Life in Ancient Ice is written for the specialist as well as for non-specialists with an interest in the natural sciences. Each chapter follows a broad scientific theme, carrying the reader from a global and evolutionary perspective down to the level of, for example, microbes or fungi in their current deep-frozen and inhospitable shelter.

On reaching the end of *Life in Ancient Ice*, one might ask whether there is any life in Space? The answer is as yet unknown, but ancient ice might hold one possible answer to this challenging question.

Reference

1 Alley, R.B. (2000) *The Two Mile Time Machine: Ice Cores, Abrupt Climate Change, and our Future*, Princeton University Press

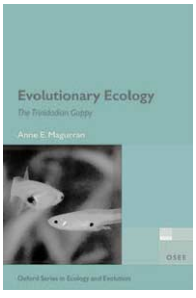
0169-5347/$ - see front matter
doi:10.1016/j.tree.2005.08.016

Lessons learned from guppies

Evolutionary Ecology: the Trinidadian guppy by Anne Magurran. Oxford University Press, 2005. £60.00/£27.50 hbk/pbk (224 pages) ISBN 0 19 852785 3/0 19 852786 1

David Reznick

Department of Biology, University of California, Riverside, CA 92521, USA



The 'birth' of guppies *Poecilia reticulata* as a paradigm of evolutionary biology was in the Arima Valley of Trinidad, where Caryl Haskins first described the simple gradient of fish communities found in the ascent up the drainages of the Northern Range Mountains and its consequence for guppies. At lower elevations, guppies lead a fugitive existence to avoid the constant threat of predation. Above waterfalls that exclude predators but not guppies, the guppies have a greatly reduced risk of being eaten and thus occupy the whole river. This contrast in mortality risk provides a basis for applying and testing evolutionary theory on natural populations. The presence of many drainages, each of which repeats the contrast between high and low predation, provides independent replicates for evaluating these predictions. It is this natural setting, combined with the facility of breeding guppies, their short generation time, their exuberant and frequent social interactions, and the remarkable color polymorphism of the males, that makes them ideal for research.

Evolutionary Ecology: the Trinidadian Guppy compliments Anne Houde's monograph on sexual selection in guppies [1] and expands on ecology, predator evasion, components of reproductive success, life-history evolution and speciation. Its greatest strengths are those parts that are derived from Magurran's research program, which includes ecology, behavioral ecology, sperm competition and the evolution of reproductive isolation. Each chapter is a graphically illustrated synopsis of research, accompanied by a summary of pertinent theory and often references to relevant research on other organisms.

One weakness is that Magurran is too polite. There is substantial variation in the quality of the published research. For example, Kelly *et al.* [2] report the important result that many antipredator behaviors can be enhanced through association with experienced fish. A consequence of the potential for such cultural transmission for other research is that it argues that, if the goal is to characterize a genetic basis to behavioral differences among guppies from populations that differ in mortality risk, then the subjects must be the product of a rearing program that prevents such transmission. The sources of guppies for experiments range from wild-caught adults to individuals collected from continuous lab culture to individuals who were reared in isolation from birth. Such differences have an impact on an investigator's ability to define behavioral differences among populations as the product of natural selection. A second source of variation is replication. Some studies represent high- versus low-predation environments with a single population of each; others exploit the abundance of available replicates. Such diversity in quality demands a critical review to help discriminate between strong and weak results. Magurran is certainly capable of doing so, but did not, save for a brief commentary at the end of the last chapter. As a consequence, the book serves well as an introduction to what we know about guppies, but should not serve as a substitute for reading the primary literature.

Although theory and empiricism are always represented in this book, they are often blended in a way that obscures how theory motivates research, as exemplified in the chapter on the evolution of reproductive isolation. Guppies display remarkable local adaptation, but reproductive isolation is not simply a sequelae of such adaptation. Addressing whether local adaptation can cause reproductive isolation should begin with a specific model, such as ecological speciation [3]. This model predicts that, if local adaptation causes changes in the phenotype that have a direct impact on mate choice or the fitness of hybrid offspring, it will also contribute to the evolution of reproductive isolation among populations. Local adaptation does not appear to influence mate preference in guppies. We are only beginning to learn about other

Corresponding author: Reznick, D. (david.reznick@ucr.edu).
Available online 23 September 2005

morphological specializations associated with adaptation to high- and low-predation environments (F. Bashey, PhD thesis, University of California, Riverside, 2002; [4]) and little has been done to evaluate whether such adaptations influence the fitness of hybrids in a natural setting. We thus lack a sufficient understanding of the system to judge whether conditions leading to ecological speciation exist in guppies. The alternative of allopatric speciation predicts that reproductive isolation evolves as a byproduct of prolonged separation. Magurran presents new evidence suggesting that allopatry is leading to reproductive isolation among guppies derived from two drainages in which the guppies are genetically distant from one another. These results suggests that studying reduced interpopulation fertility as a function of genetic distance in guppies could provide a meaningful test of ideas developed from interspecific comparisons in *Drosophila* [5].

