

# ANTH 42: Primates in Nature

Lecture 4:

Methods (2) - Behavioral ecology

**EAP in Ghana & S. Africa, 2011**

**Info session W April 14, 2:00**

**International Center**

**“Conservation bioacoustics” – Matt Anderson; Friday 11am Muir Biology 1103**

## Quiz clock

Minutes remaining: **ONE**

30 sec ...

5 4 3 2

## OK, it ain't easy

**CANNOT** record **EVERYTHING**, so sampling is necessary.

Must *choose* what to record (and so, what not to record).

If that were all, it would *just* be difficult.

**Topical bias:** How might that *choice process* lead to mistaken conclusions about behavior?

**Observational bias:** how might *what one records* be systematically biased, so that it does not accurately reflect what happened?

## OK, it ain't easy

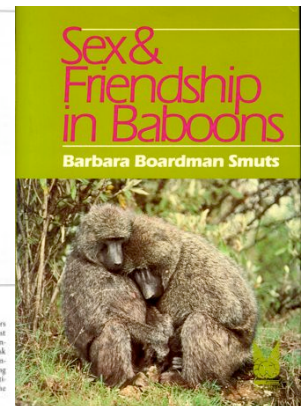
**Topical bias:** How might that *choice process* lead to mistaken conclusions about behavior?



Joseph L. Popp and Irven DeVore

Aggressive Competition  
and Social Dominance Theory:  
Synopsis

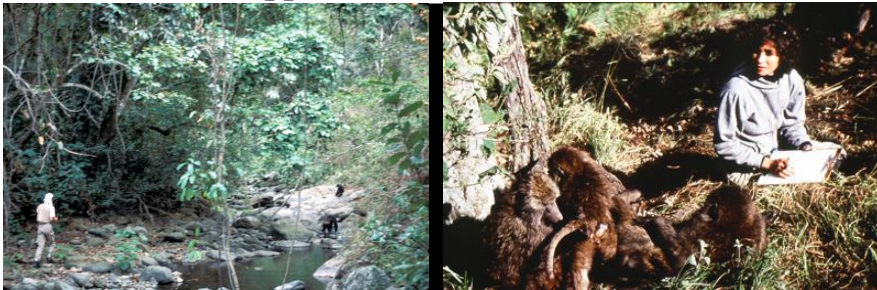
Discussion of the origin and modification of aggressive behaviors observed in the biological and social sciences, where aggression is most often attributed to proximate causes such as frustration. Here we consider aggression in the context of natural selection; specifically we ask under what circumstances will aggressive behavior increase the representation of the aggressive actor's genes in future generations? In answering this question we provide a brief outline of a model of optimal competitive strategies, in terms of animal behavior and morphology, for the maximization of an individual's reproductive success.



## OK, it ain't easy

*Topical bias:* How might that *choice process* lead to mistaken conclusions about behavior?

*Observational bias:* how might *what one records* be systematically biased, so that it does not accurately reflect what happened?



## Quick tour through sources of information (with some field pics for fun)

All come from visit by myself and grad student Alex Piel, along with colleagues Bill McGrew & Linda Marchant, to the study site of another colleague (Kevin Hunt) in Semliki, Uganda.

And that's a method itself.



## Semliki, Uganda

- “Savanna” site
- Not habituated, limited direct observation.



Adaptation to savannas illuminates range of chimpanzees' behavior and social structure, and 'models' human evolution (more later).

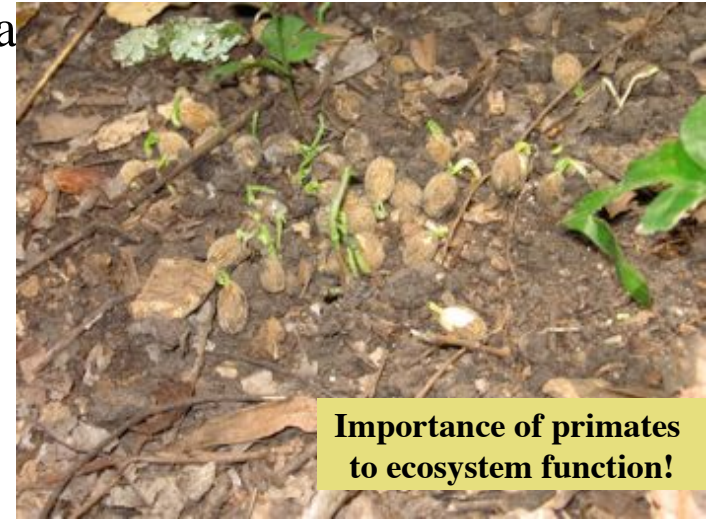
## Traces



## Other traces



This is a  
trace?



