



Welcome to the Eyjafjallajökull-meeting

Thank you for attending the TECT
final conference

&

welcome to the INCORE
final conference *"Cooperation: an
interdisciplinary dialogue"*

EUROPEAN SCIENCE FOUNDATION EUROCORES Scheme
European Collaborative Research

TECT
The Evolution of Cooperation and Trading

GEBACO
Towards the Genetic Basis of Cooperation

INCORE
Integrating Cooperation Research in Europe

SIXTH FRAMEWORK PROGRAMME

TECT - GEBACO - INCORE

what they have in common:
team formation by crossing national
and disciplinary boundaries

TECT - GEBACO - INCORE

what makes them so different:
ESF-EUROCORES: **creating the programme is a complicated 2 year process, but the reward is efficient management**

EU-Framework 6: **creating the programme is (relatively) straightforward, but the punishment is burning in bureaucratic hell**

TECT The Evolution of Cooperation & Trading

The birth of TECT
(a forceps delivery)

Phase 1:

- writing the proposal & forming a group of 24 proposers *(using various degrees of arm twisting)*
(spring 2004 – deadline 15 June 2005)

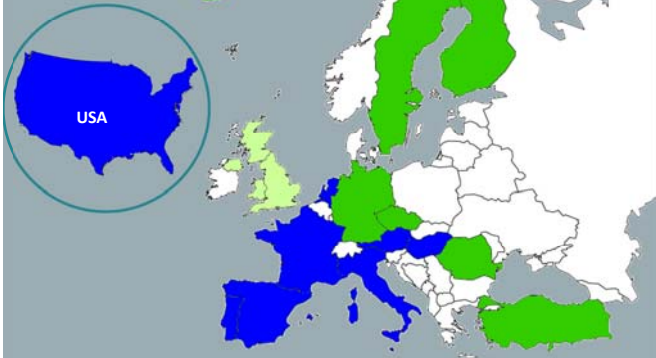
Phase 2:

- development of the TECT call
(workshop in Berlin 5-6 Nov 05)
- negotiations with national foundations
(workshop in Brussels 7-8 Dec 05)

Szathmari, Hammerstein & Bowles

Rüdiger Klein (ESF)

Phase 2: outcome of the negotiations: a patchwork!



... and now from cooperation in European science to the science of cooperation



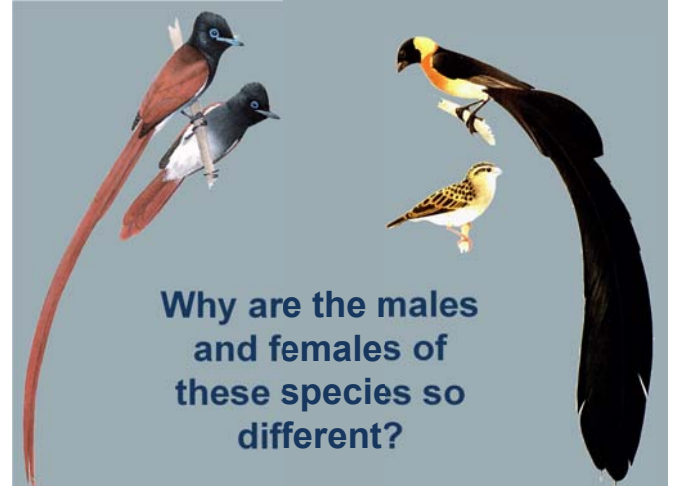
The power of partner choice

Ronald Noë



Ethologie des primates (DEPE – IPHC – CNRS) & Psychologie Université de Strasbourg France

Why are the males and females of these species so different?



..and why are the males and females of these species so similar?



