ZOOADSE01T:

ANIMAL BEHAVIOUR

SEMESTER VH

UNIT 3: Social Behaviour and Sexual Behaviour and Communication

Society : An Animal society can be defined as a group of individuals of the same species that is organized in a cooperative manner extending beyond sexual and parental behaviours.

TYPES: Social And Eusocial

Social: various condition under society (specific to species only)Sub-Social and Para-social, quasi-social and semi social

EUSOCIAL: A truly social animal is mainly characterized by reproductive division of labour, prominent caste mechanism, cooperative care for young, overlapping brood between generations, care for reproductive castes by non reproductive castes, etc. However, important elements or attributes of sociobiology are selfishness, cooperation, kinship and altruism.

Cost and Benefits / Advantages and Disadvantages: Group living confers some clear benefits or advantages as well as some costs or disadvantages to the individuals that are part of them as compared to their solitary living.

Benefits: 1. Protection from physical factors. Ex. Bobwhite Quail survive low temperature better when grouped than when isolated.(Gerstell,1939) ; 2. Protection against predators: Detection of danger and alarm communication are faster and predator deterrence is enhanced by mobbing and group defense. Ex. Prarie Dogs and Bank swallows 3. Mate-selections for sexual species. Ex. Mating swarms in insects. 4. Location and procurement of food: Ex. Communal roots in birds may serve as information centers- unsuccessful, forager learn the location of food by following successful ones. 5. Resource defense against conspecifies or competing species. Ex. Large colonies among invertebrates. 6. Division of labour among specialists. Ex. In the castes of eusocial insects. 7. Richer learning environment for young that develop slowly. Ex. For ,mammals and primates.

Costs: 1. Increased competition for resources as group size increases. Ex. As in prairie dog colonies, the amount of agonistic behavior per individual increases as a function of group size. 2. Increased chance of spread of diseases and parasites. Ex. Fleas transmit bubonic plague. 3. Interference with reproduction. Ex. Chance of cheating and killing of youngs.4. Reduced fitness due to inbreeding.

Traits selected for by **‘male combat’** are called **"weapons"**, and traits selected ***by ‘mate choice’ are called "ornaments***". Much attention has recently been given to cryptic female choice, a phenomenon in internally fertilizing animals such as mammals and birds, where a female may simply dispose of a male's sperm without his knowledge. The equivalent in male-to-male combat is sperm competition. . Whereas a female’s reproductive success depended on her ability to nurture offspring, a male’s depended on his mating success resulting from fights and defense of harems. The evolution of sexual dimorphism leading to larger male size, strength or weaponry is, therefore, easy to explain because these traits increase a male’s success in male–male combat for mates as Larger and stronger males often gain the most females.

Fisher’s Hypothesis : Elaborate male displays may be sexually selected simply because it makes attractive to females.

Example : Malte Andersson Experiment

Females often prefer to mate with males with external ornaments - exaggerated features of morphology- **mate choice**. These can plausibly arise because an arbitrary female preference for some aspect of male morphology initially increased by genetic drift, creating in due course, selection for males with the appropriate ornament. This is known as the **sexy son hypothesis**. Alternatively, genes that enable males to develop great ornaments may simply show off greater disease resistance or a more efficient metabolism - features that also benefit females. This idea is known as the **good genes hypothesis**.

Zahavi’s Handicap Hypothesis: Only good quality males can afford elaborate ornaments and display.

Example: Peacock and Stickleback

Sexual behaviour: In the second part of ‘The Descent of Man and Selection in Relation to Sex’, Charles Darwin (1871) proposed his theory of ‘Sexual Selection’.

Darwin’s first proposal: The frequency of traits can increase or decrease depending on the attractiveness of the bearer.

This theory leads to the concept of **intrasexual selection** or male-male competition: Males are equipped with large body size, strength, or weaponary for combat or competition.

Darwin’s second proposal: Competing for mates by force or by charm or agree.

