

The Cuban Treefrog in Florida: Life History of a Successful Colonizing Species.—Walter E. Meshaka, Jr. 2001. University Press of Florida, Gainesville, Florida 32611-2079. 191 pp. \$69.95 cloth.—The introduction of exotic species can have substantial effects on native flora and fauna. For example, the brown tree snake (*Boiga irregularis*) was introduced to the island of Guam in the mid 1900s and by the late 1900s 9 of 12 native forest birds, 6 of 12 lizards, and 2 of 3 bats were extinct (Fritts and Rodda 1998). Many other instances exist of declines and extinctions of native flora and fauna associated with the introduction of exotic species to islands and continents (Western and Pearl 1989).

The state of Florida is particularly prone to the introduction and establishment of exotic species. As of 1997, 108 exotic species of vertebrates had established populations in Florida: 35 freshwater fishes, 4 amphibians, 32 reptiles, 11 birds, and 26 mammals (Butterfield et al. 1997; Courtenay 1997; James 1997; Layne 1997). This book examines the successful spread of one such exotic, the Cuban treefrog (*Osteopilus septentrionalis*), through southern and central Florida. The author describes the biology of the Cuban treefrog in Florida to determine if it has the characteristics shared by many other successful, invasive exotic species. These characteristics include 1) high fecundity, 2) short generation times, 3) ability to function in a wide range of physical conditions, 4) similar habitats in native and introduced ranges, 5) coexistence with humans, 6) broad diet, 7) open niche space, 8) superior competitive ability, 9) predator-free space, and 10) body size larger than closest relatives.

The book begins with three brief chapters outlining the objectives, discussing the evolutionary history and geographic distribution of Cuban treefrogs, and introducing the main study area (Everglades National Park). Chapter four covers the general methods used to collect and analyze data. The biology of the Cuban treefrog is examined in chapters 5-11, with most emphasis on diet and reproduction. Chapter 12 is a summary of those natural history characteristics that make the Cuban treefrog a successful exotic. The book concludes with two very brief chapters projecting the future of Cuban treefrogs in Florida and, specifically, in the Everglades.

The strength of the book is in chapters 5 to 11, which cover the natural history and ecology of Cuban treefrogs, with some interesting results. For instance, the breeding activity of Cuban treefrogs was unusually high immediately following Hurricane Andrew (23-24 August 1992), demonstrating a link between reproduction and rainfall, but also suggesting that the timing of reproduction is plastic enough to exploit rare environmental conditions that may favor breeding. The author also provides comparisons of the abundance of Cuban treefrogs and native species of treefrogs, demonstrating that in some cases as Cuban treefrogs become more abundant, native species of treefrogs decline. Such data are critical for assessing the impact of an exotic species on native frog populations.

Placing the natural history of the Cuban treefrog in context with the ecological characteristics that typify successful exotics is more difficult. Evaluating these characteristics requires that they be compared to species that compete with Cuban treefrogs. The author makes these comparisons by using the green treefrog (*Hyla cinerea*), squirrel treefrog (*Hyla squirella*), wood slave (*Hemidactylus mabouia*) and indo-pacific gecko (*Hemidactylus garnotii*). However, the criteria for consideration as a competitor are not presented. Other species also may be significant competitors; certain spiders might have significant dietary overlap with Cuban treefrogs. Also, the data available for these potential competitors are generally weaker than those for Cuban treefrogs. For example, the author demonstrates that Cuban treefrogs mature in less than one year but it isn't clear if this is any more rapid than for competitors, all of which also mature within a year. Nonetheless, the natural history data on Cuban treefrogs is quite valuable and at least suggests that they share many of the ten ecological characteristics of successful exotic species.

The main weakness of the book is the organization and writing style. The text generally reads like a dissertation rather than a book, not too surprising given that the information is based on a dissertation (Meshaka 1994). The introductory and concluding chapters are very cursory and the text is probably more technical than necessary. In order to understand information presented in chapters 5-11 the reader often must refer back to earlier chapters, particularly chapters 1 and 4, because it is not always clear which of the various ecological characteristics is being evaluated in a particular chapter. The book is data rich but has too many figures and tables. For example, chapter 9 (diet) is 45 pages, but only 14 are text. The chapter includes 29 tables and 24 figures. Much of the information presented in tables and figures is not adequately discussed in the text or the terminology may be inconsistent. For example, tables (9.2-9.9) on the breadth of diet list prey species by scientific Family name, but the text uses primarily common names. The text states that many Cuban treefrogs eat roaches and cites tables 9.2-9.3, but without knowing the Family of roaches the reader won't be able to understand this point just from the tables.

The writing style is awkward; too many commas decreases the readability and scientific jargon limits the audience. For instance, on p. 140 Cuban treefrogs are referred to as "batrachophagous" whereas it seems more appropriate to just say that they eat frogs.

Although the emphasis of the book is on evaluating the success of Cuban treefrogs in Florida, a couple of interesting comparative opportunities are missed. Another exotic amphibian in Florida is the marine toad (*Bufo marinus*), also called the cane toad, a species well known for its detrimental impact on the native fauna of Australia after its introduction there. In Florida the Cuban treefrog has a larger geographic range than the marine toad, suggesting that it has been the more successful of the two. Comparisons of the characteristics of these two species would have been quite informative.

The geographic distribution of the Cuban treefrog (fig. 2.1) is presented primarily as a closed, shaded polygon rather than as dots representing specific localities, surprising given that specific localities are listed in table 2.1. A graphical depiction of established populations in Florida would indicate if they really occur throughout the southern and central portion of the state, or if they occur mainly near human-occupied areas. Furthermore, arranging localities by date of observation might allow inferences about the spread of Cuban treefrogs. Has the range expansion been a steady progression from south to north or instead more sporadic indicating many instances of introduction?

In summary, the author presents important information on an exotic species that has become established in Florida. The ideas presented in this book likely will stimulate future research on this and other exotic species in the state. The price seems excessive given the narrow focus of the book, especially given that the only photos are black and white images of field sites. Surprisingly, the only picture of a Cuban treefrog in the entire book is on the cover. The book is not written for a general audience. However, I do recommend this book to anyone interested in exotic species, particularly in Florida.—**Kyle G. Ashton**, Archbold Biological Station, 123 Main Dr., Venus, Florida 33960.

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