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Critical Review

Population Genetics of the Meat Ant (I*ridomyrmex purpureus*)

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ABSTRACT:

The meat ant (*Iridomyrmex purpureus*) is a native species of ant in Australia, exhibiting extensive distribution across the eastern and southern regions of the nation. Population genetic methodologies evaluate the genetic makeup of biological populations and the variability in genetic components that arise due to the influence of diverse factors, including the mechanisms of natural selection. Researchers in the field of population genetics strive to achieve their aims by developing abstract mathematical models that describe gene frequency dynamics, endeavoring to draw inferences from these models concerning the likely patterns of genetic variation observed in real populations, and juxtaposing the findings with empirical data. Due to climate change, ectotherms, particularly insects in temperate zones, face significant thermal stress. Population genetics of meat ants residing in a temperate ecological zone. Assessing critical thermal limits elucidates the effects of rising temperatures on organisms. The meat ant served as a model organism for a comprehensive study of thermal tolerance. The critical thermal maximum is influenced by the ramping rate in thermos limit respirometry assays. Findings indicate that thermal responses in meat ants generally do not differ among populations, with the exception of western inland populations, and climatic factors and elevation showed no significant impact on thermal tolerance across these populations. Because of studying genetic systems among insect populations offers insights into genetic diversity, relatedness, and breeding strategies. In this article, I summarize population genetics of meat ant (*I. purpureus*).

KEYWORDS: Australian Ants, Population Genetics, Causes of Population Genetics, The Meat Ant ***(Iridomyrmex purpureus).***

INTRODUCTION

Ants are arguably the most well-known and ecologically remarkable group of insects in the world, and that is not because of their potential as indicators of the health of terrestrial ecosystem but it is also because ants play an essential role in the Australian environment (Andersen, 2000). Ants also use the most complex forms of chemical communication of any creatures and their social organization offers an illuminating contrast to that of human beings (Hölldobler & Wilson, 1990). There are three characteristics of ants ‘organization: (1) cooperative brood care; (2) non-reproductive workers or helpers; and (3) overlapping adult generations (Sudd & Franks, 1987). There are also two more factors that make ants so important: their value as objects of biological study and their importance in the economy of nature (Wheeler, 1925). Ants are species without hierarchical or central control, they have the ability to reach group level patterns and they coordinate behaviour of thousands of individuals (Detrain, *et al.*, 2001).

In rural environments, ants play important roles in the ecosystem as bioindicators of soil quality (Lobry de Bruyn, 1999). Other ecological functions of ants include promoting seed germination as seed dispersers, and ants also interact with seeds of specific plants and are responsible for promoting some plant vegetative growth (Wilson, 1990) and contributing to reforestation of many ecosystems (Peternelli, *et al*. 2004). In addition, ants play essential roles in incorporating organic matter and making it fertile, and in soil aeration

(Moutinho, *et al.*, 2003).

Ants, like all insects, have three body parts; the head, the thorax, and the abdomen. They also have two compound eyes, two antennae and maxillary palps. The antennae help the ant to identify their mates and enemies while the maxillary palps help the ants to detect scent.

There are many diverse ant species, but only 1,300 Australian species have been scientifically identified and named to that time (Andersen, 2002).

Ants are known to be social insects as they live in colonies (Bourke & Franks, 1995). The sizes of the ant colonies depend on the ant species. An ant colony consists of a mother queen and her progeny; the latter are mostly female ants that are less fertile than the queen or infertile, and daughter workers (Sudd, 1967).

The female ants leave their colony to search for food (Larson & Larson, 1967), while the main role for workers is to stay in the maternal nest and support the queen so she can breed more offspring (Sudd & Franks, 1987).

Most of the ant species live within the ground. Their nest entrances are open and may be located under a rock or a log.

In the forest, many ants build their nests by using different patterns; some build their nests above ground by utilizing trunks and hollows in the branches of trees, and others create their nest cavities via overlapping leaves with each other by silk while several ant species build their nests in rotten wood or in the deep layer of leaf litter (Burwell, 2007).