This theory leads to the concept of **intersexual selection** or female choice: Female gain more than sperms but the genetic material from female choice of mate (mate choice).

Hamilton-Zuk Hypothesis: Sexual displays were reliable indicators of gametic resistance to disease appearance.

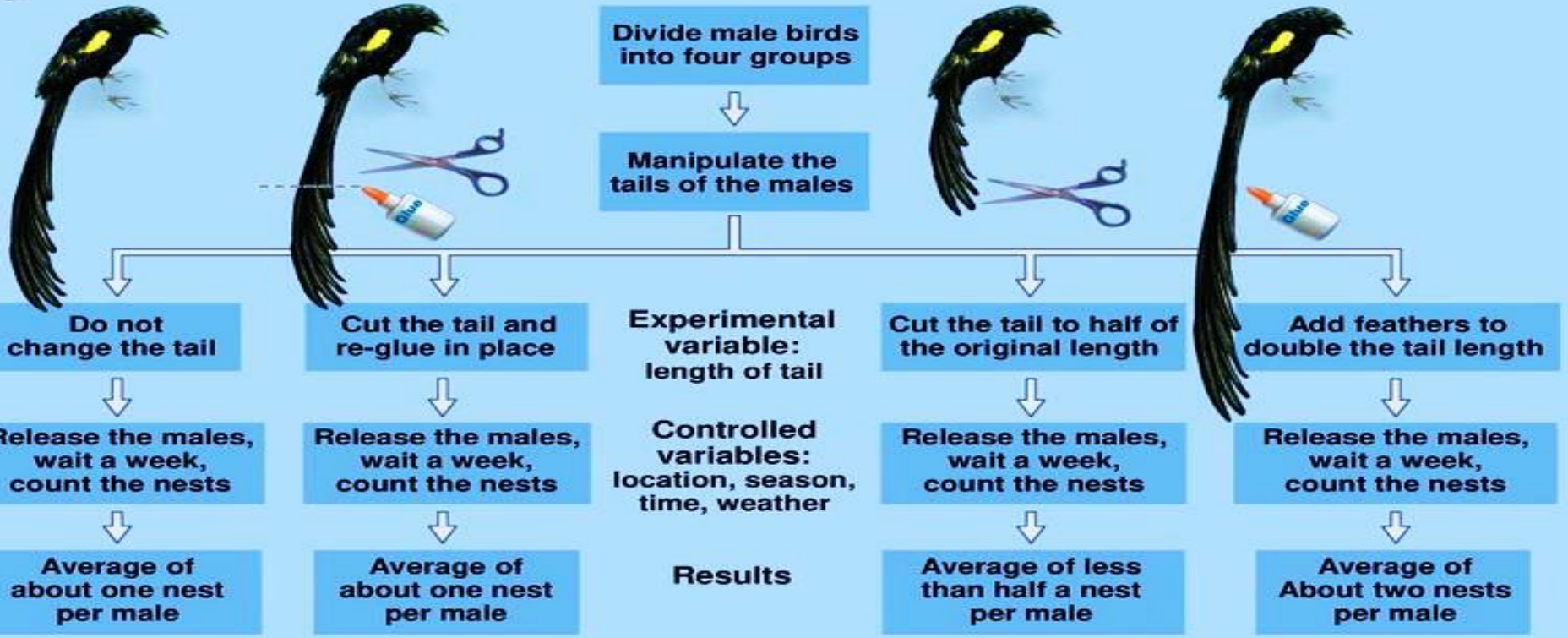
Observation: Male widowbirds have extremely long tails.

Question: Why do males, but not females, have such long tails?

Hypothesis: Males have long tails because females prefer to mate with long-tailed males.

Prediction: IF females prefer long-tailed males, THEN males with artificially lengthened tails will attract more mates.

Experiment:



Conclusion: The hypothesis that female widowbirds prefer to mate with long-tailed males (and are less likely to mate with short-tailed males) is supported.