These guys are (socially) monogamous and help incubating and caring

Males and females have their eggs in the same basket

Here the females
breed alone

Females mate with one of
many males displaying
together on 'arenas'
(or 'leks')



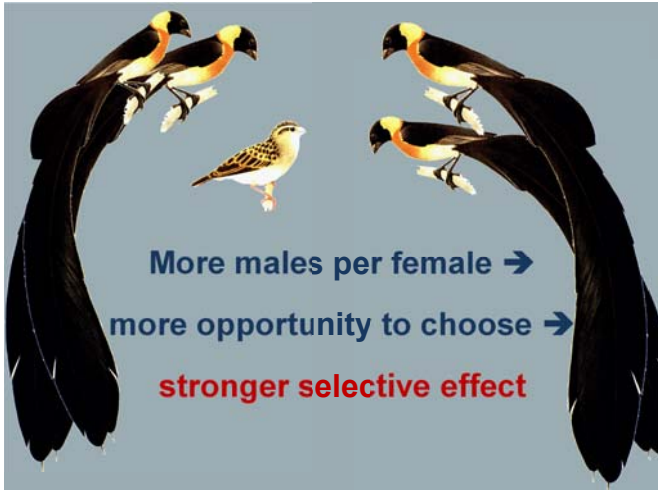
Operational
Sex Ratio:



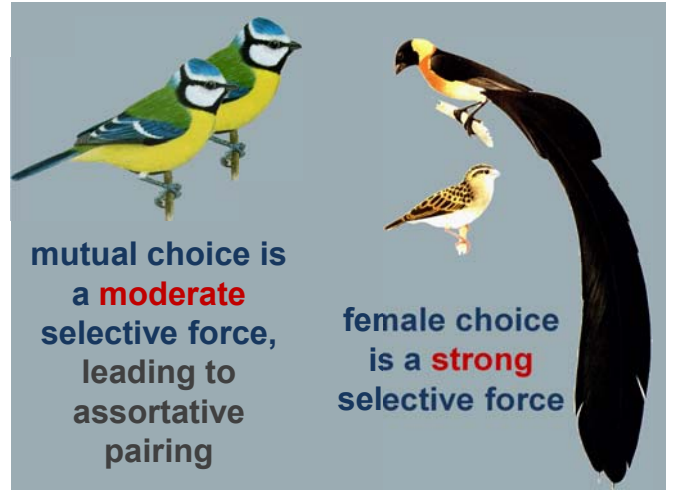
Operational
Sex Ratio:



More males per female →
more opportunity to choose →
stronger selective effect



mutual choice is
a moderate
selective force,
leading to
assortative
pairing



female choice
is a strong
selective force

Ever since Darwin introduced
sexual selection theory, we
know that the Operational Sex
Ratio governs mating markets



One wouldn't understand
mating markets, if one
would look at male-female
couples in isolation

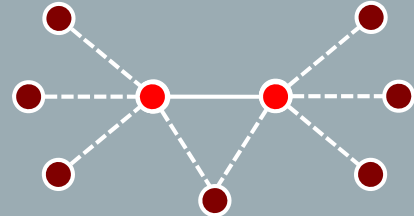


So why only use
'partner control'
paradigms to model
the evolution of
cooperation?



Very few cooperative (intra-specific) or
mutualistic (inter-specific) interactions
occur in isolation

The main question was assumed to be:
how is a partner in a dyad controlled?



But an equally important question is:
how do dyads form out of a multitude of options?

Hence **partner choice** models
such as the **'biological market'** paradigm

Biological Markets Introduction

Why "markets" ?

cooperation and trading
have much in common:

- 'goods' and 'services' (*commodities*) are exchanged
- investments with the risk of little or no returns
- partners can be chosen, rejected and replaced



Biological Markets Introduction

mating
markets

economic
markets



biological
markets

The word 'market' is used as a metaphor
Inspiration and theoretical insights come from both
economics and **sexual selection theory**



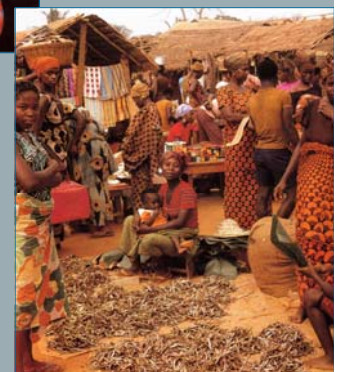
What are
biological markets?