The ants 'method of gathering diverse foods depends whether they are typically scavengers or predators. The infertile female 's duty is to look for food for the larvae. The larvae are only limited to solid foods.

The other ants, especially the workers, are known to be liquid feeders. This means they gather sugary liquids such as honeydew, sugary nectar and plant secretions (Andersen, 2002).

Other ant species are more specialized and have one mode of feeding. Some are hunters of one particular prey; some depend on gathering seeds while others feed on sugary liquids only.

The honeydew ants tend to create a symbiotic relationship with the sap sucking insects. They offer them protection and in turn they share their honeydew with the ants (Shattuck, 2000)

Ants can be important ecological engineers of habitats. When they exist in large numbers of colonies near another, they can manipulate plant growth and animal numbers.

Their relationship with plants in which they extract floral nectars while spreading pollen is a famous example of mutualism (Sudd & Franks, 1987).

Ants are a source of food for many animals such as insects, birds, mammals, and reptiles. Since most ants live in the ground, they help aerate the soil through their excavations and tunnelling (Greenslade, 1974).

Ants are known to help spread plant species. Australia has the largest plant species whose seeds are spread by ants (Gammanset *et al.*, 2005). In Australia, there are some different species of ants shown below in Table (1).

Table:(1). Some Different Species of Ants.

Ants type	Scientific name	Living	Feeding	Reference
The brown Ants	*Pheidole megacephala*	Mainly in gardens.	On animal food.	**(Andersen, 2002).**
The bull ants	*Myrmecia spp.*	In the soil and have very large nest mounds.	In the ground: leaves, plant seeds, and dead animals.	**(Andersen, 2002).**
The green-head ants	*Rhytidoponera metallica*	In open ground and under rocks.	They are scavengers and predators, but also collecting honeydew and plant seeds.	**(Shattuck & Barnett, 2001).**
Sugar ants	*Camponotus*	Inside house in wall or ceilings.	They are scavengers and predators, but collecting honeydew, sugary nectar, and plant secretions.	**Anderson, 2002).**
Green Tree Ant	Oecophylla smaragdina	In the ground.	Vegetation.	**(Shattuck & Barnett, 2001).**
Spiny Ants	**Polyrhachis sp.**	**In tree trunk holes and branches.**	**On the ground while running up and down the tree trunks**	**(Anderson, 2002).**

The spatial structure of a population determines how natural genetic difference is distributed between and within populations, for example, how population genetic variations have differed from each other and how much the populations harbors genetic differentiation (Seppä *et al*., 2009). In order to survive, a population must be able to adapt by altering its genetic structure in response to the unavoidable changes in the environment. It must produce and reproduce new phenotypes and genotypes improved to the changing conditions (Mettler & Gregg, 1969). There are some factors that determine the changes in population genetic structure.

Eliminated genetic differentiation (by effective drift) and an introduced new genetic generation (by fast migration) determine the genetic variation in the population; thus, allele frequencies are diverged among population by genetic drift, while migration counteracts this process. The essential assessment of genetic population structure is not only to understand species evolution and the population generally, but also to identify the population ‘s capability to keep their genetic differentiation from being compromised and changed (Seppä *et al.,* 2009).

Ants are haplodiploid organisms, which mean the females emerge from fertilized eggs, and males from parthenogenesis; the two occurrences of ploidy levels can be utilized as an essential tool for genetic analysis (Diehl, *et al*. 2002). Both the social behaviour and genetic structure within and among colonies are affected by haplodiploid (Seppä *et al.*, 2009). Therefore, excellent opportunities exist to investigate different evolutionary and biologically different populations using ant populations and their various social and highly complex colonies (Antagalli, *et al.*, 2013). Genetic differentiation within and between populations could be impacted by the ants ‘social behaviour (Sugg, *et al.*, 1996). Several social insects show differences in their social behaviour that could possibly impact their reproductive and mating strategies; therefore, the social insect provides a unique opportunity to study population genetic structure (Pamilo, *et al*., 1997; Ross, 2001). In particular, ant societies follow a special strategy because they build their nest as a sedentary and permanent place (Rüppell *et al*., 2003)

In ecosystem function, ants play role in terms of constituting a great part of the animal biomass as well as they present as ecosystem engineers, and ants also are important in regarding to ground processes by the changes of the physical and chemical environment and through ants ‘impacts on plants, soil organisms, and microorganisms (Folgarait, 1998). Due to the ants ‘abundance, diversity, and long history, ants constitute the important insects in terrestrial ecosystem (Fernandez & Delsinne, 2013).

