

The importance of aviculture in scientific ornithology: a historical review

T. Birkhead & S. van Balen

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Tim Birkhead & Bas (S.) van Balen. Department of Animal and Plant Sciences, The University of Sheffield, Sheffield S10 2TN, U.K. (e-mail: t.r.birkhead@sheffield.ac.uk).

The study of birds is fundamental to zoology as they are among the most tractable of animal taxa for study. Consequently they have provided more textbook examples of biological phenomena than any other class of vertebrates (Mayr, 1984). Birds have proved ideal subjects for the study of several major aspects of animal biology, notably evolution and systematics, ecology, animal behaviour, circannual rhythms, and migration. As a result there is probably a longer and richer history of 'scientific ornithology' than almost any other discipline. The keeping of birds in captivity has played a central, if subtle role, in the development of ornithological science because aviculture allowed the close and detailed observation of birds long before binoculars were available and detailed field observation a possibility. Indeed, the observations of captive birds by the likes of Konrad von Megenberg (14th century), French Pierre Belon, British William Turner and Italian Ulisse Aldrovandi (16th century), and Swiss Conrad Gesner and English Francis Willughby (17th century) constituted the very beginning of ornithological science (Stresemann, 1951). Despite the central importance of bird-keeping in ornithological science, this topic has not previously received any comprehensive treatment. There is an abundance of information, but it is extremely fragmented, existing in many different European languages and often in obscure publications.

Although some aspects of the history of bird-keeping have already been documented (e.g. brief reviews of bird keeping in the Middle Ages (e.g. Yapp, 1981), and the cultural histories of various domestic birds, such as canary, pigeon and chicken), and there are individual case-studies of the link between particular observations and science (e.g. the papers by various authors (Stresemann, 1947) on Baron von Pernau's prescient observations, made around 1700, on the acquisition of song by birds), no detailed treatment of the topic exists. Considering the serious lack of knowledge of the real world of bird-keeping amongst ornithologists (R. Restall, in litt., 2004), the study aims at documenting two inter-related processes:

History of bird keeping, from 1200 to the present

- (i) **Changes in incidence** of bird keeping: the start in Europe in 1200, following expansion during six centuries and the culmination in a Europe-wide cage bird 'mania' by the late 1800s. Since then bird keeping has declined dramatically.
- (ii) **Changes in the species** kept as cage birds: this is especially important because the species of birds in captivity determines the type of scientific information that can be obtained. Initially, only native species were held, amongst which the Goldfinch *Carduelis carduelis* (Linnaeus, 1758) was most widely kept. From around 1400 for-

eign birds were brought as cage birds into Europe as global trade and exploration increased. This started with the Canary *Serinus canarius* (Linnaeus, 1758) brought to Europe, increasingly popular until the mid 1800s but declining as it was superseded by other species, notably the Budgerigar *Melopsittacus undulatus* (Shaw, 1805) from Australia. Since around 1950, the keeping of any kinds of birds has decreased, partly due to bird protection and awareness of conservation issues.

- (iii) **Geographical patterns** in bird keeping: menageries were especially popular in the Netherlands of the 18th century. The cradle of song canary breeding is found in the Germany Harz Mts. To this very day Chaffinches *Fringilla coelebs* Linnaeus, 1758, singing contests are popular in Belgium.
- (iv) **Keeping versus breeding** in captivity.

Aviculture and the development of scientific ornithology

- (i) **Anatomy.** Anatomists such as the 19th century Edward Blyth relied upon the bodies of animals they could obtain from dealers and the several menageries that then existed. Domestic Pigeons *Columba livia* Gmelin, 1789, and doves, Zebra Finches *Poephila guttata* (Vieillot, 1817) and Bengalese Finches *Lonchura striata* (Linnaeus, 1766) are often used for the study on functional morphology and anatomy of bill, tongue, throat and other structures.
- (ii) **Genetics.** Hans Duncker (1881-1961) was one of the pioneer bird geneticists, with special interest in Canaries, Budgerigars and Lovebirds (Birkhead, 2003; Birkhead et al., 2003).
- (iii) **Behaviour.** Count von Pernau (1660-1731) kept birds in considerable numbers in his aviaries. He studied processes of song learning, and discovered the existence of territories in tamed, free-ranging birds. Surprisingly similar scientific methods were used by 20th century K. Lorenz and J. Nicolai; the latter made detailed studies of the song learning, sexual imprinting etc. of captive Bullfinches *Pyrrhula pyrrhula* (Linnaeus, 1758) (Nicolai, 1970); Zebra Finches are now the subject of many contemporary studies on sexual behaviour (Zann, 1996).
- (iv) **Migration and circannual rhythms.** Count von Pernau suggested that migratory birds are "driven at the proper time by a hidden drive" which makes him the first student of causal analysis (Gwinner, 1996). Commercial finch trappers in the Netherlands were by experience able to assess the temporal and spatial predictability of migration routes for trapping (Matthey, 2002). The contemporary research of controlling mechanisms of migration (P. Berthold a.o.) has largely been dependent on native birds kept and bred in captivity.
- (v) **Conservation biology.** The biological knowledge and expertise of bird breeders enable them to captive-breed, train and rehabilitate endangered bird species.
- (vi) **Other relevant disciplines.**

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The science of ornithology has a long history and studies on birds have helped develop several key concepts in evolution, behaviour and ecology such as the definition of species, the process of speciation, instinct, learning, ecological niches, guilds, island biogeography, phylogeography and conservation.[2] While early ornithology was principally concerned with descriptions and distributions of species, ornithologists today seek answers to very specific questions, often using birds as models to test hypotheses or predictions based on theories. Antonio Valli da Todi who wrote on aviculture in 1601 knew the connections between territory and song[27]. There are two essentially different kinds of ornithology: systematic or scientific, and popular. The history of science consists mostly of theories that were refuted, or falsified. These tend to be forgotten and instead we focus on those theories that have been supported. But never forget that 99.99+% of all scientific theories/hypotheses ever proposed have been falsified. The essence of science is a process of curiosity feeding questions feeding hypotheses, etc. Eventually this leads to some theory. As many have commented here before, theory doesn't mean a guess but is an evidence-based conclusion that is always up for being tested, checked, and refined. While several strands of historicism originated in nineteenth-century historiography, this article focuses, first, on the historicist conceptions of scientific rationality that became prominent in the 1960s and 1970s, as the maturation of the field of historiography of science began to suggest competing models of scientific development, and, second, on recent approaches such as historical epistemology. The 1990s featured the so-called Science Wars, as philosophers attempted to defend truth, rationality, objectivity, and scientific progress (and their own turf) from the perceived threats of rapidly developing, sociology-inspired science and technology studies and (other) postmodern influences.