Malte andersson experiment on widow Bird of Female Choice

Note that the handicap itself need not be heritable…it need only provide a reliable index of fitness, and fitness must be heritable

Bright color honestly signals immunocompetence and parasite/disease resistance

Traits that encumber the owner are physiologically costly (exertion in flight) as well as being more expensive to develop

Asymmetry is indicative of developmental instability and possibly “bad genes”. Symmetry is chosen in some species

Sexual Dimorphism : Sexual dimorphism may be defined as a condition where alternative sexes of single species or group exhibit and attain distinguish morphological, physiological and genetical characteristics.

Sex differences in colour size and competition is called sexual dimorphism as **" Both sexes are likely to have to compete with members of their own sex."**

Sexual dimorphism is greater in species with intense male-male competition.

For females – Inter-sexual selection for mate choice and mate compulsion(forced mating): Reproductive Success is most often limited by resources, the competition will most often for access to resources necessary for successful reproduction- choice of breeding sites, parental care, social rank; rather than male sperm.

For males –Intra-sexual selection for male to male competition : Reproductive success is most often limited by mates, the competition will usually be for access to females, either directly- through force or charm or indirectly – by monopolizing resources that female need.

In Monogamous birds both sexes often invest heavily in parental care. When males make a large contribution to parental investment, males may be choosy about whom they mate with.

Sexual Selection is natural selection operating on factors that contribute to an organism's mating success. Traits that are a liability to survival can evolve when the sexual attractiveness of a trait outweighs the liability incurred for survival. A male who lives a short time, but produces many offspring is much more successful than a long lived one that produces few.
The former's genes will eventually dominate the gene pool of his species. In many species, especially polygynous species where only a few males monopolize all the females, sexual selection has caused pronounced sexual dimorphism.

Sexual Conflict : Male reproductive success is often more limited by access to mates than is a female's reproductive success. Thus for a given encounter, it will often pay a male to mate but a female to resist.
It can be described by two degrees: 1. **Over Mating-** Male usually share benefits by a gift or a favorable resource for utilization or predator-escape. Ex.- Nuptial gift by a male scorpion fly to a female before mating, the gift is usually a food for the female.
2. **Post mating- A. Male adaptation** : 1. Sperm removal by competing males for increasing paternity, 2. sperm displacement as rival of sperm, 3. Sterile sperm and 4. Strategic allocations of sperm- testis placed in scrotum outside the abdomen in case of higher mammals.
B. Female choice cryptic- female prefer to copulate with dominant males. Subordinate males can sometimes force mating despite female resistance. Female also can control over sperm storage into her body (spermathecae).
C. Parental Care – Parents usually care for their offspring in terms of providing energy , food, protection etc. by putting themselves in risks in order to spread their genes.

Parent –Offspring Conflict: Parent- Offspring Conflict may be defined as a behavioural strategy where parents for their best interests, instead of providing usual parental care, may kill or atleast withheld care from some offspring.

Causes of Parent-Offspring Conflict:

1. **Genetic dissimilarity-** As parent and offspring are dissimilar to each other.
2. **Scarcity of food**
3. **Chance of paternity or maternity in the herds or flocks**.
4. **During and after mate selection**- the practice of siblicide is common by parents (usually males) as they genetically differ widely.

Example: owls often lay more eggs than they can normally rear as insurance policy, all are reared if food is plenty , if it is scarce the smaller ones get killed. **Or Siblicide in great egret**: As active killing of nestling by older brother or sister , with the parents look on and not intervening.

Or Killing of non related youngs by lion prides (winner males) to obtain reproductive benefits.

Communication:

Animal communication may be defined as a biological phenomenon of transfer or passage of information through signals between two or more animals, the signaller or donor that sends the signal and the recipient that receives the signal, usually of the same species, in which both the participants are benefitted and thus enhance their better survival value, conducive to perpetuation of a species.

What is signal? Signals are conspicuous behavioural patterns, often combined with structures that have been specially evolved to affect the behavior of another animal.