1. Population genetics

Population genetic techniques assess the genetic constituents of biological populations and the variation in genetic components that are caused by the operation of different factors, as well as natural selection. Scientists in population genetics pursue their objectives by formulating abstract gene frequency dynamics mathematical models, trying to retrieve conclusions from these models regarding the probable patterns of genetic disparity in actual populations, and comparing the results against experiential data (Wright, 1969)

Studies in population genetics also investigate the distribution of allele frequency and variation is influenced by the four major evolutionary processes: mutation, genetic drift, gene flow, and natural selection. It similarly considers the aspects of population structure, recombination, and population subdivision. Additionally, it tries to clarify phenomena like speciation and adaptation (Charlesworth, *et al.*, (2003). Many studies have investigated the genetic constituents of biological ant populations and the variation in genetic components that are caused by different environmental factors. Ants are social insects belonging to the family Formicidae, and, along with interrelated bees and wasps, the order Hymenoptera (DeHeer & Herbers, 2004). Ants evolved in the mid- Cretaceous period from wasp-like ancestors about 130 million years ago and branched out after the development of flowering plants. Over 12,500 out of an approximated total of 22,000 species have been categorized. They are effortlessly recognized by their unique node-like structure that creates a slender waist and elbowed antennae‖ (Wilson, 1990).

Colonies of ants can vary in size from a small number of a dozen predatory ants living in tiny natural cavities to extremely organized colonies that can inhabit large territories and comprise millions of ants. Larger colonies consist generally of barren wingless females creating castes of "soldiers", "workers", or other specialized groups. Some ant colonies have a number of fertile males (drones) and a number of single fertile females (queens). The colonies at times are depicted as super-organisms since the ants seem to operate as a cohesive entity, jointly working as one to support the colony (Hölldobler & Wilson, 1990).

Ants have colonized nearly every land habitat on Earth. The only habitats lacking native ants are Antarctica and a small number of secluded or inhospitable islands. Ants flourish in nearly all ecosystems and can form 15-25% of the Earth ‘s animal biomass. Their accomplishment in such numerous environments has been credited to their ability to transform habitats and their social organization, tap resources, and protect themselves (Wilson,1990). Their lengthy coevolution with many other animals and plants has led to parasitic mimetic, commensal, and mutualistic relationships.

1.2 Causes of genetic variation in ant populations

Once populations are separated from each other, genetic drift, the accumulation of novel mutations, and differing selection could drive genetic variations between them (Tsutsui & Case, 2001). The homogenizing influence of gene flow counters the genetic variations (Slatkin, 1987). The genetic variation in the population is affected by several factors: how fast migration produces new differentiation to the population as well as how effective drift eliminates genetic variation. In ants, specifically, the genetic variation is influenced by the genetic and social structure of the colonies (Seppä *et al.,* 2009) as the social behaviour has an essential impact on separating the genetic differentiation within and between populations (Sugg *et al.,* 1996). Therefore, sociality, migration, new colony development, and genetic variation are the main factors that determine the change of population genetics in ants.

