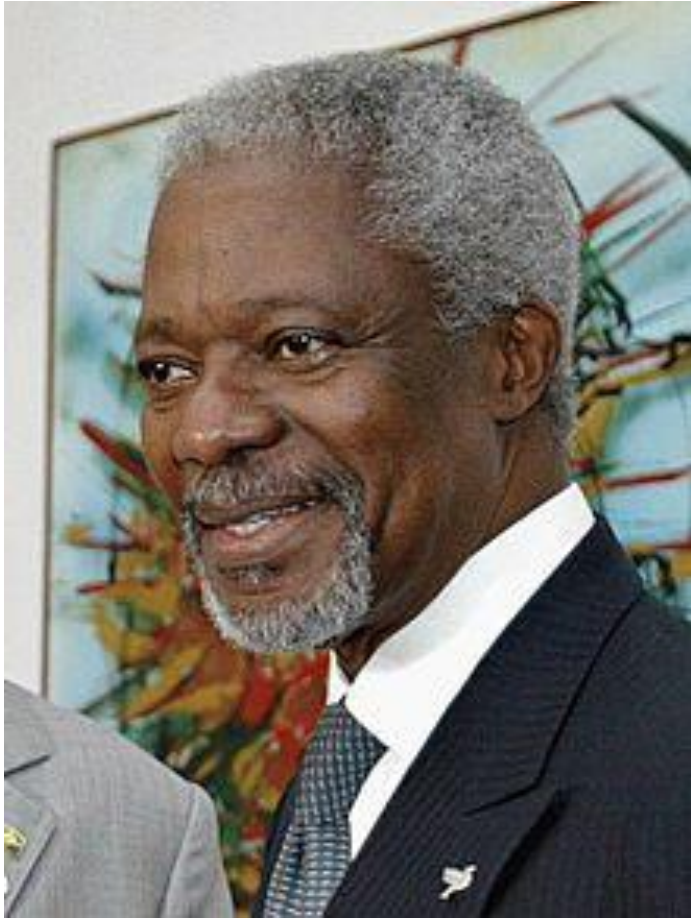
Favorite foods: fried potatoes with onions, bacon and herring, fried noodles with eggs and cheese, pizza, vanilla pudding



Chad: The Aboubakar family of Breidjing Camp

Food expenditure for one week: 685 CFA Francs or \$1.23

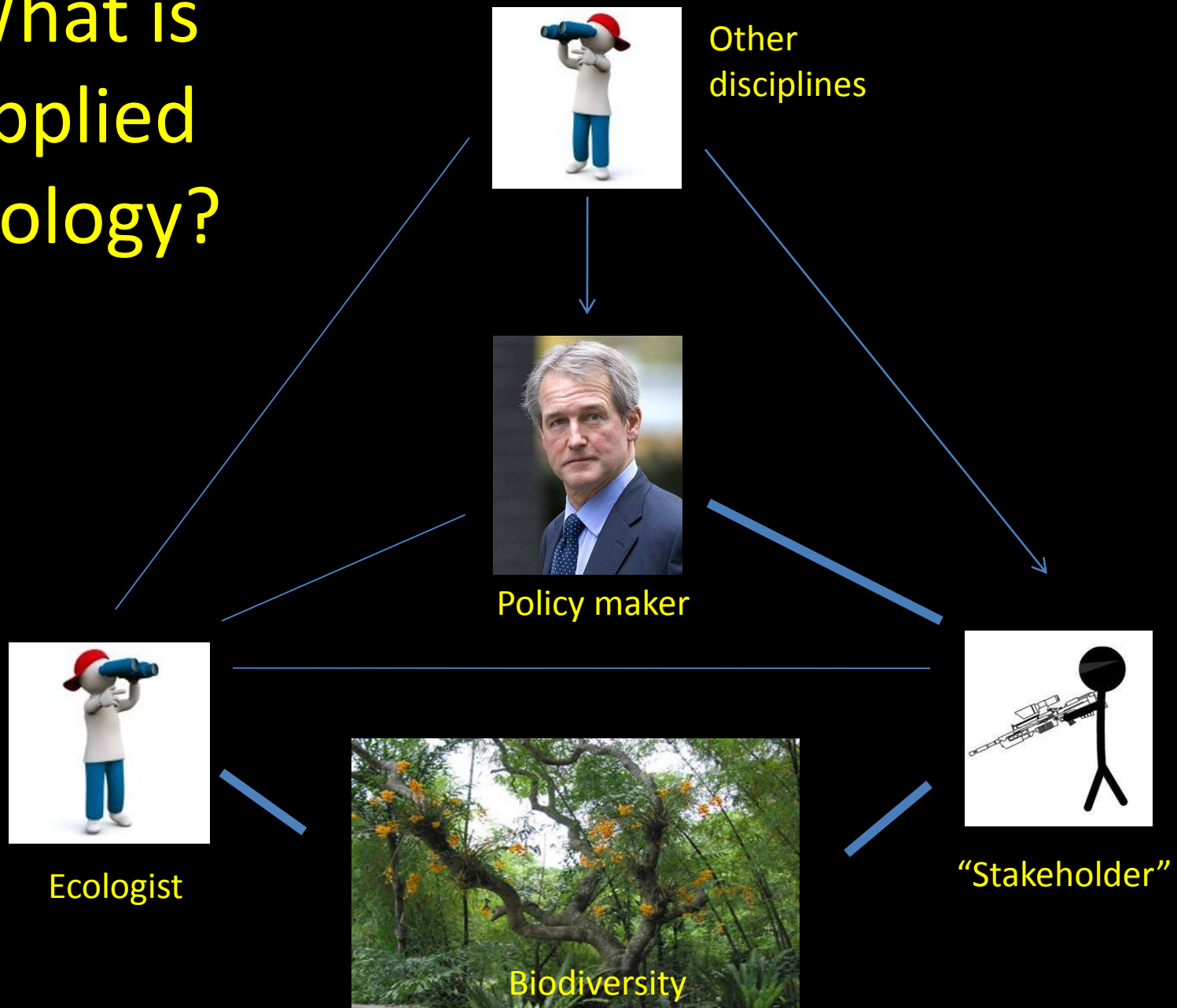
Favorite foods: soup with fresh sheep meat



“Failure to conserve and use biological diversity in a sustainable manner would result in degrading environments, new and more rampant illnesses, deepening poverty and a continued pattern in inequitable and untenable growth.”

Kofi Annan (2005)

What is applied ecology?



What is applied ecology?

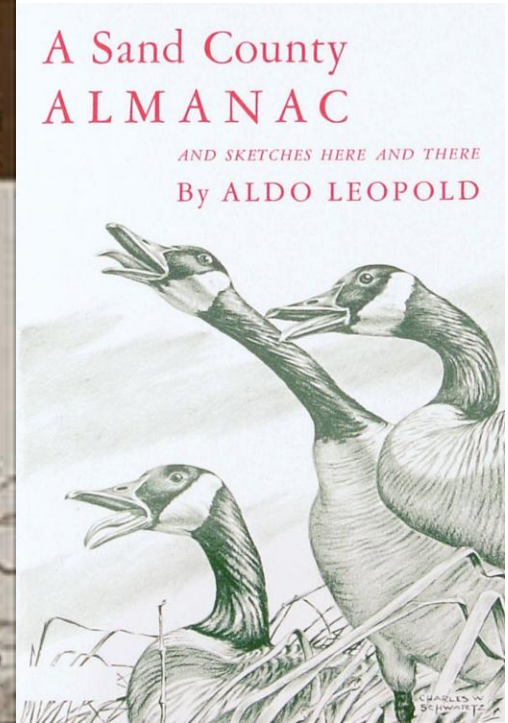
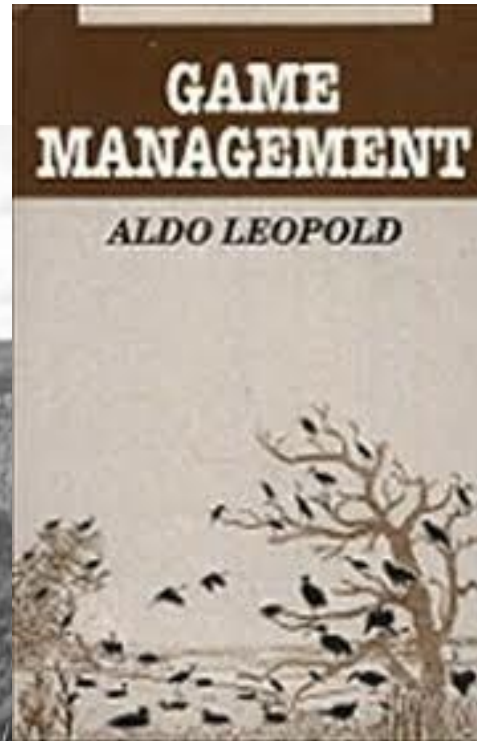
- Applying ecological knowledge to tackle real world problems
 - Sustainable management
 - Identifying & reducing threats
 - Conservation
 - Restoration
- Providing clear, objective evidence for decision makers
- Working with other disciplines
- Working with managers / stakeholders
- Working with policy makers

Tools available

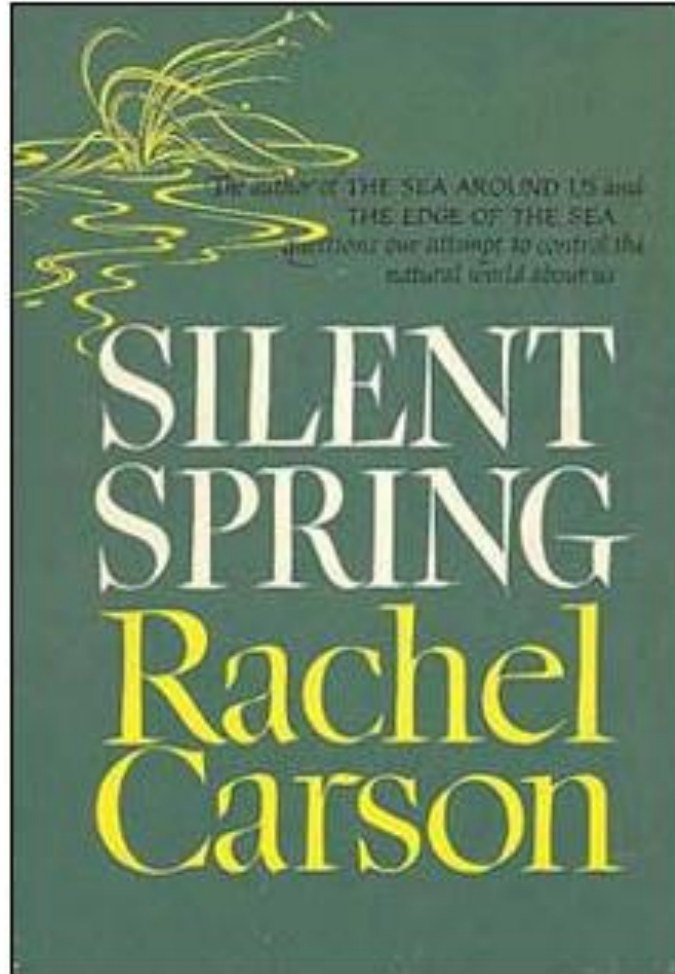
- Modelling
 - Statistical techniques
 - GIS
 - Molecular techniques
 - Experiments
-
- What is missing?