We do not yet have the genetic resources for guppies that exist for the classic models of developmental genetics, such as zebrafish. However, *Evolutionary Ecology: the Trinidadian Guppy* shows that we have something that is harder to come by: a rich natural history and well described adaptive variation in traits from behavior and male coloration to every component of the life history. This book serves well as a benchmark in the ascent of guppies as a model organism by providing a concise well written summary of this variation among populations, plus other key research on this species. I hope that it will serve equally well as an appeal to develop these genetic resources.

References

1 Houde, A. (1997) *Sex, Color and Mate Choice in Guppies*, Princeton University Press
2 Kelly, J.L. *et al*. (2003) Back to school: can antipredator behaviour in guppies be enhanced through social learning? *Anim. Behav.* 65, 655–662
3 Schluter, D. (2000) *The Ecology of Adaptive Radiation*, Oxford University Press
4 Langerhans, R.B. and DeWitt, T.J. (2004) Shared and unique features of evolutionary diversification. *Am. Nat.* 164, 335–349
5 Coyne, J.A. and Orr, H.A. (1997) 'Patterns of speciation in *Drosophila*' revisited. *Evolution* 51, 295–303

0169-5347/$ - see front matter
doi:10.1016/j.tree.2005.09.001

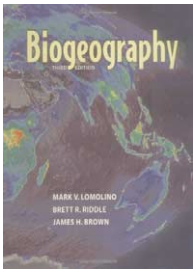
Book Review

The geography of life

Biogeography (3rd edn) by Mark V. Lomolino, Brett R. Riddle and James H. Brown. Sinauer Associates, 2006. US$89.95/£62.99 hbk (845 pages) ISBN 0 87893 062 0

Brian S. Arbogast

Humboldt State University, Arcata, CA 95521, USA



Biogeography is an incredibly diverse field, influencing most aspects of biology. Indeed, as Lomolino, Riddle and Brown emphasize, 'few patterns in ecology, evolution, conservation biology – and for that matter, most studies of biological diversity – make sense unless viewed in an explicit geographic context.' As such, it should be of little surprise that biogeographical studies have lead to many of the most important conceptual advances in biology, including Darwin's [1] and Wallace's [2,3] theory of evolution via natural selection in the 19th century, and MacArthur and Wilson's [4] equilibrium theory of island biogeography in the 20th. Neither should it be a surprise that biogeography is still a vigorous and dynamic field of study, playing a leading role in moving the disciplines of ecology, evolution and conservation biology forward into the 21st century.

The pervasive nature of biogeography, along with its historical importance and contemporary popularity, provides a large potential audience for an up-to-date, comprehensive biogeography text. The challenge in producing such a book is to integrate under a single conceptual umbrella the myriad patterns, processes and spatiotemporal scales governing the geography of life, as well as the methods used to study it. This is the same basic challenge faced by the authors of previous editions of the book [5,6]. However, in many ways this challenge has increased substantially since 1998. Recent and rapid advances on a variety of fronts, including geographic information systems (GIS), molecular phylogenetics and computational biology, have lead to an exponential increase in publications in biogeography over the past decade. Treatment of these areas, now at the forefront of many aspects of biogeography, were largely absent in the previous edition of *Biogeography*, leaving the authors with the added challenge of integrating them effectively into the third edition to meet their goal of 'balanced coverage of the entire breadth of the discipline.'

The result is an expanded, slightly reorganized, and much improved edition of *Biogeography*. It also includes a new co-author, Brett Riddle, known for his phylogeographic research on rodent assemblages of North American deserts. Similar to its predecessors, the book is well written and exceptionally well illustrated (with

Corresponding author: Arbogast, B.S. (bsa2@humboldt.edu).
Available online 21 October 2005