1.2.1 Sociality

Sociality represents kin cohorts as an extra hierarchical level in populations. Due to insects ‘organization of life style and ecological domination, social insects have played a key role in understanding and investigating population genetics and evolution of social animals. Methods of genetic connectedness and family structure provide significant and new information regarding insects ‘breeding systems (Seppae & Pamilo, 1995). For example, cohabitation of many queens (polygyny), male outputs by workers, numerous matings by females (polyandry), as well as rapid queen turnover (Seppä *et al.*, 2009) are interesting phenomena. In addition, the evaluation of comprehensive genealogical relationships among specified individuals or populations of individuals are the foundation to test inclusively different fitness forecasts (DeHeer & Herbers, 2004) and have provided some of the most convincing evidence for this (Pamilo, *et al.,* 1997). Population-level genetic occurrences in ants are greatly influenced by genetic structure and the social nature of the ants 'groups that creates a direct connection among the hierarchical levels. In monogynous populations and species (with one queen) and feebly polygynous colonies, this is projected to conclude in huge homogenous groups and panmixia in a huge area (Tsutsui & Case, 2001).

Conversely, in polygynous species as well as populations, mating takes place near or in the nest. In addition, females are frequently philopatric. This tends to lead to a powerful population structure, mainly in the mitochondrial genome, as well as raising the potential of regular mating (Seppae & Pamilo, 1995). A polygynous population form can lead to a stable and patchy habitat diminishing the success of dispersing females (Pamilo *et al.,* 1997).

1.2.2 Migration

Migration is the transfer of species from one place to another. Even though it can take place in recurring patterns (such as in birds), migration when applied in a population genetics context regularly refers to the transfer of species into or out of a distinct population.

How does movement affect relative allele frequencies (DeHeer & Herbers, 2004)? If the moving species stay and mate with the indigenous individuals, they are able to offer an unexpected influx of alleles. Following the establishment of mating among the migrating and indigenous individuals, gametes carrying alleles are contributed by the migrating individuals. This can change the existing percentage of alleles in the indigenous population. Hence, movement out of or into a population might be accountable for a noticeable alteration in allele frequencies (the percentage of members having a specific variant of a gene). Immigration can also end in the adding up of novel genetic variants to the existing gene pool of a specific population or species. In addition, several factors impact the amount of flow of genes among diverse populations of ants. One of the key features is movement, as better movement of a species tends to provide it better migratory possibilities (Pamilo *et al.,* 1997).

Sustained gene flow among diverse

populations can, in addition, lead to a mixture of different gene pools, dropping the genetic difference of the two cohorts. Because of this, gene flow robustly represents in opposition to speciation, via re-joining the gene pools of the populations, consequently, repairing the devolving variances in genetic differences that should have led to complete speciation and formation of a daughter species (DeHeer & Herbers, 2004). For instance, if types of ants inhabit one side of a highway, ants may migrate from one side to the other and vice versa. If this ant is able to mate with the other ant and generate viable offspring, the alleles in the ant can go from the group on one side of the road to the other.

1.2.3 New colony development

One common feature shared among ant colonies provides an obvious criterion for colony definition and supports the possibility of a super-colony staying as a single society: the shared recognition cues of ants. Studies of the Argentine ant (*Linepithema humile)* display this factor most successfully. The Argentine ant lives in aggressive super-colonies usually comprising billions of queens and workers, which can over to hundreds of kilometers inside. A single colony can spread through territories to appropriate habitation due to a lack of well-matched competitors. The characteristic of super-colonies, thus, is defined as the ability for unlimited growth. Moreover, no evidence has yet arisen to suggest that the methods of the worker, the indigenous patchiness of nests, and the diet traffic in these extensive-ranging populations are consequently invariant that no existing of super-colonies, nonetheless as an alternative are groups of several independent nest collections that would be named as (colonies) (Moffett, 2012).

1.2.4 Genetic structure

Due to physical barriers to movement, by tending inadequately for species to either alteration or spread (vagility), as well as propensity to stay or return to natal habitat, normal populations hardly entire breed as visualized, in theoretical random models (Buston, *et al.,* 2007). A normal geographic range is one in which species are more intimately correlated to each other compared to individuals that are randomly chosen from the whole population; this is illustrated as the degree to which a group is genetically structured. Genetic structuring may be caused by movement owing to species range expansion, historical climate change, or present availability of habitat (Pamilo *et al.*, 1997).