Godfathers & Heroes

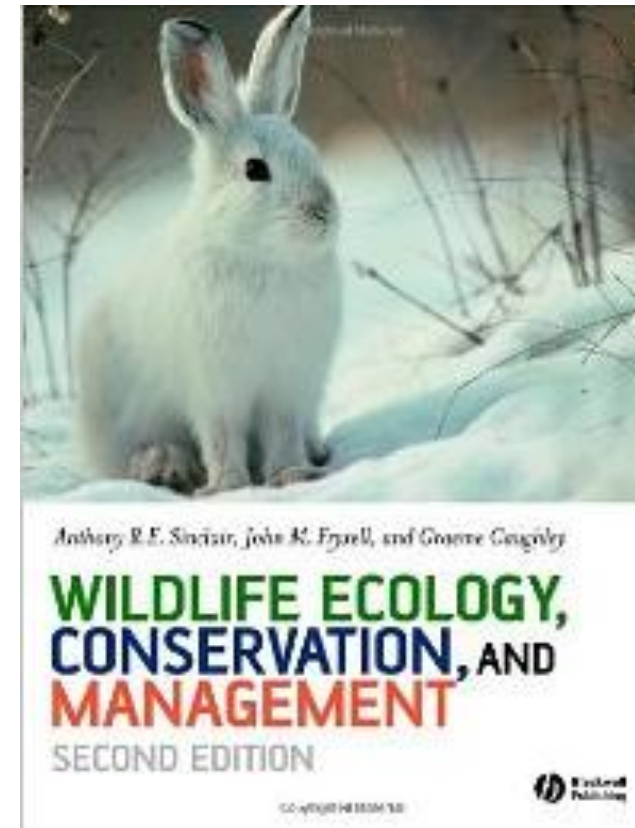
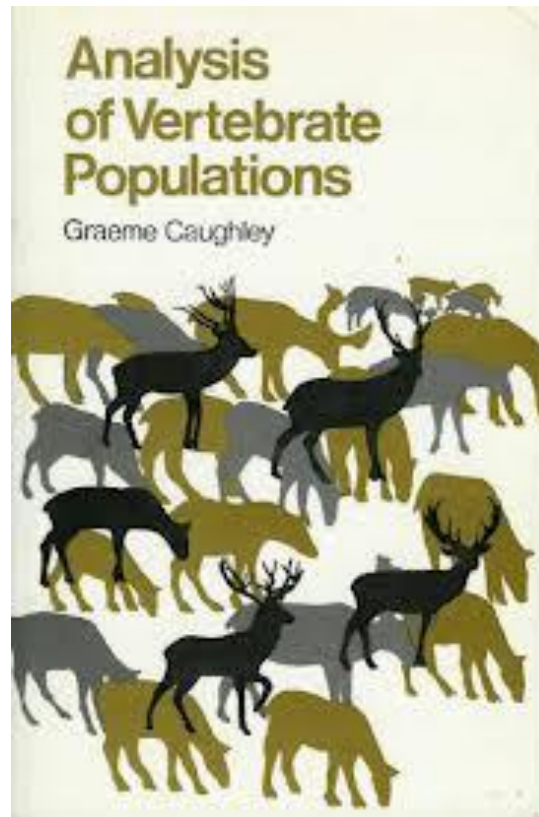
Aldo Leopold



Rachel Carson



Graeme Caughley



Elinor Ostrom



The Evolution of Institutions
for Collective Action



Political Economy
of Institutions and Decisions

Profound communicators



Applied ecology in action

Two examples:

- Impact of predation
- Harvesting strategies
- Working with managers / policy makers

Impact of predation – Hen harriers and Red grouse



Hen Harrier



- 646 pairs in UK.
- Species red-listed & Annex 1 of EU Birds Directive (79/409/EEC).
- Main threat from illegal killing on grouse moors

Red grouse



- Culturally important
- Generates unsubsidised income
- Worth ~£192million* to UK economy p.a. and 1140 full-time jobs
 - * Estimate very uncertain
- Supports internationally valuable ecosystem and associated biodiversity
- Hen harriers perceived as major protected predator

Urgent need to understand impact of harriers on grouse populations

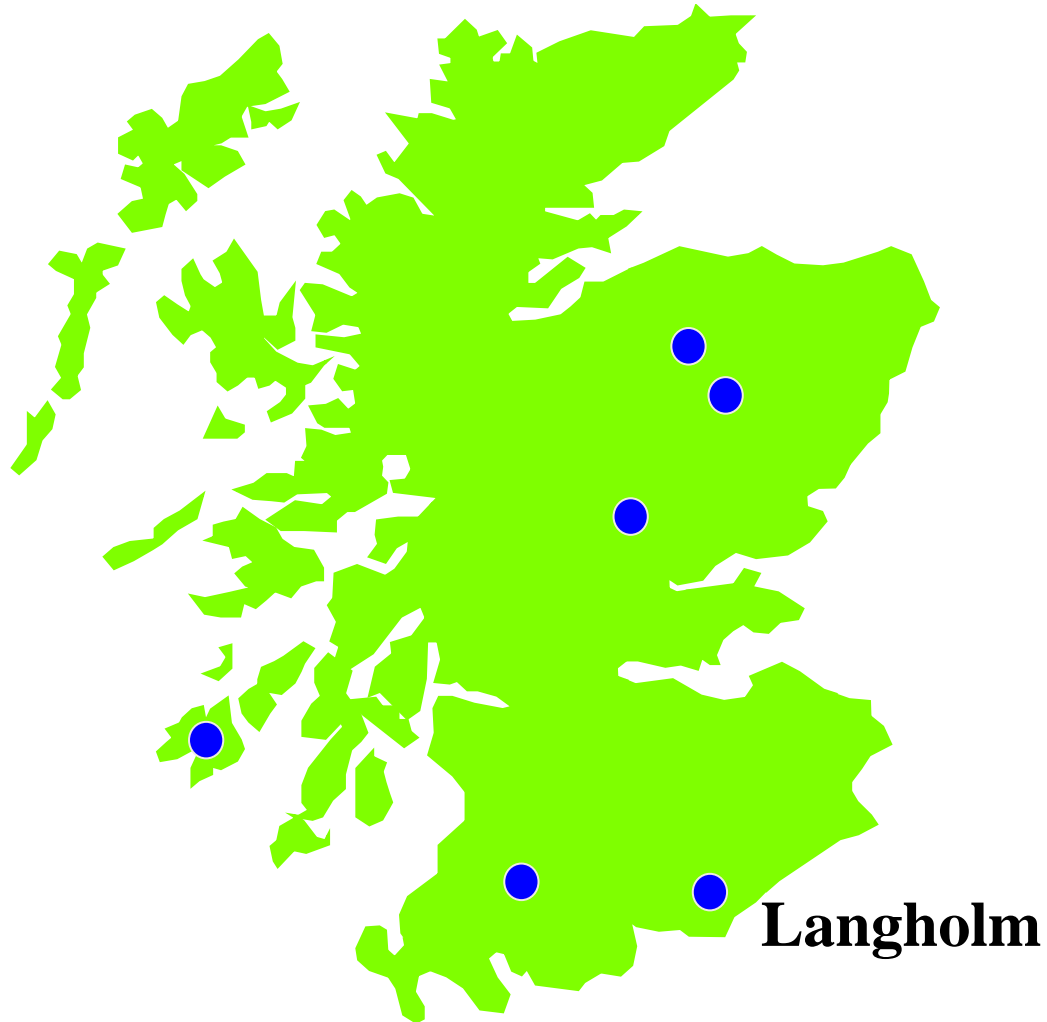


Field evidence

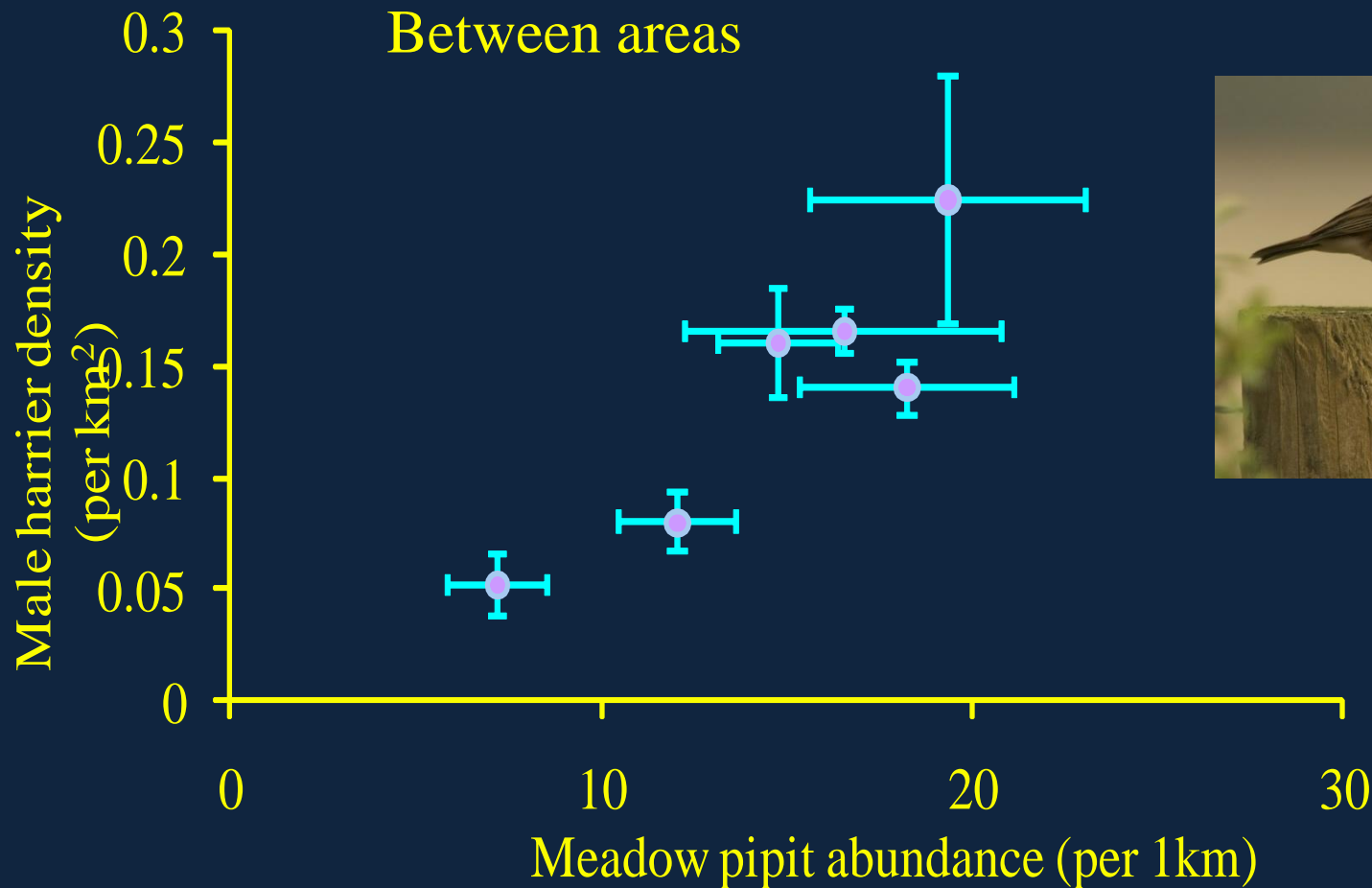
- What influences harrier numbers?
- What influences numbers of grouse killed?
- What impact do harriers have on grouse?



