Behavioural Ecology

Placentotrophy

- Prairie voles (monogamous, male parental care) Bond formation regulated by vasopressin & dopamine in forebrain
- Hypothesis: Vasopressin receptor expressed at higher levels in monogamous species

Meadow voles (polygynous, no male parental care)

Vasopressin receptor gene transfer with viral vector

Lactation (Hormonal control)

- Prolactin:
 - Secreted in pituitary
 - -Increase during gravidity
 - Inhibits ovulation
 - Stimulates milk synthesis
 - Induces nest-building behaviour
- Oxytocin:
 - Secreted in pituitary
 - Causes contraction of uterus
 - Causes milk release
 - Mother-child bond
 - Pair pond

Helpers at the Nest

- Juveniles stay to help 2nd nesting effort frequent female juveniles
- Benefits:
 - Direct (learning about maternal care)
 - Indirect (inclusive fitness by helping rear related offspring)
- e.g. Voles & magpie jays

e.g. Magpie Jays

- Habitat: coastal shrub & forests
- Lots of predators
- 6 Helper defends nest ap St shakes & gives alarm can Feeding (energetic benefit for parents)

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Alarm Calls

- Anti-predatory Alert of approaching predators (benefit for other species)
- Well developed on language level in some nonhuman primates
- e.g. Ring-tailed lemurs, white-faced capuchin monkeys, Diana monkeys, Campbell's monkeys, & vervet monkeys
- Species-specific high frequency sound (often not perceivable by predators, ultrasound)
- If individual successfully alerts social group yet doesn't reveal its location, decrease chance of caller to be detected & increase chance of social group to avoid predation.

Discriminatory Abilities in Vervet Monkey

- Difference between age classes
- Young able to distinguish between leopard, eagle, snakes
- Adult are able too distinguish between different species of raptors & non-raptors
- Group pay more attention to adult alarm calls than juveniles

Explanation for Helping at Nest

- Indirect fitness win (kin selection)
- Increase of own reproductive success
- Reciprocal behaviour
- -No possibility for own reproduction
- Reaction of former support provided by social partner or aggressive response to attack
- Tit for tat. temporal gap between support & own behaviour
 - Individuals not related
 - _ e.g. Egg trade in Hamlet-fish, blood gift in Vampire bats, allogrooming in primates

Excuse Reciprocal Behaviour e.g. Vampire Bat

- Problem:
 - Often not successful
 - _ Only little resources, survival until next night unclear
 - Strategy:
- Begging
- Result:
 - 5/8 individuals got feeding
 - No successful animal observed begging
- Donation only for related individuals or member of same sleeping community
- Individual recognition (social parasitism)
- Need for repetitions (switch of donor & recipient)
- Benefit for donation has to be higher than investment
- e.g. Kin selection in prairie dog kats. gerbils & marmots
- Prerequisiten Undiversion Office of members Reproductive skew
- Kind of help
 - - A arm val Spenefit own group, other s benefit Cocidentally
 - Care of young: warming, shelter (burrow)
 - _ Defence of territory
 - Foraging
 - e.g. Defence of young in Musk ox, formation of a defensive ring, wildebeest mother, cooperation in dwarf mongoose & banded mongoose

GROUP BEHAVIOUR & STRESS

Social Way of Life

Pros	Cons
 Better defence Higher survival Higher capabilities Opening new resources Less aggression 	 Higher competition (resources/mating) Higher infection risk

Association - Environmental factors, no social behaviour.

Society - Social appetence, social behaviour.

Criteria for the classification on intraspecific level: Recognition of individual & membership

- Distribution of tasks
- Anonymous vs. Non-anonymous, open vs. closed community
- e.g. Fish school, bird colony, bee state, wolf pack, orca family

Behavioural Ecology

Special Forms of Sleep

e.g. Dolphins & Co.

- Unihemispheric slow-wave sleep (USWS)
- One hemisphere of brain is in deep sleep, other hemisphere is alert
- Allows non-stop flight in some birds
- Allows to keep one eye on predators

e.g. Birds

- Torpor & Hibernation
- Torpor = Naturally occurring drop in body temperature with resulting drop in metabolism, circulation & respiratory rates
- Who uses torpor?
 - Birds, reptiles, amphibians, mammals
- Hibernation Multi-day torpor bouts in winter
- Endothermy not abandoned Regulate temp at lower level
- True hibernators are smaller, drop Tb close to ambient, bouts last several days
- Winter lethargy (bears, carnivores) -Temperature drops a few degrees, bouts last weeks-months

The Hibernation Cycle



A typical torpor bout:

Animal drops Tb to near Ta slows metabolism (2-6 hours)

Respiration, heart, metabolic rates drop

Animal remains at low tissue temp (6-8 days)

Metabolic process occur at very low levels

Animal returns to euthermic temperature (1-2 hours)

Metabolic & cardiovascular rates speed up

Animal becomes active

COGNITION & LEARNING



- Learning
 - Modification of behaviour as a result of experience (Thorpe, 1963)
 - Prerequisites: memory
 - Should be adaptive
 - Part of an animal's phenotypic plasticity
- Instinct
 - A consequence of natural selection - Adaptive over generations.
- Most behaviours incorporate elements of both e.g. Hunting in orca packs & tool use

