Behavioral ecology

Environment, Ecology

Differences in behaviour are widely varied within zoology and are often influenced by the size and structure of the social assembly during development in animals. In many vertebrates, the effects of social interactions in early life and in adult life are mostly mediated by changes in maturation, their physiology and their genetic make-up.

In this essay, I will be discussing the fly species Drosophila melanogaster in relation to their individual responses to socialenvironment, and what we can learn from this fly species. Drosophila melanogaster is a species of fly in thefamilyDrosophilidae.

Commonly known as a " common fruit fly" or " vinegar fly", it is one of the most widely used animals in biological research in a wide range of fields such as genetics, evolution and pathogenesis. The popularity of Drosphila in lab-based research is due to them being easily reared in labs, the high numbers of offspring which it produces and the fact that they only carry four pairs of chromosomes.

Drosophila melanogaster generally live socially and ecologically complex lives. Adults consumefoodwhich grows on rotting fruit; thus, many social interactions take place in these areas. Adult flies in nature and in labs willingly form social groups, that is, collections of unrelated adults, on sporadic food substrates.

Within the flies, groups can substantially vary in size. Males exhibit multiday site dependability, signifying that social groups can be semi-stable over a short period of time. Therefore, showing that social group formation is

integral to fly biology and flies can choose to join or leave social groups at any given time.

Frequently in nature, individuals' own behaviours have an impact on the environments in which they live, as opposed to the environments in which they live influencing their behaviour. The behaviours and characteristics by which individuals influence their own environments are typically traits that are often thought to have a genetic origin.

This theory has significant implications, suggesting that if the environment that individuals experience is determined partially by their own " environment-constructing" traits, then the different genes underlying these characteristics will govern the environment in which all traits are established.

This process is possibly significant because many traits and behaviours are phenotypically plastic; their expression and development depend on the environment, including individual's social environment. Studying the fruit fly D. melanogaster provides the opportunity to identify how different behavioural mechanisms of social environment construction vary across genotypes and influence development within species.

Comparing the development of behaviour within flies and between genotypes, after experience in the constructed and substituted environments, shows implications about the developmental effects of genetic variation in social environments. In humans, genetic variation in social environment construction is theorized to influence behavioural

development, for example, the development of mental illness, as genotypes differ in their likelihood of experiencing psychosocialstressand other risk factors for disease.

In natural populations of flies, fluctuating accessibility of resources in the environment results in variation of phenotypes between individuals, who then interact within their social groups. Within flies, all traits are expected to depend on the allocation of resources which are available to them. Resource allocation moderates the expression of male and female sexually-selected traits that in turn influence key evolutionary processes such as sexual competition and sexual selection.

These developments can potentially influence speciation and extinction rates and therefore alter biodiversity within the species. Resource attainment and competition experienced during the developmental stage of flies are acknowledged to influence the social interactions within individuals and their potential mates and rivalries in adulthood, in both laboratory and natural populations.

In flies, the environment in which they develop influences the adult body size, which tends to positively correlate with female fertility, i. e. large females produce more eggs than small females, and male competitiveness. Larger individuals tend to have larger reproductive organs, higher rates of courtship behaviour in males, higher mating frequency and higher reproductive output compared to smaller flies. Thus, adult body size is expected to be under fecundity selection in females and sexual selection in males.

High larval density is a key ecological factor In D. melanogaster, and generally results in smaller body-size adults: reduced competitiveness in males with rivals, and females that produce a fewer number of offspring. However, the scale of these larval density effects on adult reproduction can be lessened in mixed-phenotype social groups. Males direct their courtship efforts favourably to large females in mixed female size environments, which in turn reduces the fecundity advantages of large over small females.

All species face tasks in their developmental environment (i. e. physical or nutritional constraints), and in most species individuals are required to interact during their lifetime both for survival and reproduction. Despite these observations, it is difficult to conclude the comprehensive ecological impacts of these interactions amongst phenotypically distinct D. melanogaster's at a group-level, because the consequences of social interactions within groups are not completely understood.

Key questions remain unanswered: for example, we do not know whether interactions between ecological factors (e. g. larval density) and social environments impact the survival and reproductive success of groups and populations. Neither is it fully understood as to whether any potential effects are passed on to successive generations, which could further influence group productivity and persistence.

This is unfortunate as ecological and social conditions are known to influence significant physiological and behavioural processes, including immune responses, mating behavior, reproductive output and offspring quality. Therefore, the interaction between developmental environments and adult

social environments could shape the dynamics between individuals within groups or populations, and influence the likelihood of populations persisting, expanding, or going extinct.