**Importance of primates  
to ecosystem function!**

## The ultimate trace: Feces



**Diet**  
**Habitat use & party size**  
**DNA (kin, ranging, etc.)**  
**Hormones (stress & reproductive)**

**And sometimes traces are unique,  
informative, and puzzling...**



And sometimes traces are unique, informative, and puzzling...



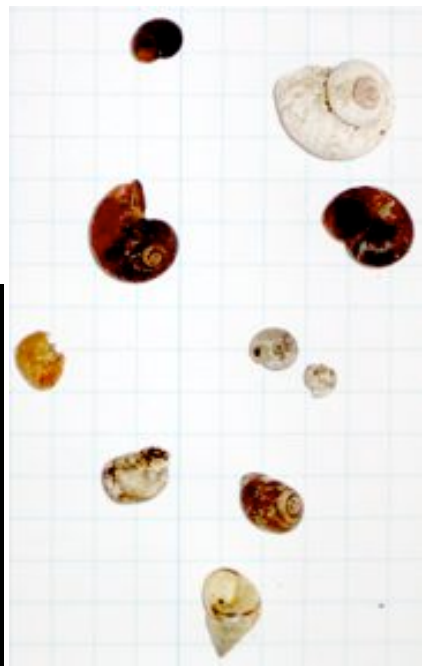
Right or left handed??

Sometimes a 'trace' is only interesting once you know to look...



Kevin Hunt  
Gil Ramos  
Bill McGrew

Like, snails



Botany



## Vegetation physiognomy



## And an open mind...



Linda Marchant, Bill McGrew



## And an open mind.



## Animals (and plants, etc) as “strategists”

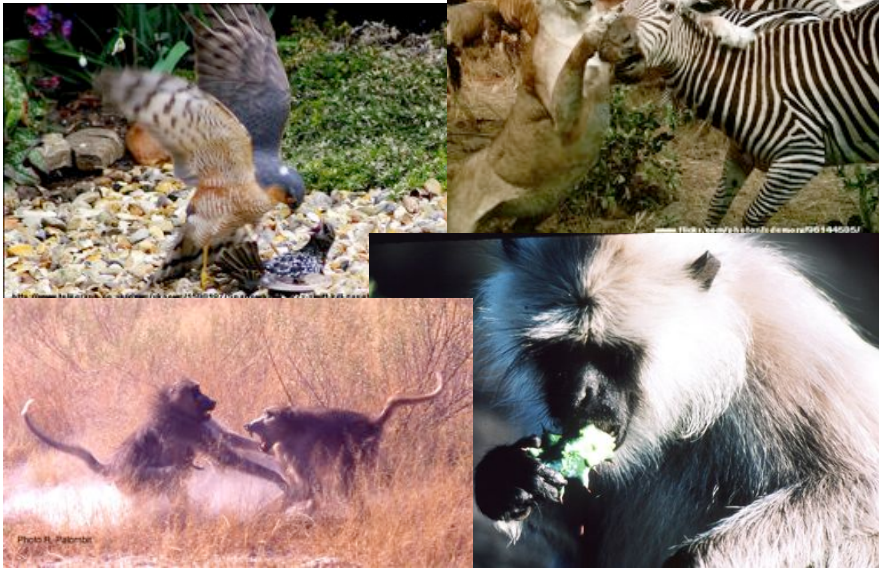
**Enough about genes to demonstrate possibility of strong genetic influences on behavior - genes + natural selection can “strategize”**

**Evolution: change in gene frequencies over time - 2 basic mechanisms**

**Life history theory - the concept**

**The problem of altruism - an historical approach**

Nature red in tooth and claw...



Of course, that's not enough ...



Superman is not Fit®.

On other hand, if not fit in Superman's sense, then don't live long.

