

From the laboratory to the field: the physiology of wild animals.

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The development of miniature electronic devices has enabled physiological variables, such as heart rate (HR) to be obtained from animals in their natural environment. I will discuss data from investigations into the physiology of diving of birds and mammals and flying (migration) of birds, both in the laboratory and in the field. Laboratory studies enable experiments to be performed that test specific hypotheses under controlled conditions, but do not necessarily provide realistic physiological responses to conditions which simulate natural situations. An example of this is forcible submersion of an aquatic bird or mammal in the laboratory versus natural diving in the field. Conversely, it is not possible to control the conditions under which data are obtained from wild animals, and it is not always possible to test a hypothesis. Some reviewers are critical of such a lack of hypothesis testing, but defining a question and making observations are important first steps of the scientific method.

Heart rate not only provides much physiological information. By careful calibration of HR against rate of oxygen consumption (\dot{V}_{O_2}) in the laboratory, it is possible to convert HR obtained from animals in the field into \dot{V}_{O_2} and, therefore, into rate of energy expenditure.