



RICHARD M.F.S. SADLEIR

THE REPRODUCTION OF VERTEBRATES

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*To the students of
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Preface

Although sexual activity does not actually supply the motive power for the rotatory motion of our planet, the ability to reproduce is perhaps the most fundamental characteristic of the living organisms which abide there. It seems fair to suggest that vertebrates, the animals with backbones, spend proportionately more of their time and energy in breeding processes than do most invertebrate species. There can be no doubt that the great diversity of body forms and life histories of vertebrates has evolved as a result of the many different habitats they occupy. In turn, their ability to utilize such habitats is a function of their distinct and varied methods of reproduction.

Reproduction is a unique physiological process. All other physiological systems, such as excretion, thermoregulation, and digestion, have evolved to promote the survival of the individual organism in which the processes are acting. The selective forces which have molded the reproductive processes promote the optimal survival of the young so that parental survival is secondary. There are extreme cases, in vertebrates and invertebrates, in which completion of reproduction means death to the individual. For example, the salmon fights its way upstream only to die immediately after spawning; the mayfly mates, lays eggs, and dies within twelve

hours. In addition selective forces are particularly severe in their action during reproductive processes and on the immature life forms present at those times. Eggs and sperm can tolerate much narrower ranges of physical conditions than adult animals, and free external zygotes, or developing eggs, are likewise highly susceptible to changes in physical conditions or to predation. As a result of these selective pressures, and related to their shift from aquatic to terrestrial environments, vertebrates have developed internal fertilization. However, it is still generally true to say that selective forces are most severe on individuals and their young at or near the times of breeding.

Yet despite such severe selection, vertebrates do occupy, and breed in, a very wide diversity of environments—from the pressurized blackness of oceanic depths to the shallow muddy pools of desert oases, from tropical jungles with their relatively unchanging physical conditions and food supply to the Arctic where good conditions occupy such a short period of the year. To be able to breed in so many different sorts of areas has meant the development of many specific reproductive patterns and also of several uniquely vertebrate reproductive features. For example, the change to a terrestrial environment resulted in the development of the cleidoic egg, while many vertebrates have overcome the problem of poor survival of independent eggs by retaining them inside the body so that viviparity has arisen. Many other trends in reproduction will be discussed in the following chapters. Comparison between vertebrate classes shows that fewer and fewer young are produced as one progresses from fish to birds and mammals. The size of the egg or size of the newborn young tends to become larger relative to the size of the parent. Parental care of the young is most highly developed in the upper vertebrate classes.

Two more features of vertebrate reproduction deserve mention. Generally vertebrates live longer than invertebrates, and as many of the former are repeat breeders they undergo reproduction several times during their lives. This allows for the development of experience and expertise in the rearing of young inside the life-span of one individual which is not possible in the shorter-lived invertebrates. Second, unlike numbers of invertebrate species in which many members of the species are asexual and play no part in