participants exchange goods
or services
("commodities")



What are
biological markets?

partner choice
and
outbidding
are important
mechanisms





What are biological markets?

supply and demand determine the exchange rate of commodities

Biological Markets Introduction

Bartering rather than complex market mechanisms



Amsterdam stock market
Emanuel de Witte
1653

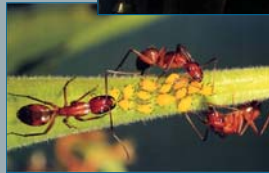


fish seller
Quiringh G. van Brekelenkam
1650 - 1670

Biological Markets Introduction

Among **non-human** traders a few things are unlikely:

- the use of a currency
- binding contracts



Biological Markets Introduction

But economic (human) and biological markets otherwise have much in common, such as (often) 2 classes of traders

- buyers - sellers
- employers - employees



Biological Markets Introduction

Partner choice has 2 main consequences:

1. Selection through partner choice
2. Dynamic changes in exchange rates of commodities

Biological Markets Examples – Selection through partner choice

Delayed plumage maturation in lazuli buntings



Greene et al. 2000
Nature 407: 1000-1003

Dominant males prefer neighbours with "delayed plumage"



.. selecting against yearlings with more mature plumage

Two opposing forms of social choice:



adult male



yearling male

sexual selection

preference for blue males by females

market selection

preference for brown males by α -males

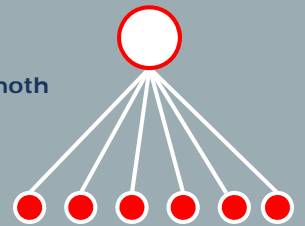
Selective abortion

Bull & Rice (1991)

J. theor. Biol. 149: 63-74



- fig - fig wasp
- yucca – yucca moth
- senita cactus – senita moth



- obligate pollination systems
- single big individual (tree/plant) + large number of small pollinators

partner choice mechanisms on nutrient exchange markets:

- ▶ pre-investment partner selection
- ▶ preference based partner treatment
- ▶ post-investment partner rejection ("sanctioning")



plant – mycorrhizal fungi



plant – rhizobia (bacteria)

Pre-investment partner selection by plants among rhizobia has been reported:

- Heath & Tiffin 2007 (Proc R Soc B)
- Gubry-Rangin, Garcia & Béna 2010 (Proc R Soc B)
- unsolved problem: "partner quality information "
 - honest (costly) signals?
 - pleiotropy?
 - screening?



plant – rhizobia (bacteria)

Partner choice has 2 main consequences:

- 1. Selection through partner choice
- 2. Dynamic changes in exchange rates of commodities

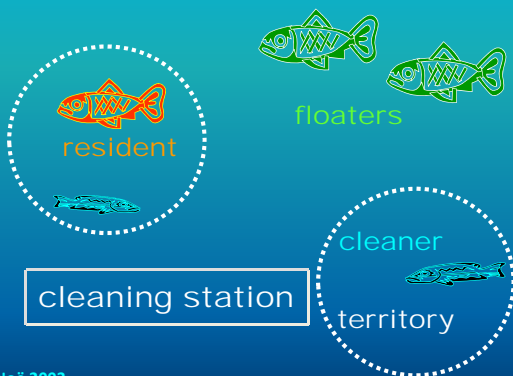
The cleaner fish market

Redouan Bshary



B. Jones & M. Shimlock
New Scientist. 27apr 02 p. 8

cleaner fish



Bshary & Noë 2003

In: Hammerstein (ed) Genetic and Cultural Evolution of Cooperation

Same analysis with same cleaner fish species, but with a single client species

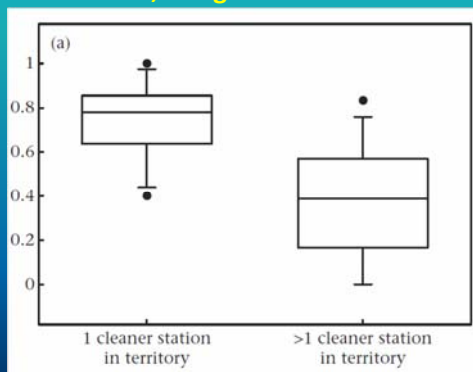


Figure 1. An ornate butterflyfish continues to solicit cleaning while its service provider, a bluestreak cleaner wrasse, swims away. Photo: Katy Muenster.

