

Ecology, 00(0), 0000, pp. 000–000
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WEE GUPPIES PACK AN EVOLUTIONARY PUNCH

Magurran, Anne E. 2005. **Evolutionary ecology: the Trinidadian guppy**. Oxford Series in Ecology and Evolution. Oxford University Press, New York. xi + 206 p. \$49.50, ISBN: 0-19-852786-1 (acid-free paper).

Key words: guppy; evolutionary ecology; life history; *Poecilia reticulata*; predator.

Smaller than well-cooked penne, lighter than a postdoc's wallet, and (sometimes) faster than a jumping guabine (*Rivulus hartii*). How could something of this magnitude possibly do anything interesting? After reading Anne Magurran's *Evolutionary ecology: the Trinidadian guppy*, doubts, if any, that the diminutive guppy (*Poecilia reticulata*) is both interesting and a formidable model system in evolutionary ecology should be cast aside. Magurran writes with a crisp, organized, sometimes autobiographical style, which makes this book an enjoyably informative read, even for someone not entrenched in research on guppy biology. For guppy connoisseurs, much of the content will likely be old hat (or stashed in a pile of "must read" articles for a rainy day). But, even connoisseurs might stand to gain a bit from Magurran's seamless fusion of historical and admirably up-to-date perspectives on diverse topics ranging from sperm competition and storage, to shoal structure and mate recognition. The history lesson that Magurran weaves throughout the text is impetus enough to mine for forgotten treasures on one's own study organism in the dusty recesses of the university library, and could serve as an instant reminder to those who tend not to read anything without pixels. The stated goal of Magurran's monograph was to elucidate how guppy research has, in large part, sculpted evolutionary ecology. She has done a remarkable job testifying on behalf of the guppy, and revealing in a relatively small volume the past, present, and future riches that the guppy system has or will bring to the table.

The monograph begins with a lay of the land (Chapters 1 and 2), describing in detail the scene (the Trinidad river system) and the players (guppies, their predators, other community members, and the physical environment) that constitute a veritable natural research laboratory. Magurran's enthusiasm for Trinidad's yet untapped empirical cache is evident throughout the book but tempered with realistic perspectives on the limitations of field research and the potential impacts of ever-expanding exploratory traffic into the area (Chapters 7 and 8). The balance of the monograph relies heavily on the groundwork laid down in Chapter 3, which provides an overview of the guppy's arsenal of anti-predator and shoaling behavior, recapitulates variation in predation risk among Trinidadian streams, and reveals some of the phenotypic consequences of variable predation pressure. Chapter 4 tackles some of the less mainstream, and poorly understood aspects of reproduction and mating systems in *P. reticulata*, including empirically driven, insightful commentaries on male mate choice, the ramifications of multiple mating (for males and females), and cryptic female choice. In the next chapter (Chapter 5), it becomes abundantly clear that predation pressure has left an indelible, genetically encoded mark on guppy life history traits. From the reader's perspective, it is difficult at this point not to earmark the consequences of variable predation risk as the dominant knitting of guppy evolutionary ecology research. "*Crenicichla* site" and "*Rivulus* site" should be engraved in long-term memory. But should all roads lead to predation? On the one hand, I enjoyed being immersed in Magurran's comprehensive yet concise accounts of this fascinating area of guppy research. On the other hand, it was a bit frustrating to find that I couldn't escape reference to predators, even when there was promise for understanding how primary productivity, invertebrate biomass, canopy cover, or the social milieu might influence the evolution of divergent phenotypes existing among streams and/or the expression of labile phenotypic characters. As an outsider looking in, this predation-centric view is, indeed, productive and quite exciting. But, in the same breath, I applaud Magurran's underscoring, despite the paucity of replicated data, the potential for other

factors to operate alongside voracious pike cichlids, rivulids, and prawns.

“Evolution of reproductive isolation” (Chapter 6) was invigorating, as a forward-looking analysis pitting evidence for putative reproductive isolation mechanisms against preventative measures (e.g., sexual coercion) inherent in the behavior or biogeography of Trinidadian guppies. Will speciation occur among genetically divergent guppy populations? Stay tuned. In Chapter 7, Magurran reflects on some of the perils facing the Trinidadian ecosystem, the natural experiment in which guppies have assumed a starring role, and provides some solutions particularly with respect to coordinating scientific efforts towards the end of minimal impact.

Without reservation, the first seven chapters supply an authoritative view of the guppy’s prominent place in evolutionary ecology research. The organization of text within chapters and the descriptions of lavish phenotypic variation within the guppy system, however, sometimes made it difficult to discern the focal level of variation. There are phenotypic differences among individuals of different populations, among individuals within a population, and within a single individual in space and time. Unfortunately, these disparate levels of variation are not delineated with as much care as the forces underlying phenotypic diversity (e.g., predation). Magurran cites a fair number of convincing examples of relatively rapid divergence in genetically encoded traits (e.g., color pattern). But with some early examples of behavioral or life history trait variation (e.g., courtship, brood size), the reader is left to ruminate (until page 97) about whether consensus has been established regarding the extent to which selection has favored phenotypic flexibility or the particular trait (or suite of traits) in question.

The closing chapter identifies fruitful areas for future investigation, which complement the innovative perspectives and challenging questions that Magurran provides throughout the text. Indeed, I found this to be one of the strengths of

Evolutionary ecology: the Trinidadian guppy. That is, there are an abundance of heretofore untouched, or understudied topics revealed by Magurran on at least fifteen pages of text (in addition to Chapter 8) that are ripe for the picking. Headlining Magurran’s “Future directions” section is some excitement about emerging genomic resources, which are of great import for discovering possible genetic underpinnings of phenotypic variation. An area that has been neglected by guppy researchers, save a handful of studies on endocrine disruptors, is the quest to understand the neuroendocrine basis for phenotypic variation. Implementation of non-invasive techniques for steroid hormone sampling in small fishes, and continued improvement of neurobiological assays could facilitate the identification of important neuroendocrine targets. Expression or synthesis of these target molecules (e.g., hormones or neuropeptides) might covary with or be causally linked to population differences in behavior, reproduction, or immunological competence. Incorporating these intermediate molecular assays—downstream of genes and upstream of the trait—is compatible with a more global and integrative understanding of guppy evolutionary ecology. With that said, Magurran’s monograph is an excellent resource, and should find a not-so-sedentary home on the bookshelves of any student interested in pursuing the guppy, or poeciliids generally, as a model system.

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