BIRD RESEARCH IN THE NETHERLANDS: INSIDE, OUTSIDE AND INSIGHT

by

CAREL TEN CATE

(Section of Ethology, Institute of Evolutionary and Ecological Sciences, Leiden University, P.O. Box 9516, 2300 RA Leiden, The Netherlands)

SUMMARY

A selective review is given of those aspects of bird research in the Netherlands which might be called 'physiological' in its broadest sense. This research concentrates on the organismal level of analysis; covering areas like functional morphology, behavioural ecology, sensory physiology and ethology. Most research groups combine studies in the field with studies in the lab, usually looking at aspects of behaviour in relation to either causal mechanisms or functional implications. This approach is illustrated by examples indicating how research on one or several bird species is used to get an understanding of a number of fundamental questions, aiming at developing unifying concepts. The discussion gives attention to the fact that the fundamental knowledge provides not just general insights, but can be applied in other contexts. It can, for instance, be used to improve the quality of life for chickens in the poultry industry; to provide the scientific argumentation for nature conservation, or to assist in breeding endangered bird species.

KEY WORDS: bird research, animal models, feeding mechanisms, energy allocation, visual system, behavioural development, vocal communication, song development.

INTRODUCTION

In general, birds are among the most conspicuous vertebrates. Many of the over 9000 species can be seen flying around in open air; most are active during the day and many species have conspicuous colorations, visual displays or vocalizations. Like in humans, visual and acoustic signals rather than, for instance, olfactory or tactile ones are the main way of communicating. All this has the consequence that birds are easily detectable in the field. In addition, they are relatively abundant in numbers and species. In the Netherlands, for instance, some 240 species of birds can be seen on a regular basis, compared to 70 mammals (including cetaceans), 7 reptiles, 16 amphibians and 186 fish species (based on a recent survey by P. Koomen, pers. comm.). Altogether these factors make them an ideal group for field studies. Such studies have contributed considerably to unifying concepts concerning,

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for instance, the evolution of mating systems or types of social organization (e.g. Clutton-Brock, 1988); to the optimality theories used by behavioural ecologists (e.g. Krebs & Davies, 1984), or to evolutionary theories on sexual selection, the process of which peacocks and birds of paradise are seen as the most outspoken products (e.g. Cronin, 1991). At the same time several species can be kept, bred and studied in captivity without great difficulties and quite a few species have been domesticated for various purposes (e.g. chickens and quail for eggs or meat; homing pigeons for transporting messages; canaries for their songs or appearance). Therefore, birds provide the opportunity to combine field and laboratory research. This makes them particularly suitable models in those areas which aim at understanding the mechanisms or the functional aspects of the way animals deal with their physical, biotic or social environment. Here lab and field studies will frequently go hand in hand.

When I limit myself to research which might be called 'physiological' in its broadest sense, bird studies concentrate on the organismal side of the spectrum. In the Netherlands, birds are used as model species for fundamental research dealing with what might best be covered by the term 'behavioural biology'. This comprises functional morphology, behavioural ecology (with strong links to ecology and population biology), sensory physiology and ethology. Many of the studies on these subjects combine observations of behaviour (i.e. looking from outside) with methods aiming at measuring and understanding what is happening inside the animal. In what follows I will illustrate the main lines of bird research with some selected examples, ending with some reflections on using birds as models in research.

**BIRDS AS MODELS IN BEHAVIOURAL BIOLOGY**

*Functional morphology*

Different species of birds may use very different techniques during foraging, which is reflected in a great variety of bill shapes. On the first sight these shapes and the ways the bill is used may look so different from one another that it is hard to see any general pattern in them. Yet, evolutionary theory assumes that all foraging modes share a common origin, present in the evolutionary ancestor of all birds. The morphology group at Leiden University concentrates on understanding the evolution of this diversity. This is one aspect of their studies of the control of movement in multi-articular systems and of the sensorimotor circuits involved. The work is based on a detailed study of the feeding methods in a number of species, like the pigeon (Zweers, 1982), various duck species (KooLooos et al., 1989) and others (Zweers