

Altruism and Selfishness

B.Sc. Part-I, Paper-I

Dr. Vandana Kumari, Department of Zoology, R.C.S. College,
Manjhaul

There are four possible types of interactions among individuals living together in a population.

1. Cooperation or mutualism- both the participants gain from the act as in the nest building by both male and female birds, or cooperation in the colony of social insects or group hunting in wild dogs and lions or territorial defense in animal groups.

2. Altruism- The act in which the actor (individual that carries out the action) pays fitness cost to the recipient that gets the benefit. Social insects have developed altruism to the extreme where workers carry out duties in the nest without apparent benefit to the individual concerned.

3. Selfishness- The actor gains and the recipient lose in terms of fitness.

4. Spite- It is rare phenomenon in which both the participants lose in terms of fitness. As for example in the case of two eagles fighting in the air for the possession of a killed prey, which ultimately falls down and is taken away by a fox.

Altruism and Kin selection

Altruism, or the provision of benefit for others at the cost of one's own, is a prominent trait characteristic of our species. Altruistic behaviour challenges evolutionary theory, in that natural selection favours prosocial traits over selfish ones. By all accounts, *Homo sapiens* shows extraordinarily altruistic tendencies.

It is a phenomenon in which one individual benefits the other at its own expense. The phenomenon occurs in social animals or in closely knit populations, and signifies natural selection theory. How can a gene that benefits other individuals at the expense of the bearer be favoured by natural selection? But kin selection favours traits that result in decreased personal fitness provided they increase the survival and reproductive fitness of the species, population or family. Altruism evolved in colonies which shows kinship, Kin selection works not on individuals but on genotypes. An altruist by way of helping other individuals increases the fitness of its own genome. A honey bee worker is a sterile female and shares at least 50% of its genotype with its sisters even when its mother and father are unrelated. Workers share only 25% genes with haploid brother drones. If a worker decides to breed on its own, its diploid daughters and haploid sons will never be more than 50% related to it. So, the worker becomes sterile and ensures the survival of her genetically identical sisters because then queen can produce more offspring than workers reproducing individually.

The equation shows that a gene that favours altruism could spread when participants are related and the cost to the actor is low as compared to the benefit to the recipient. Altruism is promoted by kin selection and close genetic relationship.

In a large number of bird species, especially those in which nesting opportunities are limited, young ones help their parents in rearing their own sisters and brothers by way of nest building, nest defence and feeding the chicks, although they are themselves capable of breeding. In such birds, as for example in bee-eaters, help is always given to their kin, and the importance of this assistance can be gauged by the fact that there is considerable mortality of chicks due to starvation if such a help is withdrawn.

Reciprocal altruism and Group selection

The theory of group selection was championed by Wynne-Edwards (1962). Altruism has evolved among the related individuals by means of kin selection. But there are instances of cooperation among the unrelated individuals. Altruistic act towards non-kin is possible only if the recipient is likely to return the favour at a later date, in a '*Tit for Tat*' manner.

Natural selection will favour altruism among unrelated individuals only if they reciprocate, and then this is called Group selection, which will select out selfish individuals from the population. Robert Trivers (1971) proposed that reciprocal altruism can develop in the following conditions:

1. If interacting individuals remain together for considerably longer time.
2. If frequency of altruistic attempts is high.
3. If the cost and benefit to both individuals are more or less equal.
4. If individuals that fail to reciprocate are punished in some way, such as withdrawing the benefits in future.

Species which have mutual dependence in defence, foraging, territoriality etc. are most likely to develop reciprocal altruism, as in monkeys, baboons, chimpanzees and man. Kin selection and reciprocal altruism are sometimes found to coexist in many social groups of animals and at times it is difficult to distinguish between the two or measure them independently.

Alarm calls and Group Selection

In birds and mammals high-pitched alarm calls are given to alert other individuals of a stalking predator. Hunting parties of birds which move together in forest not only exploit different resources of food in a better way but also benefit from the alarm calls of the species that are gifted with loud voice.

Alarm calls benefit others as they can flee from the area but puts the caller in danger of getting killed. Animals living in non-social groups, such as herd of bosons, flock of birds or troupe of monkeys, not only get advantage of alarm calls of alert members but also get benefited in foraging and mating. Group selection will eliminate individuals which stray away from the herd and preserve those which remain closest to others. Group selection is often interspecific and involves individuals of a wide variety of species.

Trophallaxis

This is a phenomenon in which food is offered by one individual to the other which is not its own offspring. This is very common in social insects where feeding is done by specialized individuals of the colony. Among the group hunters such as lions and wild dogs there is sharing of the killed prey but no apparent deliberate attempt to offer food. In chimpanzees distribution of meat among individuals after collective hunting of monkey has been recorded.

Social life in insects

Social insects, such as termites, ants, bees and wasps have highly developed eusociality (true social structure) and altruism. They live in cohesive colonies in which division of labour has modified individuals morphologically as well as behaviourally, so much so that they are incapable to perform any other duties in the colony. Thus, queen only lays eggs and does nothing else; in termites has such a large abdomen that it is incapable of locomotion. Male only fertilize the queen and do not help in household chores.

All other duties in the colony and defence are left to the workers and soldiers. Individuals of a colony are related to one another and therefore an increase in the fitness of the colony is indirect fitness of the individual.

In Hymenoptera (ants, bees and wasps) queen and workers are diploid and develop from fertilized eggs, the latter being sterile,

while males develop from unfertilized eggs and hence haploid. Females are therefore more closely related to their sisters than to males or their own offspring, because sisters share genes of their father. Thus, workers will show altruistic preference to sisters than to brothers.

Although they themselves do not reproduce, workers are always in control of the reproduction in the colony. They can rear queens or workers by choice by regulating the diet of royal jelly to the larvae and by restricting the entry of drones (males) into the colony. Workers seem to have upper hand over both queen and drones and ensure propagation of their genes. The high coefficient of relatedness in social Hymenoptera favours reproductive altruism and social life, which imparts high fitness to the colony as compared to individuals breeding isolated on their own.

Selfishness

The quality or state of being selfish; exclusive regard to one's own interest or happiness; that supreme self-love or self-preference which leads a person to direct his purposes to the advancement of his own interest, power, or happiness, without regarding those of others.

Cost of selfishness

Individuals living in groups enjoy the advantage of protection from the predators as some members out of hundreds will spot the predator and give alarm calls to alert the others. Similarly, prey hunted by a predator group can be shared by all members and sometimes even injured individuals that cannot hunt themselves can also get food. But this favour must be returned by individuals when their turn comes.

If the favour is not returned then the individuals are labelled *selfish* and will be selected out of the group. Herding protects the herbivore animals from predators but an individual straying away from the group will be killed by predators and

eliminated from the population. Selfishness is therefore punished by natural selection. Selfishness is also found in the prides of lions where male lion kills all the cubs after dethroning a lion and taking over his pride.

This is done to bring the lionesses to oestrus so that he can have his own progeny quickly. Selfishness is also seen in protocoooperation in which only one individual derives benefit, as in the case of suckerfish attached to the shark. Shark does not get any benefit but the suckerfish gets leftover food from shark's mouth. Group selection and kin selection, therefore, demand faithfulness to the society and selfish individuals are selected out and eliminated from the population.

Source:

IAS Zoology.com

biologyonline.com