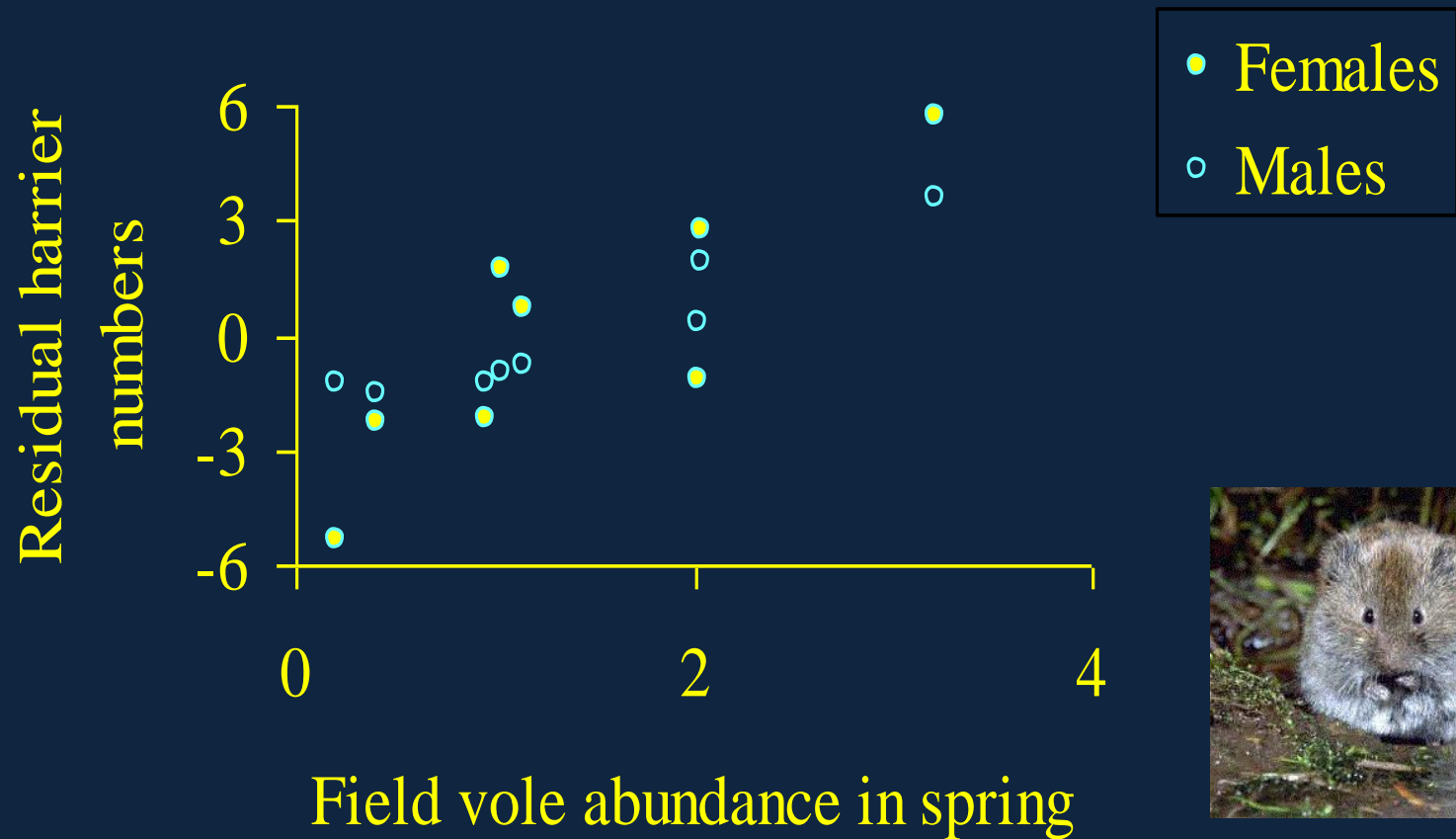
Study Sites



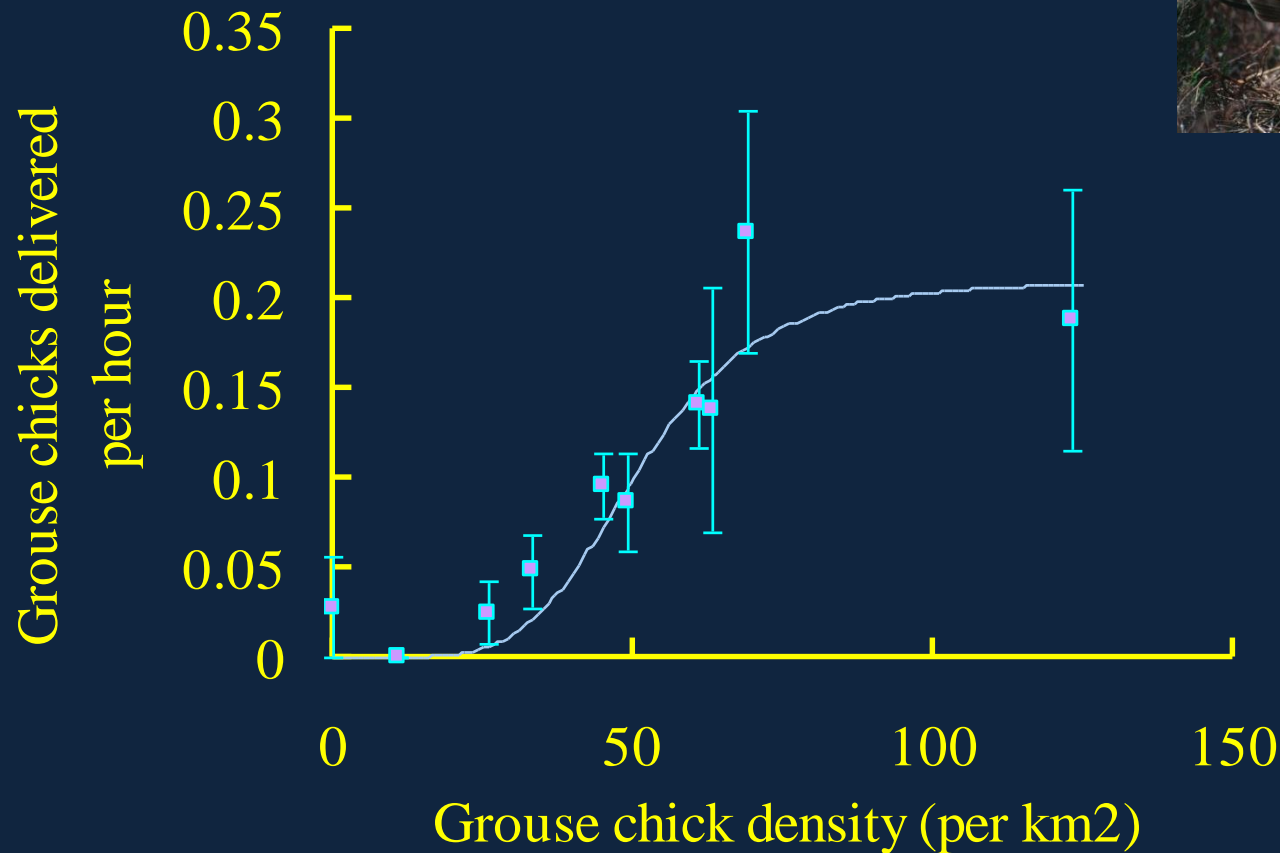
Numerical response



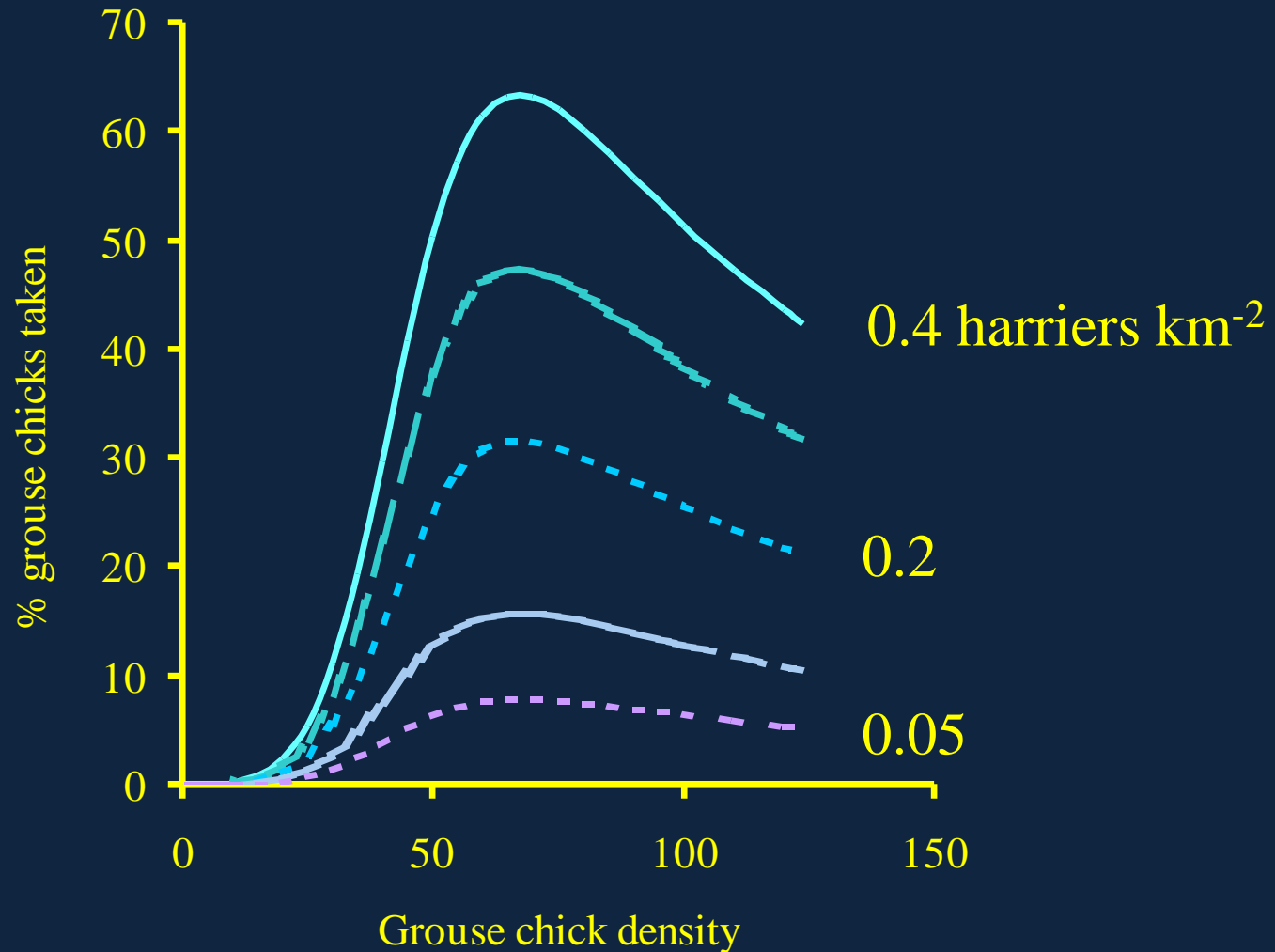
Harriers & voles at Langholm



Functional response



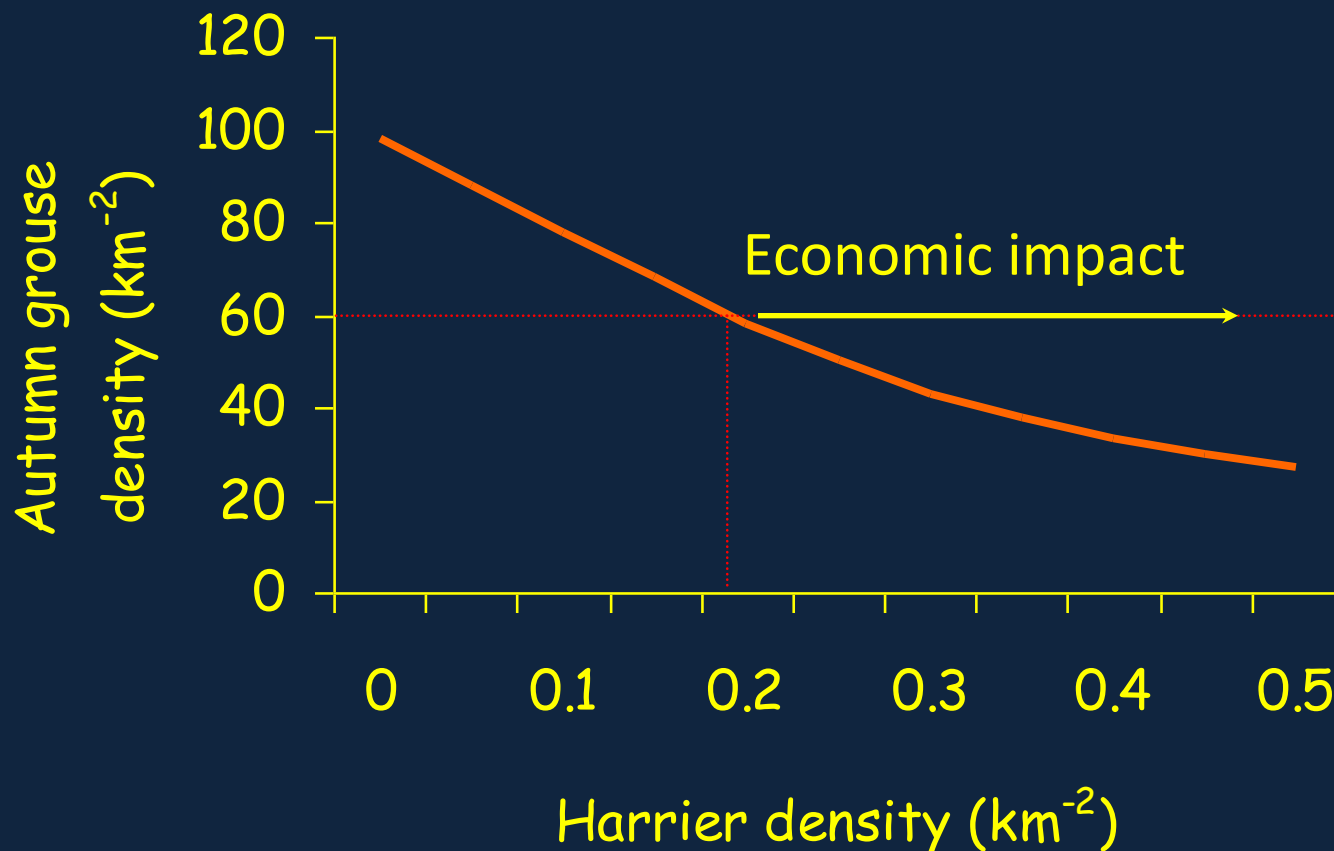
Total response