IMPORTANT FEATURES:

- Signaller and recipient animals should be involved in such a behavior.
- Both participants should be usually benefitted. Otherwise it should not be called a communication.
- Communication can not be restricted within species but also between species.
- Communication is not always exclusively honest, but may be cheating.

BASIC COMPONENTS: Ewsbury 1978,

1. **Signaller-** The member who gives off a signal.
2. **Receiver-**The individual who receives the signal.
3. **Message-** The behaviour emitted by the signaller.
4. **Channels-** It is the pathway through which normally a signal travels.
5. **Noise-** Background activity emitted and transmitted in the channel which is not related to the signal.
6. **Contacts-** It is the particular setting in which a signal is emitted, transmitted and received.
7. **Code-** It includes complete set of languages of possible signals and contexts.

Animals use communication to define and maintain territories. Food and water sources must be shared; assembly sites announced. Hierarchies within a group may need to be established, and activities synchronized. Migration timetables and routes must be coordinated. Mates must be found and courted; bonds established; rivals discouraged. Signals of surrender or submission may control aggression. Parents and offspring need to recognize each other. Juveniles express hunger, pain, or frustration as they seek attention from adults, who pass on essential skills. Animals communicate many messages in an amazing number of ways: visual, auditory, tactile, olfactory, and even vibrations. There are two types of communication: verbal and non-verbal.

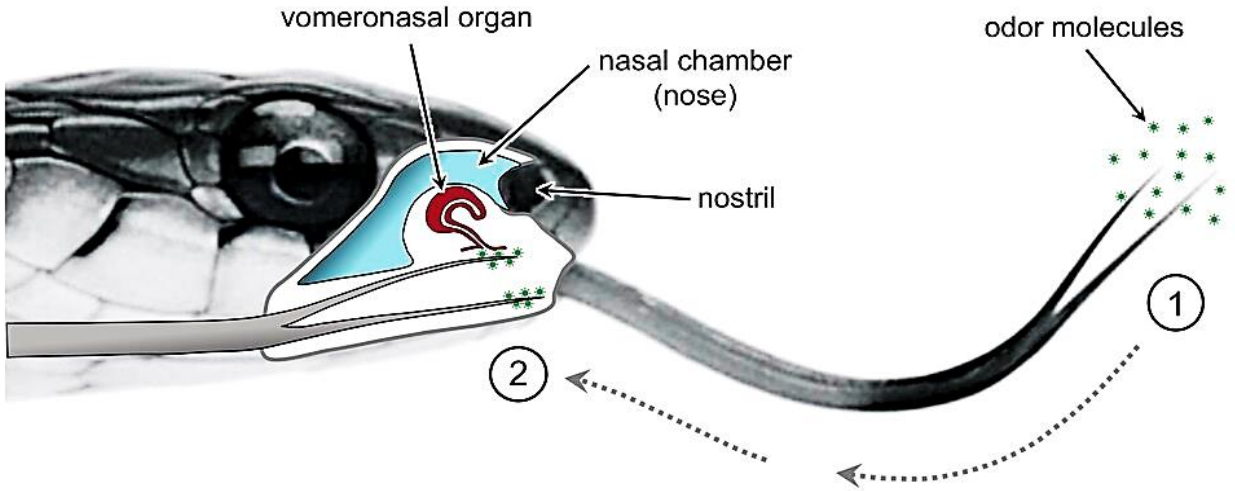
Visual communication

- unintentional, that aid species recognition and individual identification - Variations in pigmentation or pattern may indicate gender, physical condition, or position within the group. Colorful features and breeding plumage advertise mating availability and genetic potential.
- initiated by the sender in response to certain circumstances or stimuli-Carnivores' laid-back ears and barred teeth might indicate that fear is holding aggression in check, while a stiffness in the legs and body of any animal can mean attack is imminent, Within a group, attitudes may indicate social standing.
- universality about some postures- A threatening animal usually enlarges its body by whatever means possible: back arched, hair bristling, wings spread, throat sac inflated, collar or hood extended.
- Most visual messages are transitory, but some are longer lasting. Dung piles can indicate the boundaries of a territory. Scratches on a tree show the presence of an animal and also indicate its size by the height at which they were made. Some males present gifts or build elaborate structures to advertise their worthiness.