- Natural selection
- Sexual selection (usually for traits associated with fitness)

Basically, competitive world, nasty, brutish and short, individuals look out for themselves, losers go extinct.

(maybe ...)

With that in mind, short history of natural selection theory since 1959

### VC Wynne-Edwards and group selection



V. C. Wynne-Edwards (1959) THE CONTROL OF POPULATION-DENSITY THROUGH SOCIAL BEHAVIOUR: A HYPOTHESIS *Ibis* 101 (3-4) , 436-441

## VC Wynne-Edwards and group selection



- Malthus, Darwin: struggle for survival, food is limiting.
- If all individuals breed without restraint (maximize RS), population overshoots resources.
- Massive die-offs, everyone loses.

- Very rarely see that happening.
- If remove an egg, bird usually lays another.

**PROBLEM:** Clearly *could* lay more eggs, overbreed, but don't see that happening. **Seems inconsistent with natural selection. Theory predicts birds maximizing RS. Wrong??**

## VC Wynne-Edwards and group selection



- **W-E proposed:** By flocking, assess population size, and adjust breeding accordingly (“assess” not necessarily aware).

- Groups (populations) that FAIL to do this starve and are replaced by healthier, restrained groups. **Group selection for *altruistic restraint*.**

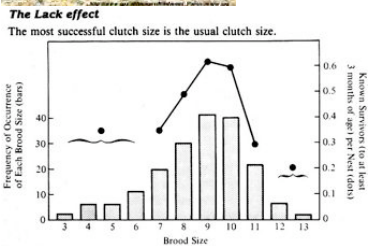
- Humans do many things for their groups; incredibly altruistic. **Fitted common observations in social sciences.**

**PROBLEM:** A “cheater” would do better, so selfishness should invade group-selected reproductive altruism. {FYI to the curious: google “Tragedy of the commons” (Garrett Hardin)}

## VC Wynne-Edwards and group selection

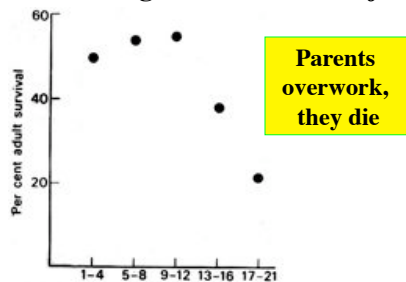


- By problematizing reproductive “restraint”, triggered immense amount of research; valuable but wrong (happens in science).
- Enter David Lack & the great tit (*Parus major*)



Breeding success of the great tit (*Parus major*) near Oxford, England, 1949-55

**It's not how many eggs you lay, it's how many live to reproduce**



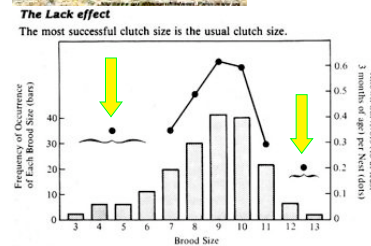
**Parents overwork, they die**

**Maximizing RS after all... Group selection wrong**

## VC Wynne-Edwards and group selection



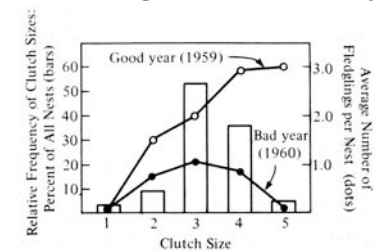
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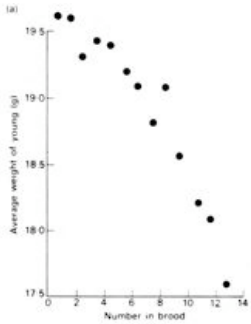
**So WHY?**

**Low end - sick??**



Breeding success of the boat-tailed grackle (*Cassidix mexicanus*) in Texas

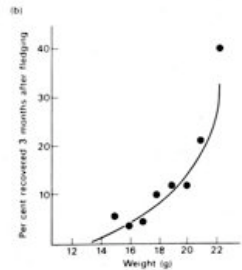
**Years vary. Balanced polymorphism and/or decision process.**



## Tradeoffs: survival vs. fecundity

But not so simple.