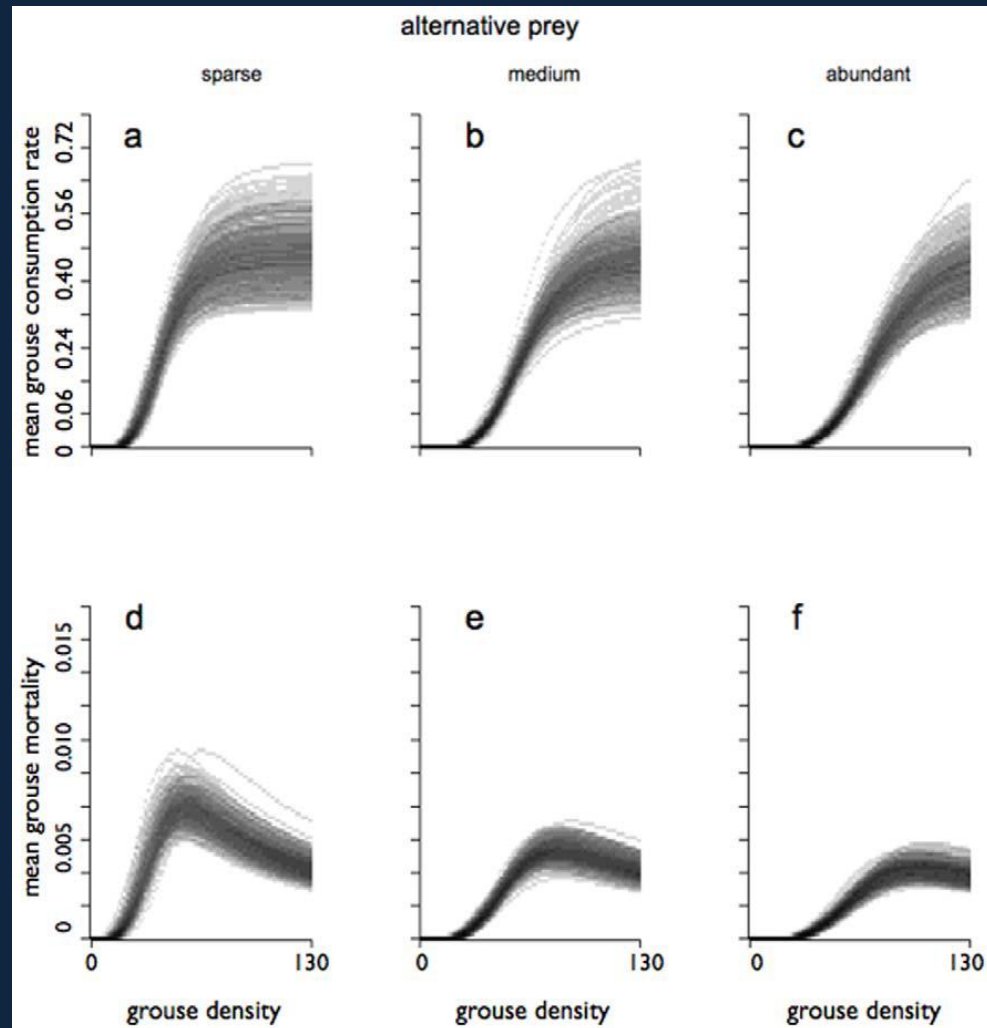
Grouse mortality to raptors

	<u>1995</u>	<u>1996</u>
Live grouse in October (km ⁻²)	46	41
% killed October - April	28%	47%
% killed April - October	30%	39%
% chicks killed	35%	39%

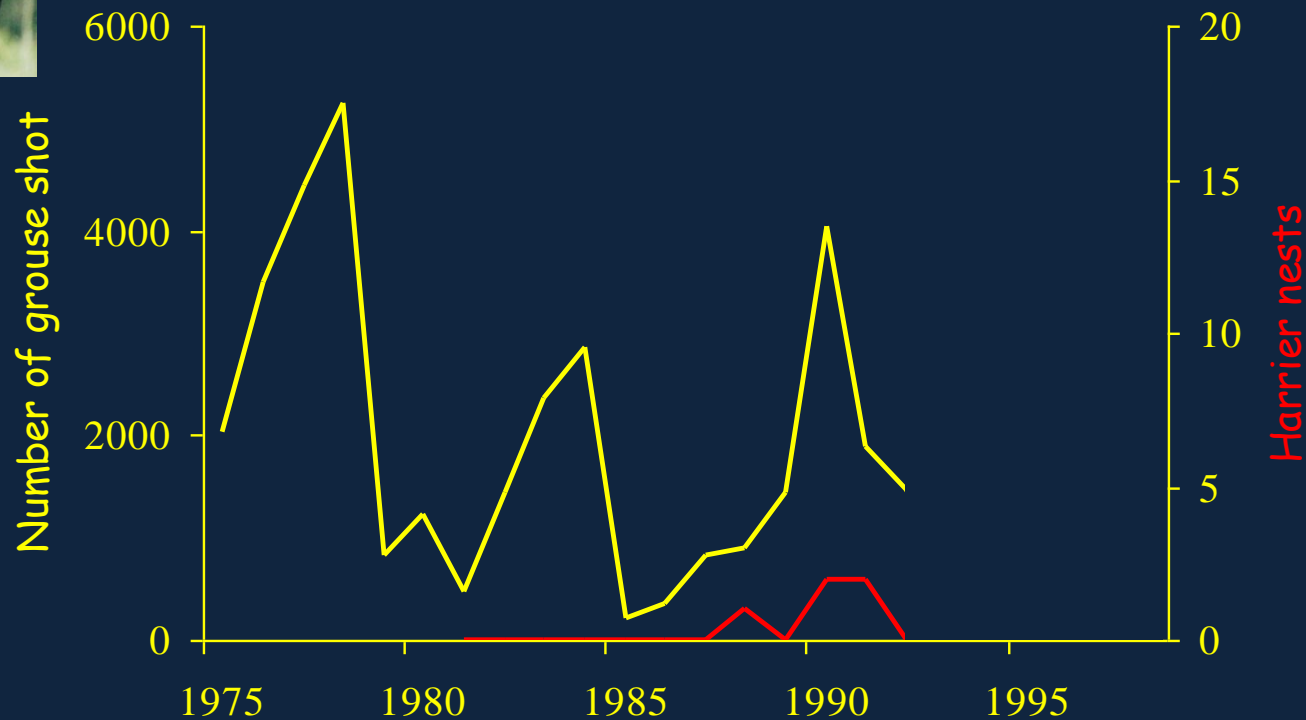
Modelling the impact of harriers on grouse