Clever Hans (1890s)

- Horse in possession of retired school teacher, Mr. Von Osten.
- Could answer complex questions by stomping foot correct number of times.
- Maths & words using letter chart
- Investigated by commission including university professor, director of Hanover Zoo, an African explorer & two experts from the Prussian cavalry.
- Student, Oskar Pfungst, investigated further: Horse could not answer correctly unless questioner knew answer.
- Could not answer if questioner in a tent
- Trainers movement of head & trunk were involuntary & unconscious.
- e.g. by your eye movements, bleathing rhythm non-verbal communic no Widely distributed

Habiturtion

- Classicator Payloan Conditioning
- 2 Paulovs dog
- Animal learns to respond to particular stimuli
- Basic obedience training
- Unconditioned Stimulus (US): Automatically elicits a response (reflex)
- Unconditioned Response (UR):
- Food, Water, Sex, Pain,
- Initially "neutral" Does not initially trigger same response as US
- Lights, sounds, tastes, odours,
- After pairings with US, elicits a conditioned response

Instrumental Conditioning

- Trial-&-error learning
- Skinner Box, labyrinth
- Behaviour can be "shaped"

Latent of Associative Learning

- Exploratory learning
- No obvious reward
- _ Helps animal learn about its surroundings

Perception of Fear

- Brain area amygdala (all emotions)
- Experimental evidence: Inactivation of amygdala during training prevents fear conditioning
- Inactivation of amygdala immediately after conditioning blocks memory formation What is the explanation for the reactions:

Behavioural Ecology

Signal - Physical form in which a message is coded

Discrete vs. Graded

- <u>Discrete</u> "All or none"
 <u>Graded</u> Varying in intensity & frequency; provides info about strength of stimulus

Biological Communication

- Cost & Benefit Analysis
- True Communication Both benefit;
- e.g. Male bird song during mating season Deceit or Manipulation - Sender benefits,
- receiver is unaffected or harmed
 - e.g. Killdeer performing "broken wing display"

Deceit

- Interspecific deceit more common
- Predator-prey relationships
- e.g. Aquatic predators attract prey using lures
- Intraspecific "deceit" unlikely to spread in a population

Channels of Communication

- Odour, chemical signals
- Sound (ultrasonic, sonic, and infrasonic)
- -Seismic vibrations
- -Touch
- Electric field
- _ Visual

6 senses in Animal Kingdom

- 1. Mechanoreception
- Tactile information (proprioception)
 - Acoustic signals (auditory reception) ew from Page
- 2. Chemoreception
- Taste (gustation)Smell (olfaction)
- 3. Vision
- Magne of ece tion
 Electro eception
- 6. Thermoreception

Properties of Sensory Channels

- Range Short-Long
- Transmission Rate Slow-Fast
- Can it travel around objects? yes or no
- -Can it be used at night? (yes, no, or sometimes)
- -Fade-out time (how long does it last? - Slowfast)
- Locate sender? (Easy-difficult) -
- Cost to send signal (Low-high)
- Complexity of message (Low-high)

Acoustic Signals

- Can occur within or outside of human "umwelt" (~20-20,000 Hz)
- Ultrasonic (high frequency e.g., echolocation)
- Infrasonic (low frequency e.g., African elephant rumbles, whale song)

Acoustic Signals

- Range? Depends on wavelength
- ravels around objects? Yes
- Useful at night? Yes
- Fade-out time? Fast

- Cost to sender? - High

<u>Odo</u>ur

- Evolutionarily "old" sense
- Used by most species
- Usually involves pheromones: - A species-specific odour cue released by animals that influences the behaviour and/or physiology of conspecifics
- Group Spacing Marking territories
- Recognition Identifying conspecifics, kin, individuals
- Reproduction Attracting mates, altering physiology (e.g. levels of sex hormones)
- Alarm fear pheromone (e.g., inverts)

Odour Signals

- Range? Long
- Travels around objects? Yes
- Useful at night? Yes
- Fade-out time? Slow
- _ Cost to sender? - Low
- _ Sender unable to locate

Seismic Vibration

- Substrate-borne vibrations detected by animals
- _ e.g. White-lipped male frogs make thumps, females extremely sensitive to vibrations
- e.g. Spiders catch prey by detecting dibrations e.g. Male orb-weaving spiders foll c." at web to bring female out for mating

Tactie Computerication

- Physical contract
 - Common in in etebrates: Antennae, tube feet, etc. also pick up chemical cues) Veneorate copulation → Tactile stimulation
- 6 elicits lordosis response in female mammals
- Touch (e.g. vaginal stimulation) can induce ovulation in some species

Tactile Signals

- Range? Short
- Travels around objects? No
- -Useful at night? - Yes
- Fade-out time? Fast
- Cost to sender? Low
- Sender can be located
- Only simple messages

Visual Communication

- Markings, patterns, colour require vision
- Mostly used by diurnal species (visual displays), e.g., aggressive displays of SFF
- Consider bioluminescence
- Exception: fireflies
 - Species-specific flashing to attract mates & during courtship
 - "femme fatales" of Photuris versicolor (deceit)

Visual Signals

Range? - Medium