The structure of genetic populations of species is affected by internal (species- specific) and external factors that can interrelate. Internal factors contain inbreeding, genetic drift, and dispersal capabilities because of differences in population bulks (Clemencet, *et al.*, 2005; Ruda, et al., 2010) Climate and landscape affect the structure of population in terms of the carrying, fragmentation, and distribution ability of appropriate habitats. Christiansen and Reyer (2011) and Zachos and Hartl (2011) have shown how the structure of populations may be controlled if gene flow is decreased because of geographic obstacles such as deserts, islands, or due to disintegration in human-inhabited landscapes. Additionally, population structure may be affected by historical phenomenon; for example, ice ages or the range spreading out from relict populations (Grant, *et al*, 2011; Schmitt & Seitz, 2001).

Hölldobler and Wilson (1990) found that distance, which happens once the opportunities of mating reduce among species with geographical distance, affected how distinctive the structure of a population pattern was in permanent habitats. The level of this method relies on the spreading abilities of the central organisms. Additionally, in ants, winged sexual scatter in mating flights of distances from 50 meters up to a few kilometers. For instance, genetic investigates discovered typical dispersion distances of 65 to 86 m as well as isolation by distance (IBD) on this scale (Suni & Gordon, 2010). In ants, dispersion and mating through courtship flights trailed via autonomous colonies ‘establishment of winged queens is evidently the ancestral reproductive method (Foitzik, et al., 2011).

However, many ant species have developed diverse mating and dispersion behaviour even in dependent colony foundations and in nest mating through which no wing queens escorted via workers create new nests near the mothers ‘nest (Peeters & Ito, 2001). Particularly, this substitutionally generative style of colony fission or budding, which is often revealed by polygynous (Mult-queen) colonies, leads to powerful organizing of ant species on a local scale. It produces a great relatedness between neighboring nests as well as diminishing relatedness upon the remoteness of numerous meters. This type of population stickiness has been depicted in several ant types with dependent colony foundations (Seppae & Pamilo, 1995; Giraud, *et al*., 2000).

Restricted dispersal results in an elevated relatedness between mating partners. This, in turn, leads to a high level of homozygosity between progeny. This bears suitability costs, for example, the generation of sterile diploid males in social Hymenoptera (J. M. Cook, 1993; Santomauro, *et al.,* 2004), decreased colony expansion and survival, altered sexual investment and smaller body size (Gerloff *et al.,* 2005; Tarpy & Page, 2002). However, there has been a detection of inbreeding and diploid males in a number of ant species with local dispersion (Haag-Liautard, *et al.,* 2009; Cole & Wiernasz, 1997; Foitzik & Heinze, 2001; Sundström, *et al.,* 2003). Furthermore, in ants of the genera hypo Ponera and Cardiocondyla and in numerous invasive ant species (Yamauchi, *et al.,* 1996; Yamauchi et al., 2001; S. Foitzik, *et al.,* 2002), normal intranidal (in-nest) mating occurs (Foitzik *et al.,* 2011).

2. The meat ant

(Iridomyrmex purpureus)

The meat ant is the most predominant Australian ant in terms of its influence, abundance, and effectiveness overcoming other species of the surface fauna (Greenslade, 1976). Due to the high rates of their activity, their great abundance, and their extreme aggressiveness (Andersen & Patel, 1994) they are highly successful. The meat ant is also known as the gravel ant and it is also one of the 60 species of *Iridomyrmex* in Australia (Shattuck & Barnett, 2001). It usually has a reddish head and trunk contrasting with gaster, and it is large (>4mm) (Andersen, 2000). There are at least eight color forms of meat ants and together they make up a very conspicuous part of Australian ant fauna (Halliday, 1983). Meat ants 'nests are often large and built underground with sand or gravel mounded around the entrances to the nest. The meat ants are often involved in mutually beneficial relationship with caterpillars. The caterpillars provide sugary fluid for the ants in return for protection from predators (Shattuck, 1993).