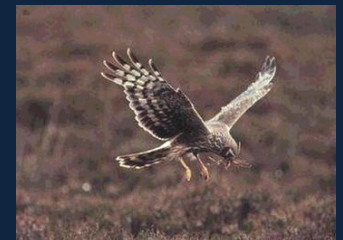
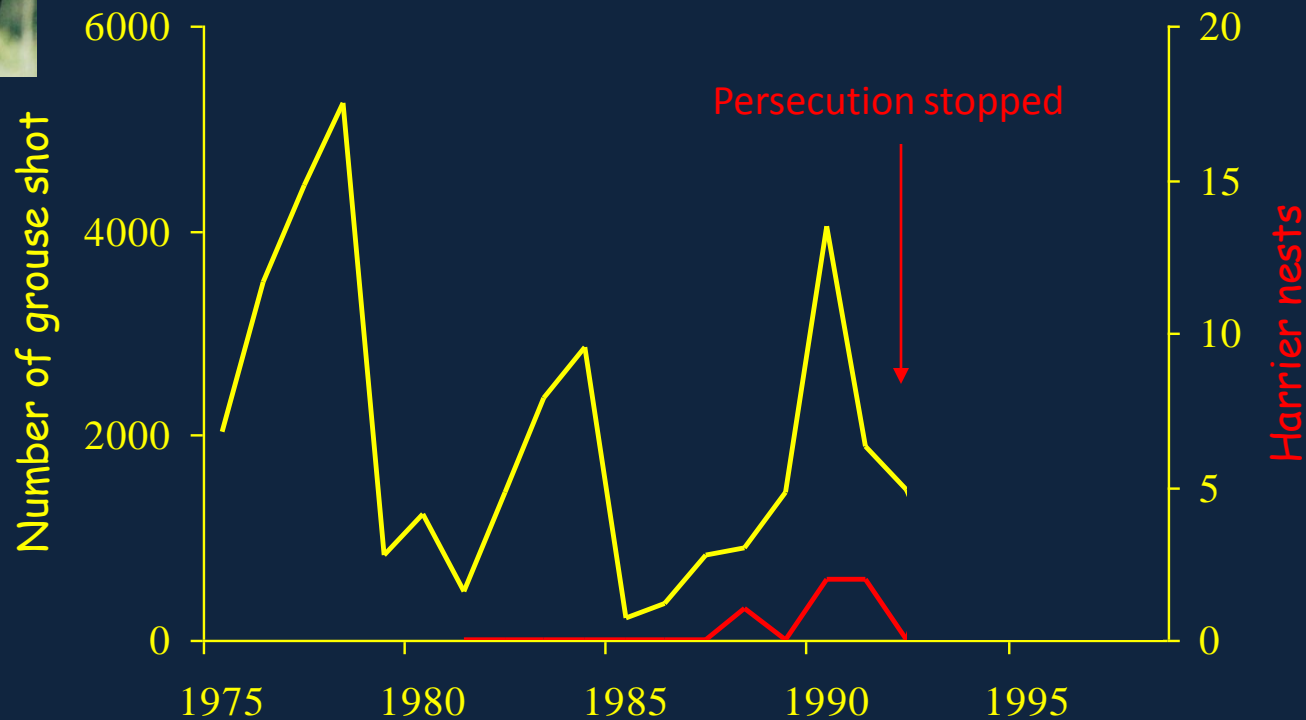
More complicated modelling



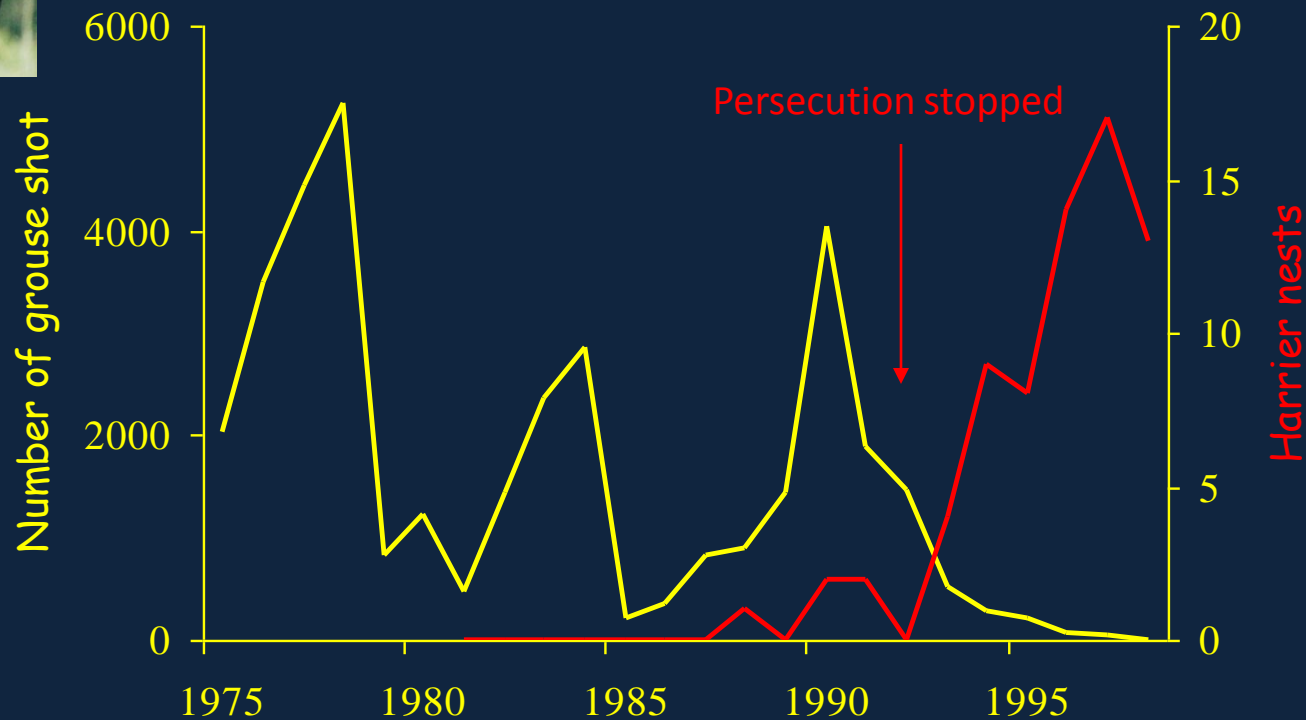
Quantifying the impact



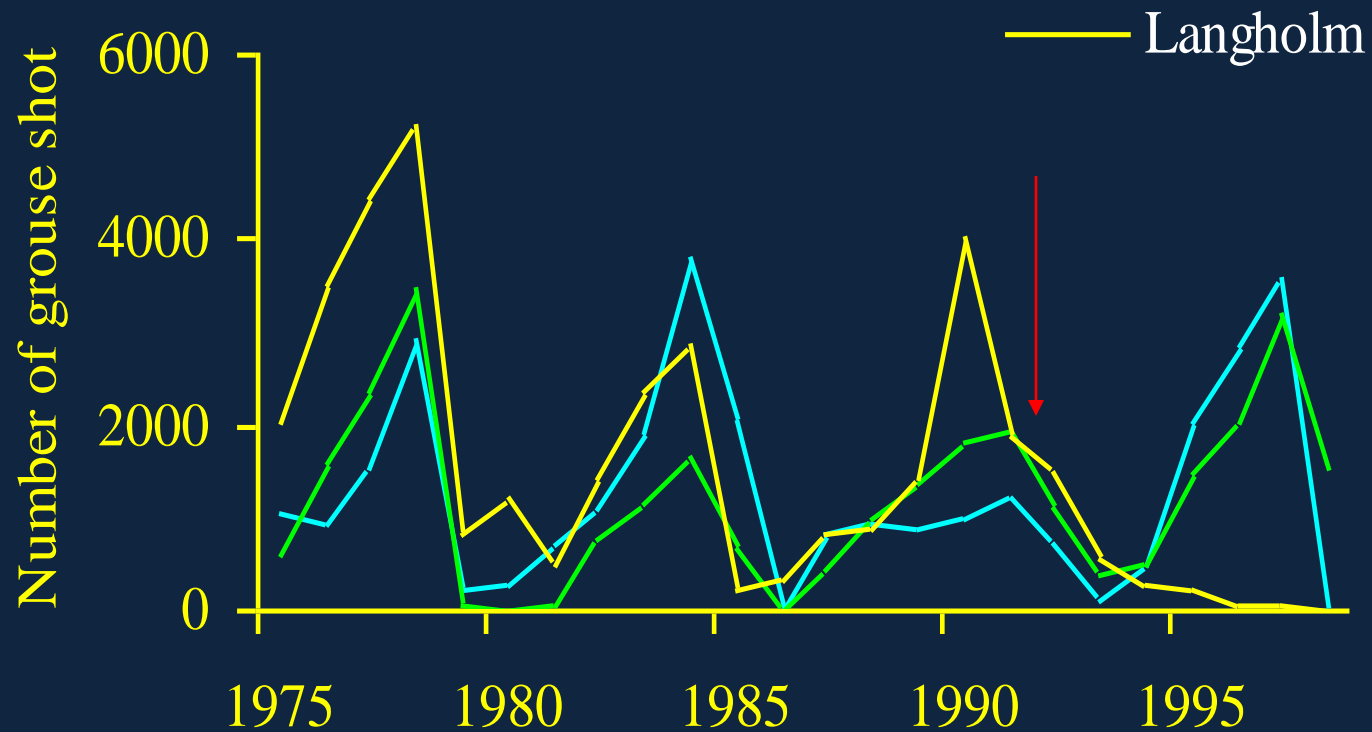
Quantifying the impact



Quantifying the impact

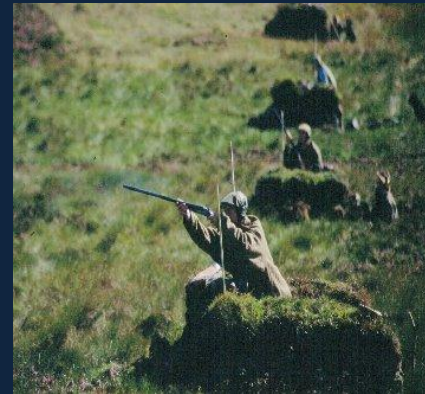


Grouse bags on Langholm and neighbouring moors



Inference from scientific evidence

- Harriers breeding at high density can make driven grouse shooting economically unviable.