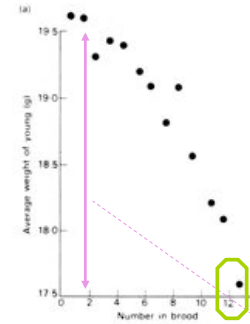
Interaction among number of eggs, weight of chicks, and survival.



The more chicks in the nest, the smaller on average each is. Parents can only carry so many worms...

But larger chicks have a greater chance of being recaptured 3 months later ( $\approx$  surviving).

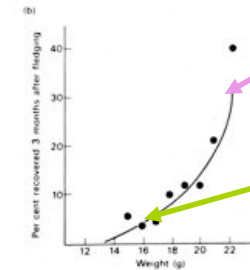
Fig. 1.3 (a) In larger broods of great tits the young weigh less at fledging because the parents cannot feed them so efficiently. (b) The weight of a nestling at fledging...



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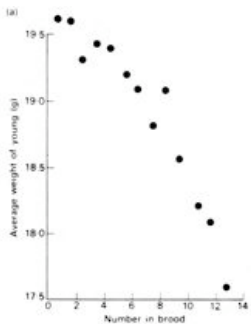
Interaction among number of eggs, weight of chicks, and survival.



30% of 20g recovered later; to have 20g chicks, can only have about 2; expect  $0.3 * 2 = 0.6$  fledged.

5% of 16g recovered later; to have 16g chicks, can have about 12; expect  $0.05 * 12 = 0.6$  fledged.

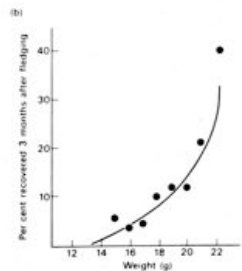
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## Tradeoffs: survival vs. fecundity

But not so simple.

Interaction among number of eggs, weight of chicks, and survival.



Does this mean it makes no difference what the birds do???

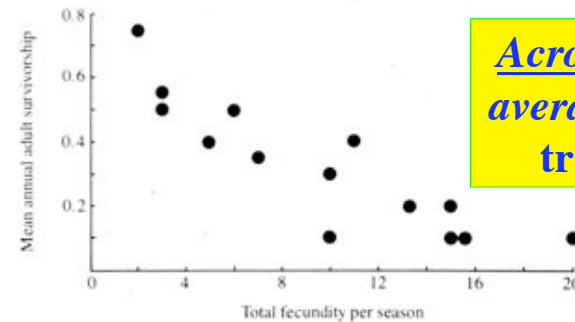
No. Averages; birds always trying to beat the odds. Payoffs *not* extremely different - makes sense, or natural selection would have eliminated the 'loser strategy' long ago.

Fig. 1.3 (a) In larger broods of great tits the young weigh less at fledging because the parents cannot feed them so efficiently. (b) The weight of a nestling at fledging...

Each point is a species' average value

## Tradeoffs: survival vs. fecundity

Survival versus fecundity in lizards



Across species, averages can be traded off.

When several species of lizards are compared, high fecundity is associated with a low probability of surviving to breed again. One interpretation of this negative relationship is that expenditure of reproductive effort leads to mortality; conversely, poor survival prospects may select for elevated effort. In either case, there is an evident trade-off between fecundity and survival. (Adapted from Tinkle, 1969, Figure 1 [615] © 1969 by the University of Chicago.)

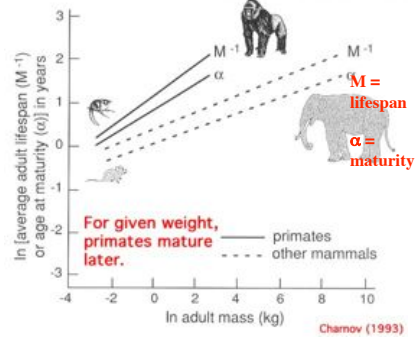
2 possibilities



## LIFE HISTORY THEORY

“...natural selection favors organismic life cycles in which resources are allocated among **growth, maintenance** and **reproduction** in relation to age or size in a manner that maximizes the reproductive potential across individual life spans.”

Pereira 1993: 17



Basic life histories can be compared across Orders. For example, on average Primates mature later and live longer than other mammals.

## LIFE HISTORY THEORY

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“**Nature has ensured**” - shorthand for natural selection acting on pattern of behavioral development.