The meat ant (Iridomyrmex purpureus) is a dominant ant in south eastern Australia (Andersen & Patel, 1994), and it is one of the 60 species of *Iridomyrmex* in Australia (Shattuck & Barnett, 2001). The meat ants ‘colony is polygynous (a mating pattern in which a single individual mates with more than one individual of the opposite sex) (Hölldobler & Carlin, 1985), but less than 20% of the galleries are controlled by queens (Greaves & Hughes, 1974). Hölldobler and Wilson (1990) suggested, however, that many mature nests consist of more than one functional (egg-laying) queen (Hölldobler & Carlin, 1985). Workers (sterile females) perform all other colony activity such as feeding the young, serving the queen, collecting water and food, and protecting the nest (Wilson, 1976). Workers are also genetically recognizable as solitary family units combined to form huge multi-nest colonies with a considerable exchange of workers among the nests (Halliday, 1983). Workers perform most jobs within the colony: some assist young queens to establish colonies and others attack strangers, indicating that they might be able to discriminate between outsiders and their nest mates (Carew, *et al*., 1997).

In Australia, meat ants (*Iridomyrmex purpureus)* are one of the dominant ant species in ant communities of eastern Australia (Greenslade, 1976). Some of this ecological success could be due to their population genetics. Population genetics provides insight into the roles the essential evolutionary forces of gene flow, drift, and selection play in processes such as speciation and adaption (Ross, *et al.,* 1999). Once a population is isolated from another, the accumulation of novel mutations, genetic drift, and locally differing selection can lead to genetic variations between populations. There are some factors that may impact the altering of the genetic structure of the meat ant *I. purpureus.* Several theoretical and empirical studies have demonstrated that the population structure of species is the result of dispersal, mortality, and mating of individuals (Rüppell, *et al,* 2003), as well as the effects of breeding (Storz, *et al.,* 2001), local extinction (Wade & McCauley, 1988), and restricted dispersal (Hansson, *et al,* 2002). Assessing population genetics does not only investigate gene behaviour within a population, it also includes the study of how organisms adapt to a stabilizing or fluctuating environment (Cook, 1976).

2.1 Meat ant activity

The activity of a meat ant infertile females is affected by temperature so, in the summer, workers search for food from dawn to the late afternoon, while their activity, in the winter, begins after sunrise and continues until sunset (Greenaway, 1981). Each day, the large groups of infertile females spend the day outside the nest that in distance for feeding on honeydew and excreting, while the other rest of group spends the day scavenging the territory around the colony for proteinaceous and dead insects (Greaves & Hughes, 1974). The workers gather food from dead animals by stripping off their meat as the colonies of meat ants are not far from each other (Mahboba, 2023). Nevertheless, their major source of food is honeydew from sap sucking insects (Greenslade & Halliday, 1982). The meat ant's food types depend on carbon or nitrogen they have which getting by colonies' surrounded soil (Mahboba,2023).

2.2 Meat ants' behaviour and organization in colonies

Unlike other ant species, meat ants do not have specific duties for each ant; meat ants have various roles in their colony during various stages in their lives. This is known as age cast polytheism. In their colonies, it is the duty of the younger ants to take care of eggs and the larvae. Elderly ants make up the bulky foraging groups for exploiting substantial constant food resources like dead animals. The older ants search for their food through open ground by gathering invertebrates to be used in the colonies (Shattuck, 1993). Meat ants' foraging and communication with other insects Meat ants are scavengers and predators. They are diurnal;however, foraging becomes bimodal during the hot season (McIver, 1991). Like other species, the meat ant engages in a symbiotic relationship with caterpillars and butterflies. The caterpillars and the butterflies provide secretions that are the ant 's food and in return, the ant provides security from their predators. Honeydew is the main source of nourishment for the meat ants. However, the honeydew can be supplemented by the meat from the dead animals (Schultheiss & Nooten, 2013).

The meat ants can be very aggressive towards ants from other colonies (Anderson & Patel, 1994). The meat ants engage the other ants in battle to establish borders or foraging barriers (Schultheiss & Nooten, 2013). The meat ants are so aggressive so when somethings are closer from their colonies, they will attack them (Mahboba,2023). However, meat ants from larger colonies are less aggressive to other ants from small colonies (Ettershank & Ettershank, 1982). They can even recognize their mate nest from other nests (Van

Wilgenburg, *et al.,* 2006). Furthermore ants ‘nests are built in a homogenous environment, so this environment may have similar food resources (Mahboba, 2023).