Reducing impact

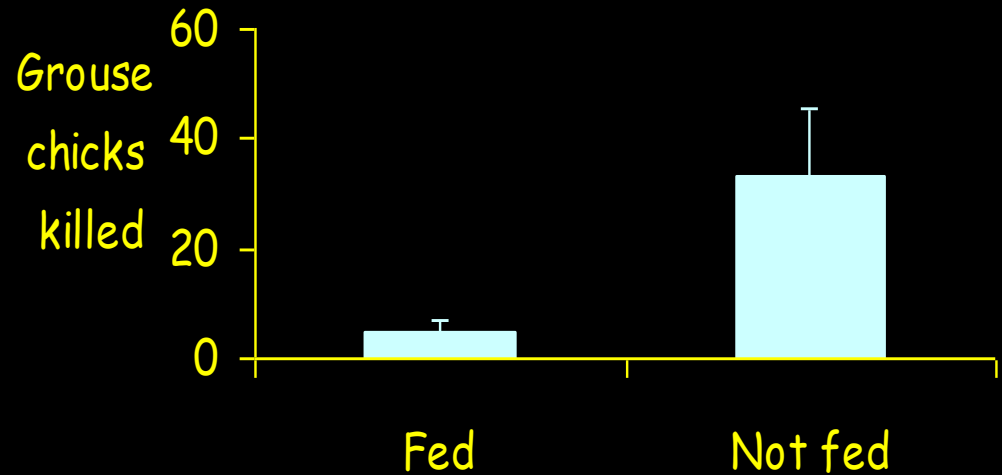
- Ban grouse shooting
- License grouse shooting
- Increase enforcement
- Move to low intensity management
- Financial compensation
- Intra-guild predation (increase Golden Eagles)
- Increase grouse numbers – trap & transfer or rear & release
- Alter habitat to reduce harrier numbers or predation rates
- Alter landscape to draw hunting harriers away from grouse
- Plastic heather to draw harriers away from grouse moors
- Chemical aversion therapy to stop harriers eating grouse
- Feed harriers to stop them eating grouse
- Deter harriers from settling using eagles, gas-guns
- Quota or ceiling scheme – move or kill surplus
- Zoning
- Re-introduce elsewhere
- Kill the harriers

Reducing impact - feeding

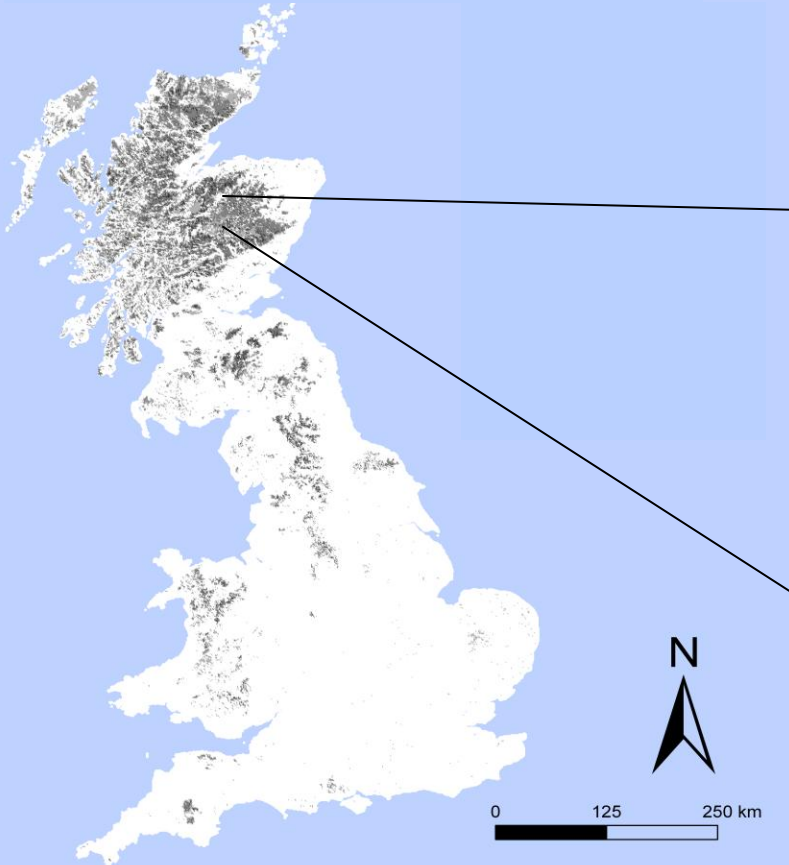
Can predation on grouse chicks be reduced through supplementary feeding?



Reducing impact - feeding

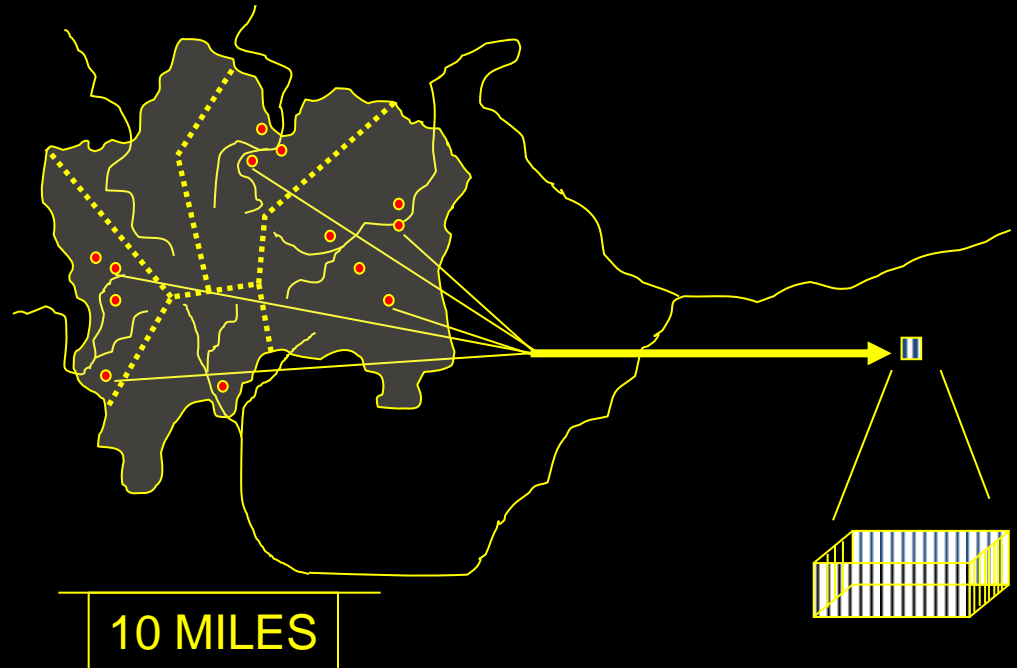


Reducing impact – managing harrier densities



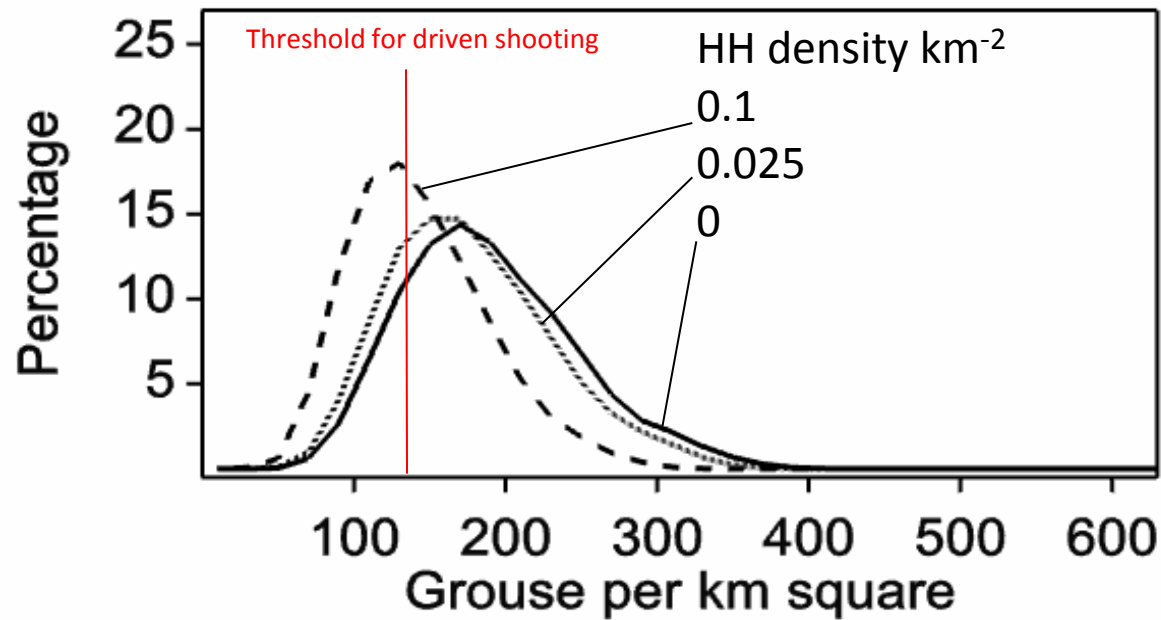
Set a ceiling above which harrier numbers and grouse shooting are incompatible.

Remove surplus harrier broods & rear chicks away from grouse moors.



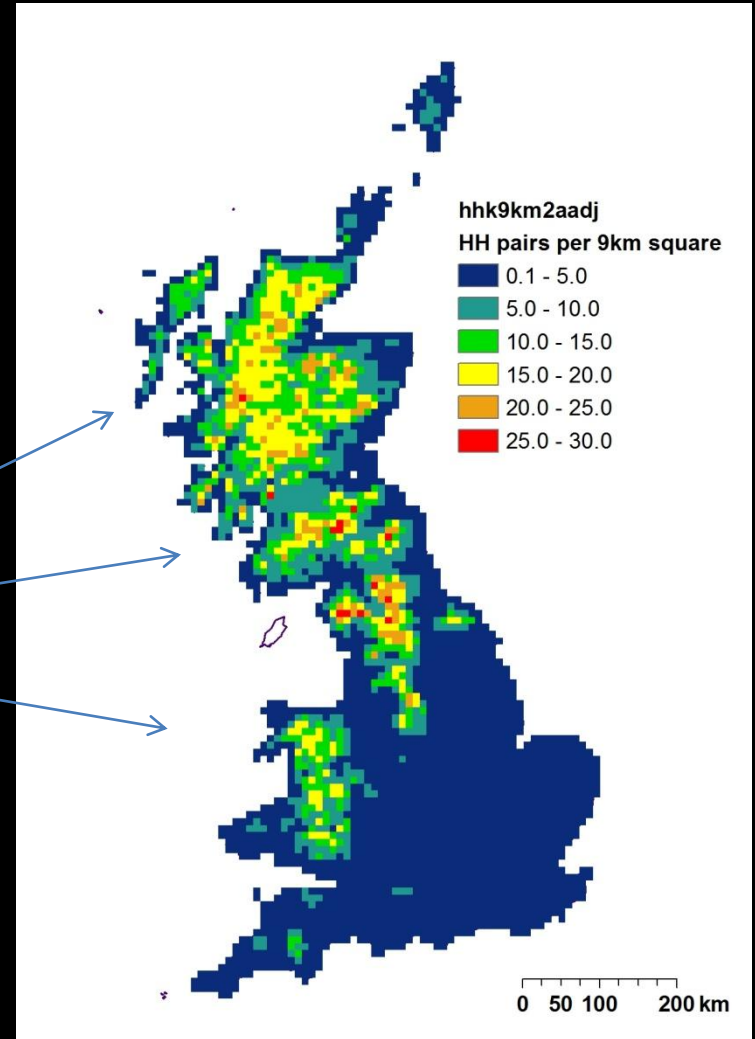
Reducing impact – managing harrier densities

a)



Making predictions – Individual Based Model

Model habitat & prey
Seed with harriers
Incorporate demographic knowledge
Vary management parameters
Consequences for population