Adam, T. C. 2010. Competition encourages cooperation: client fish receive higher-quality service when cleaner fish compete. *Animal Behaviour*, in press.

Clients with access to multiple stations are not cheated less, but get better service

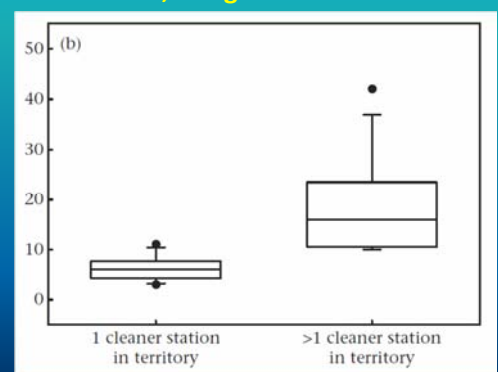
proportion of interactions terminated by cleaner



Adam 2010
Fig. 5a

Clients with access to multiple stations are not cheated less, but get better service

inspection duration per cleaning event



Adam 2010
Fig. 5a



Peter Henzi

Baby markets



Louise Barrett



Photos: Peter Henzi

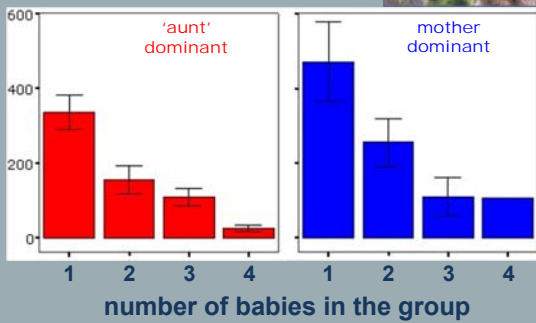
chacma baboons (South-Africa)

Barrett & Henzi 2006

(Kappeler & van Schaik eds)



grooming (sec)



To the Loskop Dam Nature Reserve, South-Africa .. for an experimental approach



Fruteau, Voelkl, van Damme & Noë 2009 PNAS



Phase 1: a single “provider” in each group could open a box with fruit for everyone (5 chopped apples)

PhD Cécile Fruteau (Univ. of Tilburg, NL)



Phase 2: a second “provider” could open a second box simultaneously with the first

The same amount of resource as used in phase 1 was divided over both boxes



Market experiment with vervet monkeys

Grooming measured in the hour after the opening of the food containers

(for phase 0: 55 h of focal group observation)

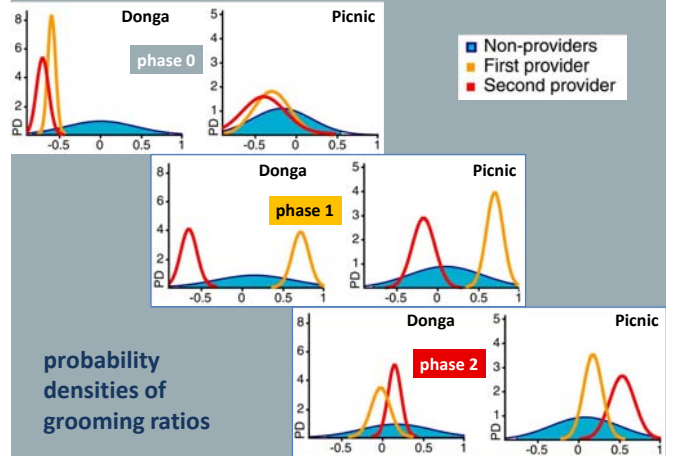


Grooming ratio:

$$\frac{\text{time being groomed} - \text{time grooming}}{\text{total grooming time}}$$

Market experiment with vervet monkeys

graphs: Bernhard Voelkl



Price setting on markets without language?