2.3 Regulation of sexuality

Queen, workers (fertile, infertile ants), and soldiers are consisted the nest, and each has different duties, such as the queen is responsible for reproduce (Hölldobler & Carlin, 1985), while the works (infertile) help the queen during the reproductive process, and also the queen is able to choose and select the appropriate mate, and the soldiers are mainly responsible for protect the nest, specially, to ensure all conditions are favorable for the queen during mating time(Keller & Wilson, 1993); because of choosing the worker who live in soil rich with (N) (Mahboba,2023).

In addition, the queen produces a hormone that helps to identify and attract her mating partner during the reproductive season. Once the pheromone is produced, it induces the worker ants (infertile) into a reaction (Mahboba,2023).

The hormone is also used to help in the reproductive development of the ants; it helps to create the sexual ants. This helps to keep colonies intact since the mating is only limited to a few ants. In some cases, it is believed that the worker ant helps in determining the sexual partner for the queen in order to create a strong colony (Crozier & Pamilo, 1996).

CONCLUSION

Meat ants, or *Iridomyrmex purpureus*, are a prominent species in ant populations located in the eastern region of Australia. Some of their ecological success might be attributable to their population genetics.

The study of population genetics sheds light on the functions that selection, drift, and gene flow three fundamental evolutionary forces play in phenomena like speciation and adaptation.

Genetic variances across populations can result from the accumulation of new mutations, genetic drift, and regionally varying selection when a population is isolated from another.

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الملخص

نملة اللحم Iridomyrmex Purpureus هي نوع أصلي من النمل في أستراليا، ويظهر توزيعًا واسع النطاق عبر المناطق الشرقية والجنوبية من البلاد. تقوم المنهجيات الوراثية السكانية بتقييم التركيب الجيني للمجموعات البيولوجية والتباين في المكونات الجينية التي تنشأ بسبب تأثير العوامل المتنوعة، بما في ذلك آليات الانتقاء الطبيعي. يسعى الباحثون في مجال علم الوراثة السكانية إلى تحقيق أهدافهم من خلال تطوير نماذج مجردة تصف ديناميكيات تردد الجينات، والسعي لاستخلاص استنتاجات من هذه النماذج فيما يتعلق بالأنماط المحتملة للتنوع الجيني الملحوظ في المجموعات السكانية الحقيقية، ومقارنة النتائج مع البيانات التجريبية. بسبب تغير المناخ، تواجه ذوات الحرارة الخارجية، وخاصة الحشرات في المناطق المعتدلة، إجهادًا حراريًا كبيرًا. الوراثة السكانية لنمل اللحوم المقيمين في منطقة بيئية معتدلة. يوضح تقييم الحدود الحرارية الحرجة تأثيرات ارتفاع درجات الحرارة على الكائنات الحية. كانت نملة اللحم بمثابة كائن حي نموذجي لدراسة شاملة للتسامح الحراري. يتأثر الحد الأقصى الحراري الحرج بمعدل التعلية في فحوصات قياس التنفس بالحد من الترمس. تشير النتائج إلى أن الاستجابات الحرارية في نمل اللحوم لا تختلف عمومًا بين المجموعات السكانية، باستثناء مجموعات المناطق الداخلية الغربية، ولم تظهر العوامل المناخية والارتفاع أي تأثير كبير على التسامح الحراري بين هذه المجموعات السكانية. نظرًا لأن دراسة الأنظمة الوراثية بين مجموعات الحشرات توفر نظرة ثاقبة للتنوع الجيني والارتباط واستراتيجيات التكاثر. في هذه المقالة، ألخص الوراثة السكانية لنملة اللحوم I. Purpureus.

الكلمات المفتاحية: النمل الأسترالي، علم الوراثة السكانية؛ أسباب الوراثة السكانية - نملة اللحم Iridomyrmex purpureus