Olfactory communication

- Chemical communication is generally acknowledged to be the most widespread mode of communication among insects, but it is more prevalent among all animals than was formerly thought. most highly developed form of chemical communication involves pheromones: chemicals that bring about a specific response in others of the same species. pheromones can mark boundaries and convey information about gender, age, ranking, or sexual receptiveness.
- Pheromones can be extremely complex. Different combinations of chemicals relate to aggregation, dispersal, alarm, trail marking, kinship recognition, and sex. For animals living in cooperative groups, pheromones are believed to synchronize estrus cycles. Research suggests that for some social animals, pheromones produced by a queen or alpha female not only suppress reproduction by other colony members, but also induce subordinates to care for infants not their owns. Pheromones are probably produced at all times, but released only in response to certain stimuli, such as hormones, emotional states, or environmental conditions.

Visual Communication: Courtship displays of Great Egret



Olfactory communication: A vomeronasal organ or Organ of Jacobson communicating through olfaction.

Tactile Communication: Touching of tasks in elephants for exchanging greetings

- **Auditory communication:**

Sound offers multiple advantages. Sound can reach many individuals at once, and an animal can advertise ownership of a territory without visiting its borders. Sound carries in darkness, over distances, and under water.

Frequencies of a sound made by a species is specific that other species are unable to hear.

Auditory communication includes non-vocal noises - chest beating, tail slaps, foot thumps, hoof beats, bill clacking, buzzing, stridulating (the shrill, creaking noise produced by rubbing together special bodily structures, but usually lack the potential for elaboration.

vocalizations can be varied by pitch, clarity, volume, duration, and rate of repetition, making intricate codes possible. vocal communications alone can convey very specific information.

Except for long-range communication, land mammals rarely use auditory signals in isolation. At close range, sounds usually accompany postures or displays.

Tactile communication

- Touch is used mostly with kin, or among members of the same species that live in social groups. Touch is important in courtship, bonding, and displacement of anger.
- Ants recognize nest members by a sequence of antenna taps, and male spiders tap on a female's web or body as a prelude to mating. Elephants use their sensitive trunks extensively for greeting and in child rearing

Auditory Communication: male to male combat between Swallows

Reciprocal Altruism: This refers to condition of altruism where one individual provides another with help and the second subsequently reciprocates or pays back the first.

Usually kin selection does not involve reciprocation; beneficiary of the altruism does not repay the altruist.
However, reciprocal altruism is found to in some natural cases where individuals can recognize each other and if they have good memories.
Example: Vampire Bat offer regurgitate blood meal to its kin who help him, because 18% individuals bats in a colony dies in 2-3 days without a blood meal.

Kin Selection: Kin Selection refers to a form helping behavior(altruism) of animals favoured by Natural Selection through the benefit obtained by genetically related individuals, called relatives or kin, in the form of increased survival and reproductive value.

Principle: The principle in this type of altruism is that the decrease in an individual's fitness as a result of its spending time and energy helping its relatives (kin) is more than compensated for by the increased fitness of its relatives or kin.

Example: Social insects- They maintain a caste system of fertile female(queen), male and infertile female. Infertile female are workers of a colony in expense of their fertility to the queen, usually either their mother or sisters.

Hamilton (1964) first full quantitative treatment of kin selection: He showed that the condition for spread of altruism through kin selection could be expressed by a single equation: $\frac{b}{c} > \frac{1}{r}$; where 'b' is benefit (in terms of Darwinian individual fitness) to the beneficiary of the altruism, 'c' is the cost that altruist suffers, 'r' is the degree of relatedness between two individuals.

The more distantly related two individuals are, the less likely kin-selection is to be involved.

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