Lesson from harrier-grouse work

We can understand impacts

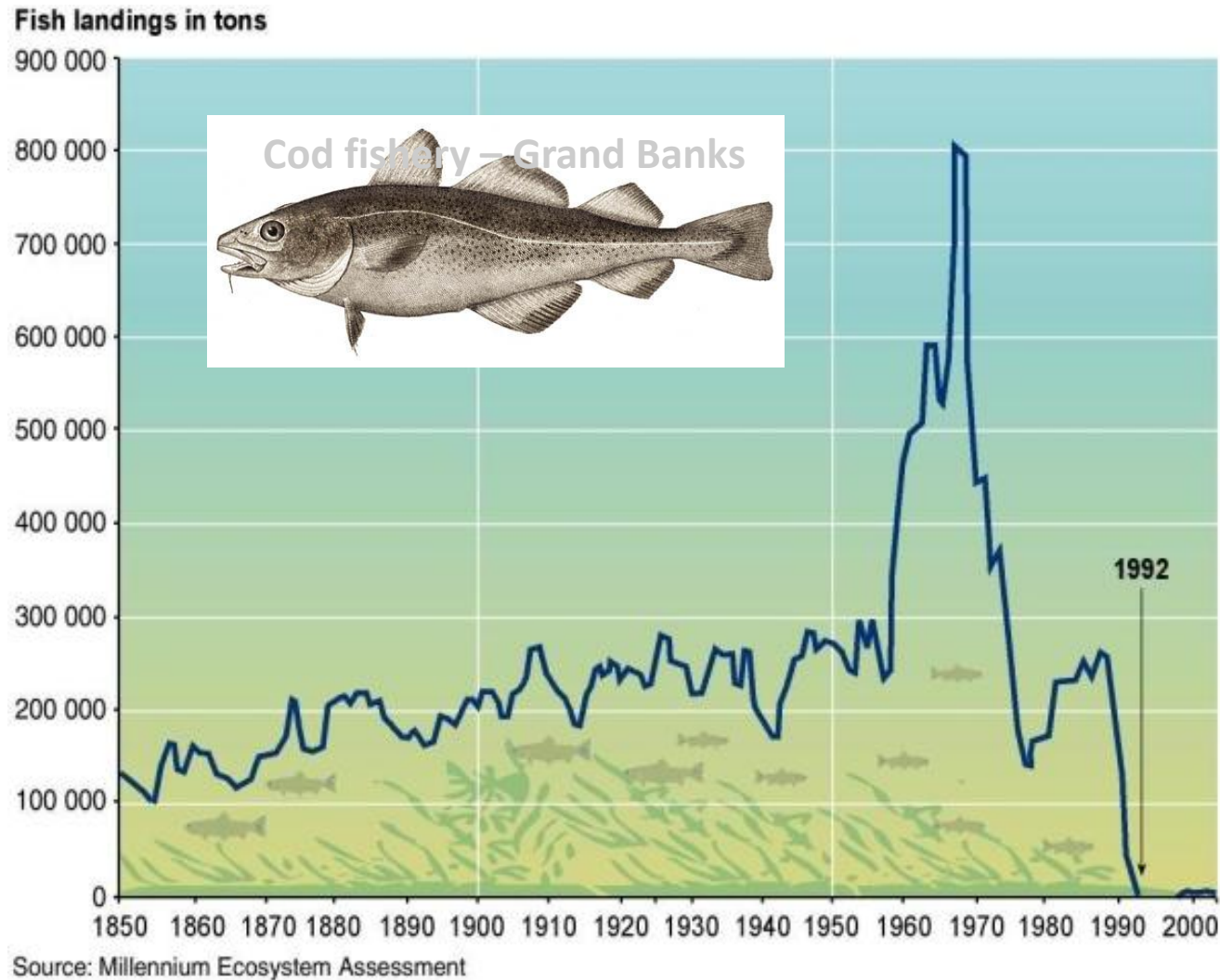
We can test mitigation techniques

But, Ecology alone is not enough

We need to work with people



Improving harvesting strategies



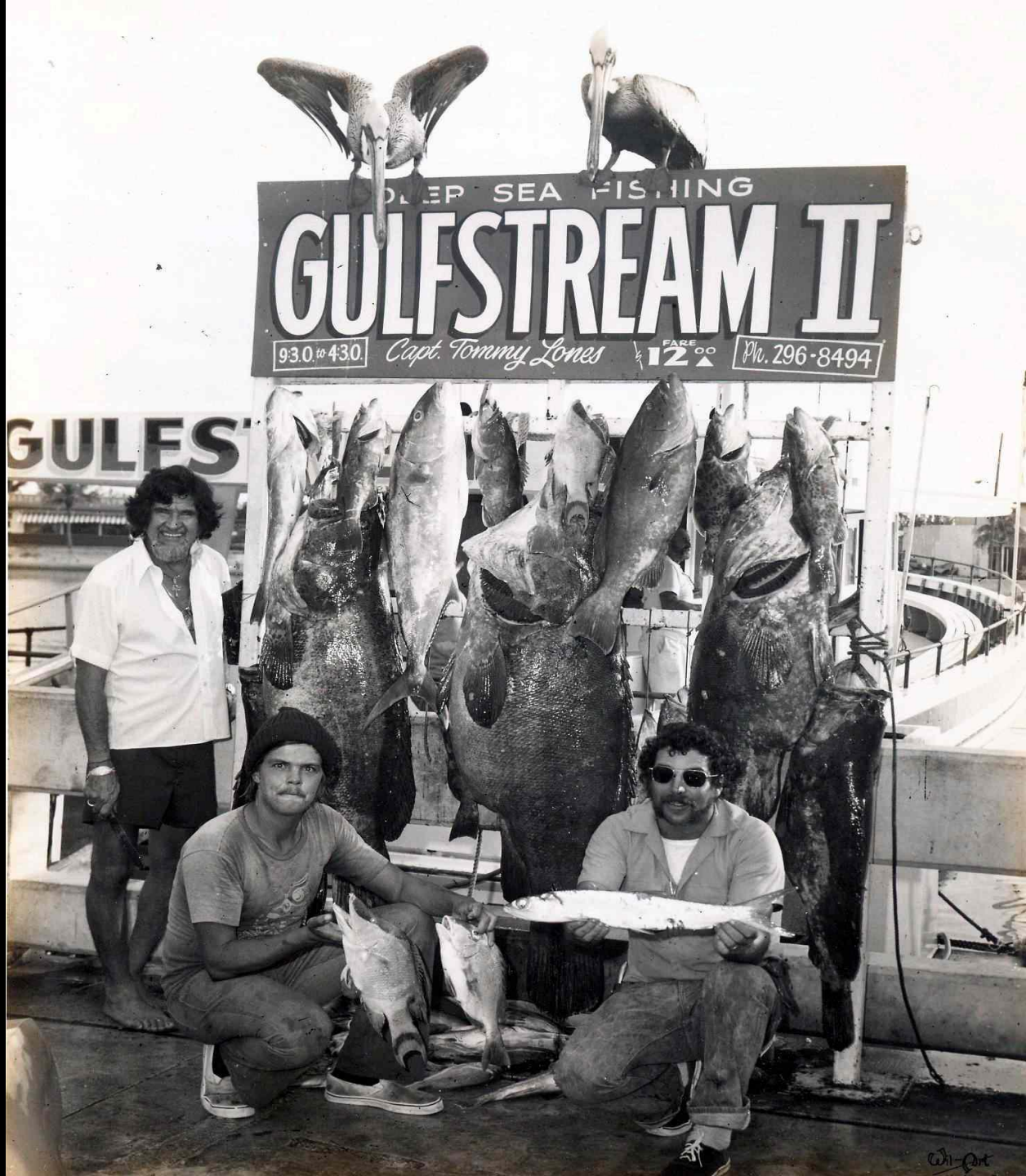


Thanks to Martin Sharman

ALL DAY DEEP SEA FISHING
YAGHT GULF STREAM

CAUGHT ON THE
YACHT
GULFSTREAM
Key West Fla





GULF STREAM II

DEEP SEA FISHING

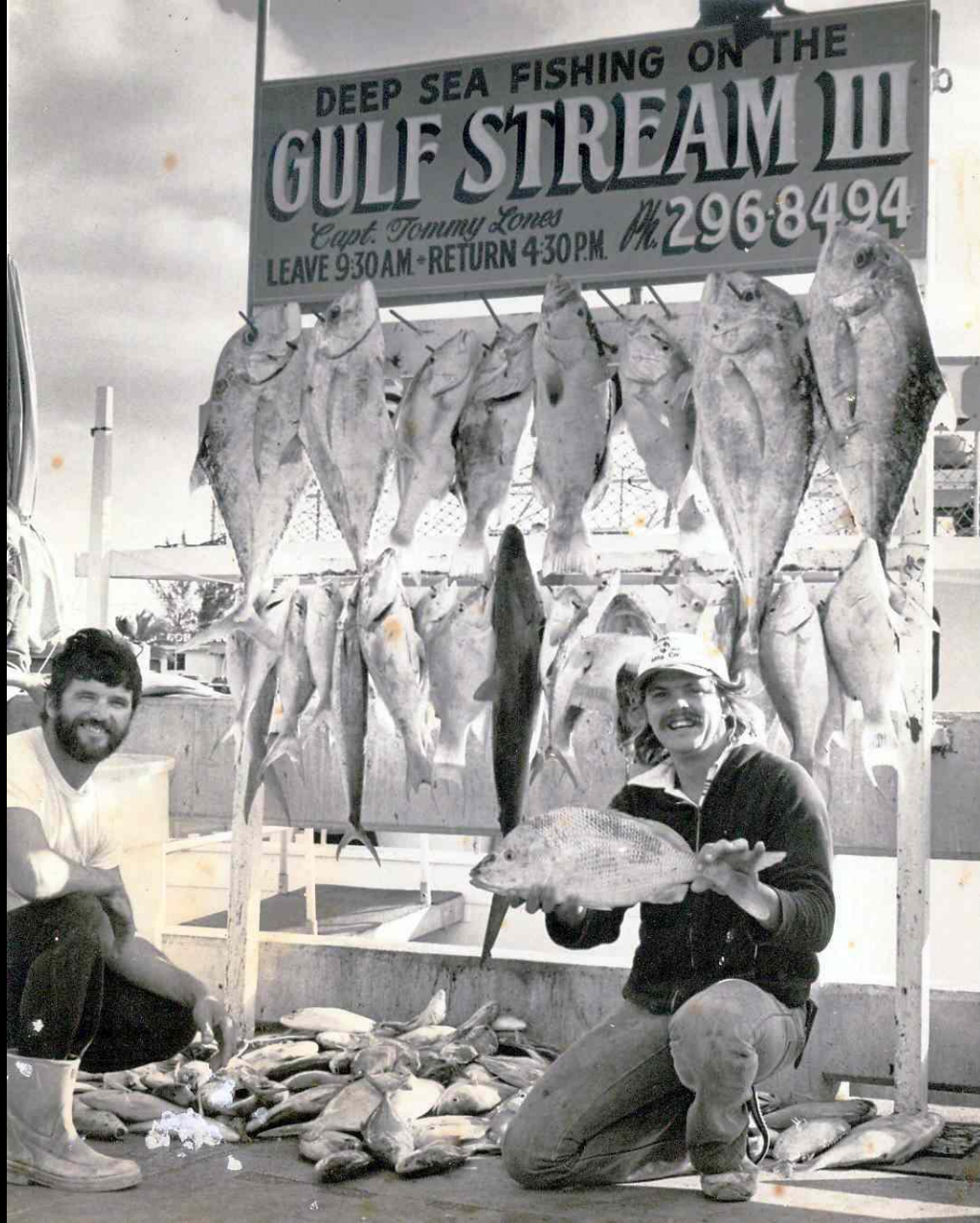
PHONE
296-8494

DAILY
9:00 AM TO
4:00 PM

CAPT. TOMMY LONES FARE \$10.00



DEEP SEA FISHING ON THE
GULF STREAM III
Capt. Tommy Lones
LEAVE 9:30 AM - RETURN 4:30 PM. *Ph. 296-8494*





GREY HOUND

PH. 296·5139 *OR* 296·5923

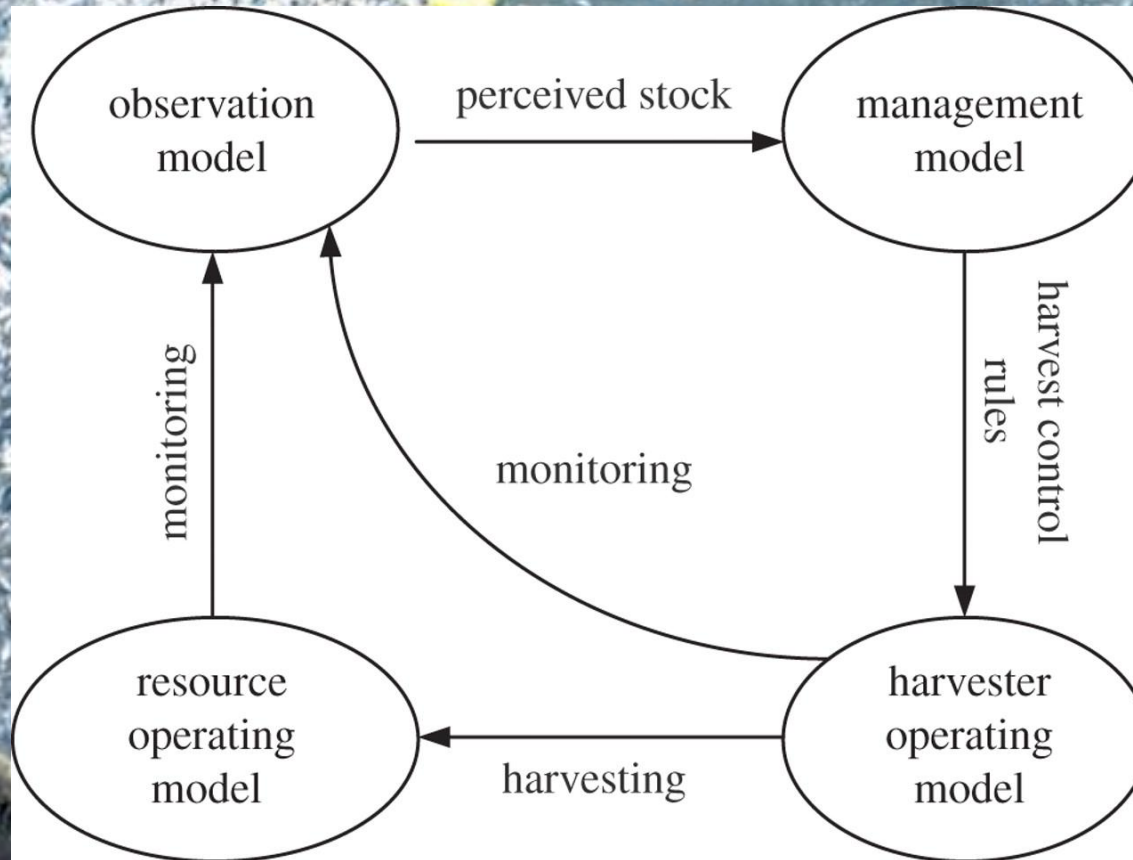


Harvesting



Thanks to Martin Sharman

Management Strategy Evaluation

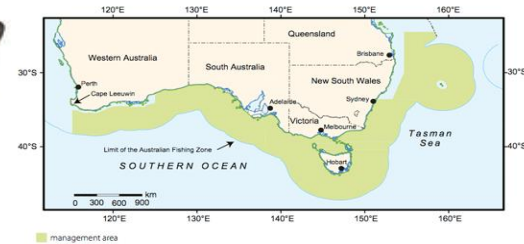


Bunnefeld et al. (2011). TREE
Milner-Gulland et al. (2011) PNAS

Management Strategy Evaluation

Does it work?

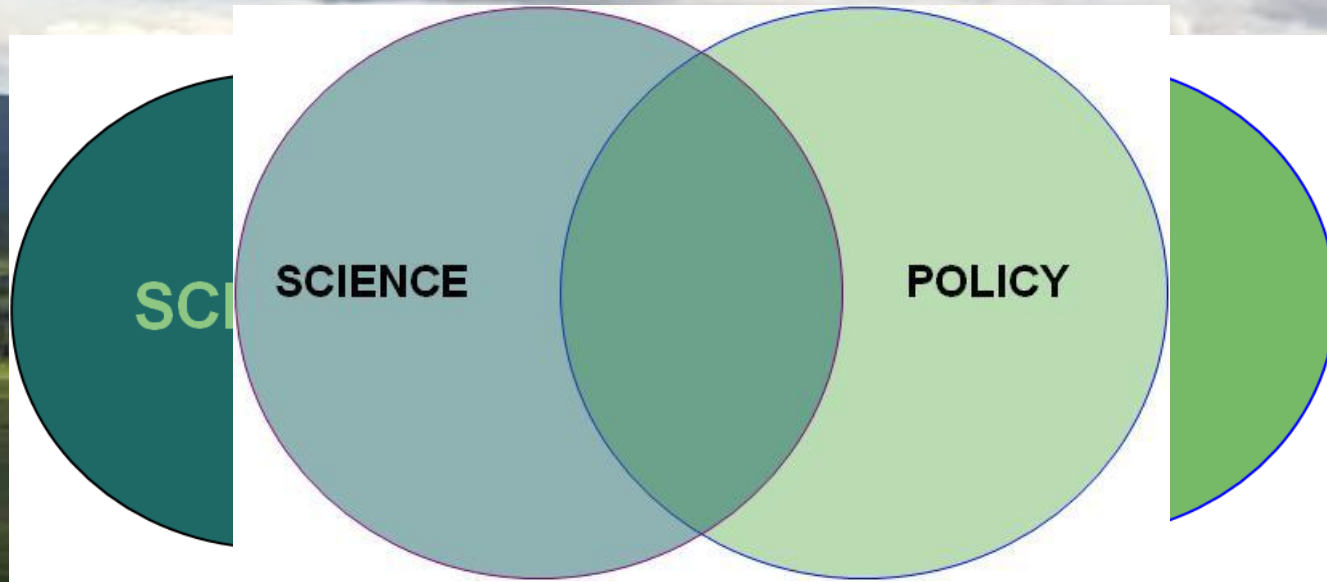
- Southern and eastern scalefish and shark fishery (Australia)



- Overfishing led to adoption of MSE
- Since MSE began in 2005, net decrease in quota
- Resulting conservation benefits
