REPRODUCTIVE CYCLES IN LIZARDS AND SNAKES

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HENRY S. FITCH

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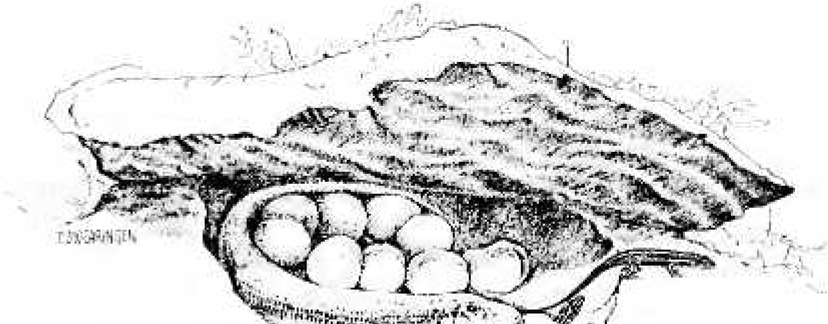

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Reproductive Cycles of Lizards and Snakes

BY

HENRY S. FITCH

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INTRODUCTION

Every species of animal, in adaptation to its particular ecological niche, has attained various adjustments in the timing of its reproductive efforts and in the numbers of offspring produced. For some years, investigations of the life histories of various reptiles on The University of Kansas Natural History Reservation caused me to become aware of the great diversity of reproductive cycles, even in species occurring in the same environments. Some of these same species were investigated elsewhere in other parts of their geographic ranges, and were found to have somewhat altered reproductive cycles. Interest in reproductive cycles aroused by these findings later led to an investigation of the cycles of several tropical species, and eventually to a general survey of these cycles in the snakes and lizards of the world.

Partly from published literature information has been compiled for many species, but for most of them available data are few. Most detailed life history studies that include intensive investigation of reproductive cycles have been made in the United States, Europe, and Japan, with little information from elsewhere, including the tropics where most species of reptiles occur.

In studying reproductive cycles, I tried to learn as much as possible about the following for each species: 1, Whether it is viviparous or oviparous and, if the latter, whether part of the embryonic development takes place in the female's oviduct; 2, Seasons of copulation, ovulation, oviposition or parturition and hatching—how they are correlated with annual cycles of temperature and precipitation and whether the reproductive cycle is annual, occurs less often, or more often; 3, If more than one brood or litter is produced annually, the length of the interval between ovulation cycles, and the effects of the abundance or scarcity of food; 4, Lengths of incubation or gestation periods; 5, Time required for growth and development from hatching or birth to sexual maturity; 6, Numbers of eggs per clutch or young per litter; 7, Intraspecific differences in the above factors, arising from innate individual variation, from age and size, and from geographic variation.

Information was accumulated on all of these subjects, but was incomplete for every species. More than 50 species have been the subjects of detailed study, and their reproductive cycles are relatively well known, but for most only meager data or scraps of information are available from which reproductive cycles may be deduced. Even such poorly known species are included, because it is evident that each species is to some extent unique in its reproductive pattern, although trends can be discerned for groups of species, both on the basis of phylogenetic relationship and on the basis of response to a particular type of climate or habitat.

PROCEDURE

Essentially, the data and conclusions presented herein originate from three sources: 1, My field studies of various species of lizards and snakes, chiefly in Kansas, California, and Oregon, but also in most of the states in the far western United States, in Louisiana, in Costa Rica for eight weeks in 1965, and in Ecuador in March of 1967; 2, Study of preserved museum specimens, chiefly in The University of Kansas Museum of Natural History, the University of California Museum of Vertebrate Zoology, The American Museum of Natural History, and the University of Texas Natural History Museum; 3, Survey of published literature.

The personal observations of my collaborators and me have involved the following species: *Agkistrodon contortrix*, *Agkistrodon piscivorus*, *Ameiva ameiva*, *Anolis chrysolepis*, *Anolis cupreus*, *Anolis fuscoauratus*, *Anolis humilis*, *Anolis lemurinus*, *Anolis leptoscelis*, *Anolis limifrons*, *Anolis lionotus*, *Basiliscus basiliscus*, *Basiliscus vittatus*, *Carphophis vermis*, *Cnemidophorus deppei*, *Cnemidophorus exsanguis*, *Cnemidophorus sexlineatus*, *Cnemidophorus tigris*, *Coluber constrictor*, *Crotaphytus collaris*, *Crotalus viridis*, *Ctenosaura similis*, *Diadophis punctatus*, *Elaphe obsoleta*, *Eumeces fasciatus*, *Eumeces obsoletus*, *Geophis brachycephalus*, *Gerrhonotus coeruleus*, *Gerrhonotus multicarinatus*, *Gonatodes albogularis*, *Heterodon nasicus*, *Heterodon platyrhinos*, *Holbrookia maculata*, *Holbrookia texana*, *Kentropyx calcaratus*, *Mabuya alliacea*, *Neusticurus ecpleopus*, *Ophisaurus attenuatus*, *Sceloporus jarrovi*, *Sceloporus malachiticus*, *Sceloporus occidentalis occidentalis*, *Sceloporus occidentalis biseriatus*, *Sceloporus undulatus erythrocheilus*, *Sceloporus undulatus garmani*, *Sceloporus undulatus hya-*