Editorial
Volume 10:1, 2022

Journal of Phylogenetics & Evolutionary Biology

ISSN: 2329-9002 Open Access

An Overview on Metapopulation and its Theory

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Editorial

A metapopulation is a set of populations of the same species that are geographically separated but interact on some level. Richard Levins created the word "metapopulation" in 1969 to propose a model of population dynamics of insect pests in agricultural fields, but the concept has since been applied to species in naturally or artificially fragmented habitats. It is, in Levins' words, "a population of populations." A metapopulation is often thought to be made up of numerous separate populations as well as areas of suitable habitat that are currently uninhabited. According to classical metapopulation theory, each population cycles independently of the other populations and finally becomes extinct as a result of demographic stochasticity. Metapopulations are thought to be spatially structured populations made up of discrete units (subpopulations) separated by space or barriers and linked through dispersal movements. Metapopulations are characterised by a turnover of local populations that go extinct and then re-emerge, resulting in a shifting distribution pattern throughout time. The impacts of habitat fragmentation on birds in the temperate zone are studied using metapopulation theory, which integrates numerous theories for the scarcity of species in isolated ecotopes. The evolution of metapopulation theory, in tandem with the evolution of source–sink dynamics, emphasised the necessity of connectedness between seemingly isolated populations. Although no single population can guarantee a species' long-term existence, the combined effect of multiple populations may be able to achieve so.

Although individual populations have finite life spans, the metapopulation as a whole is often stable because immigrants from one population (which may be undergoing a population boom, for example) are likely to re-colonize habitat left available by the extinction of another. They may also emigrate to a tiny population and save it from extinction (called the rescue effect). Such a rescue impact could emerge because diminishing populations provide up specialised opportunities for "rescuers." The theory of metapopulations was initially created for terrestrial ecosystems and then adapted to the marine world. The phrase "subpopulation" in fisheries science is analogous to the term "local population" in metapopulation science. A metapopulation is a geographical group of related populations of a species in ecology. Each metapopulation for a given species is constantly being modified by increases (births and immigrations) and decreases (deaths and emigrations) in individual numbers, as well as the creation and dissolution of local populations included within it. As the size of a given species' local populations fluctuates, it becomes vulnerable to extinction during periods when its numbers are low. Local population extinction is prevalent in some species, and the regional survival of such species is contingent on the presence of a metapopulation. As a result, removing much of the metapopulation structure of some species may raise the likelihood of species regional extinction. The structure of metapopulations differs between species. In some animals, one population may be especially stable over time and serve as a source of recruits for other, less stable populations. In California, for example, populations of the checkerspot butterfly (Euphydryas editha) have a metapopulation structure made up of a number of small satellite populations that surround a big source population on which they rely for new recruits. Satellite populations are too small and fluctuate too much to last indefinitely. The removal of the source population from this metapopulation would very certainly result in the extinction of the smaller satellite populations.

The source of metapopulations may change. Any one local community may be the stable source population that feeds recruits to the more unstable surrounding populations for a short period of time. The source population may become unstable as conditions change, such as when disease spreads locally or the physical environment deteriorates. Synthetic habitat landscapes have been created on a chip by constructing a collection of bacterial mini-habitats with nano-scale channels providing nutrients for habitat renewal and connecting them by corridors in various topological arrangements, resulting in a spatial mosaic of patches of opportunity distributed over time. Life-history evolution has been explained using metapopulation models, such as the ecological stability of amphibian metamorphosis in small vernal ponds. Alternative eco-strategies have emerged [1-5].

References

1. Hanski, Ilkka A. "Eco-evolutionary spatial dynamics in the Glanville fritillary butterfly." *Proc Natl Acad Sci* 108 (2011): 14397-14404.
2. Hanski, Ilkka. "Dynamics of regional distribution: the core and satellite species hypothesis." *Oikos* (1982): 210-221.
3. Pulliam, H. Ronald. "Sources, sinks, and population regulation." *Am Nat* 132, no. 5 (1988): 652-661.
4. Dias, Paula C. "Sources and sinks in population biology." *Trends Ecol Evol* 11 (1996): 326-330.
5. Moilanen, Atte, and Ilkka Hanski. "Metapopulation dynamics: effects of habitat quality and landscape structure." *Ecology* 79 (1998): 2503-2515.

How to cite this article: Lin, Zhengo. “An Overview on Metapopulation and its Theory.” J Phylogenetics Evol Biol 10 (2022): 196.

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Received: 04 January, 2022, Manuscript No. jpgeb-22-55738; **Editor assigned:** 05 January, 2022, PreQC No. P-55738; **Reviewed:** 18 January, 2022, QC No. Q-55738; **Revised:** 19 January, 2022, Manuscript No. R-55738; **Published:** 28 January, 2022, DOI: 10.37421/ 2329-9002.2022.10.196.