- Time to reach agreement on catch from “several weeks” to <2 days
- Positive response to science

Linking science & policy

Science – Policy interface



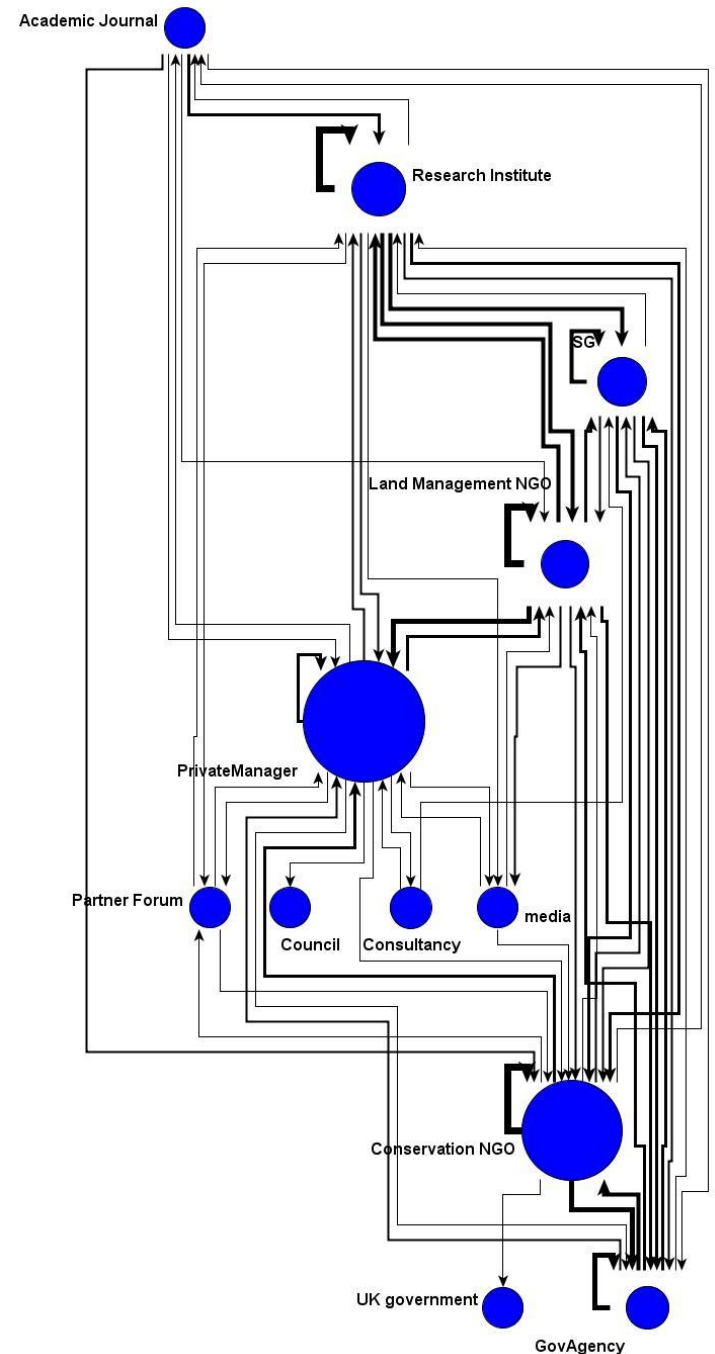
Science-policy interfaces: the many ways in which scientists, policy makers and others link up to communicate, exchange ideas, and

- Reporting of science knowledge results in development of policy grounded in evidence, in clear and controllable ways
- One-way flow in which 'truth' (science) speaks to 'power' (policy)

Science-Policy networks

How are research findings disseminated?

Size of circles represents betweenness centrality - a measure of the bridging role of institutions.





What is the applied ecologists' role?

(observers – honest brokers – advocates)

Roger Pielke (2002) – The Honest Broker

Some challenges

- Local solutions & general lessons
 - Publishing in high impact journals
- Fighting for limited resources
- Dealing & communicating uncertainty
- Doing experiments at appropriate scales
- Working with people
- Considering our role

Why be an applied ecologist?

- Making a difference
 - Solving relevant & urgent problems
- Diverse challenges
- Rewarding & enriching