1. how do traders arrive at agreements over exchange rates?
 - negotiations?
 - binding contracts?
2. how are market-wide exchange rates established?

Biological market & sexual selection theory



Mating markets

Biological market & sexual selection theory

Mate choice may be based on sexual and economical factors



...but does biological market theory add anything to sexual selection theory ?

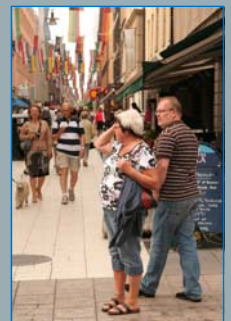
Biological market & sexual selection theory

Biological market theory in the analysis of human mating patterns

Thomas Pollet & Daniel Nettle

Driving a hard bargain: sex ratio and male marriage success in a historical US population
2008 - *Biol. Letters*, 4, 31-33

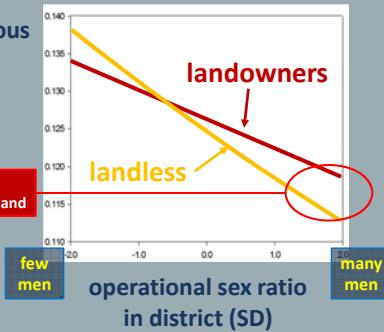
Market forces affect patterns of polygyny in Uganda
2009 - *PNAS*, 106, 2114-2117



Biological market & sexual selection theory: human mating patterns

The relationship between landownership and polygyny in 56 districts in Uganda in 2002

proportion polygynous marriages in district



Pollet & Nettle 2009
PNAS 106: 2114-2117

Biological market & sexual selection theory

Is biological market theory a useful addition to sexual selection theory?

I have my doubts, but maybe BM theory helps to pay more attention to the effects of local and short term fluctuations of supply and demand

Biological market & sexual selection theory

Is biological market theory "sexual selection theory" for cooperation?

Not when one compares the consequences of mate choice with partner choice in evolutionary terms

Sexual selection: the genetic basis of preferred traits and preferences for those traits tend to become **linked**: carried by both sexes, but expressed in one or the other

Market selection: perhaps comparable linking only when endo-symbionts are **vertically transmitted** (inherited)?

The role of partner choice in team formation

Many interesting forms of cooperation, notably among humans, are not dyadic, but multiple agents have to cooperate simultaneously to make the cooperation a success:

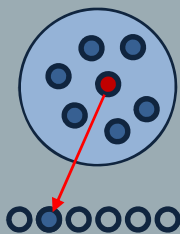
Key words: social dilemmas, collective actions, public goods, tragedies-of-the-commons

Important question:

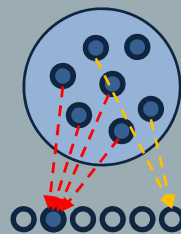
how do teams of cooperating agents form?

The role of partner choice in team formation

Many mechanism could play a role, among which several involving partner choice



Despotic partner choice



Democratic partner choice

So how did GEBACO & INCORE came into being?



Brussels, October 18, 2005: GEBACO starts up and we got some hints that led to INCORE

.. a few years later:
two full blown programmes



GEBACO – Dublin April 2008



INCORE – Prague Sept 2007

Dictators or democrats?



Tamás Székely

David Skuse

... or behind-the-screens power players?



Delphine Réminiac



Fiona Roberts

Acknowledgements



The Evolution of
Cooperation & Trading



UNISA

UNIVERSITEIT



VAN TILBURG

Center



Evolution & Behaviour



UNIVERSITÉ DE STRASBOURG



2000-2005



never again!

