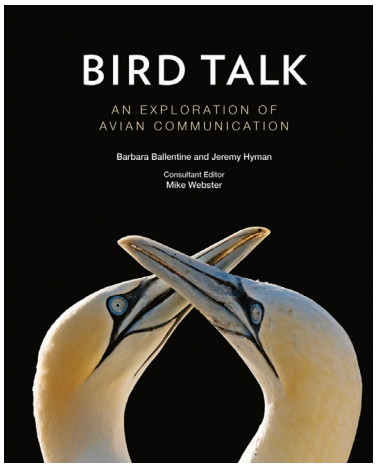
Book Review



Bird talk: An exploration of avian communication. Barbara Ballentine and Jeremy Hyman, 2021. CSIRO Publishing, Quarto Publishing and Cornell University Press. Hardcover. 192 pp. Colour photographs. ISBN: 9781486315307. RRP $A 44.99.

This book is an overview of communication in birds from a functional and adaptive perspective. I do not think it is particularly aimed at professional ornithologists or avian ethologists, who would not learn much from it that they do not already know; rather, it presents a summary of current knowledge about avian communication that people keenly interested in birds, but not experts in how birds communicate, will find very interesting and informative.

The Introduction outlines what is meant by communication, the types of information transmitted in bird signalling, how sending and receiving signals can potentially be costly energetically and even in terms of genetic fitness, signal detection theory (signals should be sufficiently distinct from background 'noise' to maximise accurate detection, while minimising false alarms) and, very briefly, how the main avian sensory systems (visual and auditory) work.

Chapter 1 examines how vocal signals are produced by the syrinx, an organ unique to birds, which in conjunction with control of breathing and movements of the respiratory tract and beak enables sophisticated and complex sound generation. It outlines the role of learning during juvenile development in shaping oscine and hummingbird song and parrot calls. The influence of hormones, particularly testosterone, on song development, and the role of genes in species-specific song recognition and production are also discussed. The authors outline the use of non-vocal sounds in communication by birds e.g. high frequency 'whistles' produced by stridulation of specialised wing feathers by Club-winged Manakins. With respect to the role of plumage colour in signalling, they discuss the four classes of pigment produced endogenously or acquired from the diet and the structural colours (bright blue and iridescence) resulting from the arrangement and density of keratin molecules in the feathers; separately or in combination these are responsible for feather colouration that often plays an important role in avian communication. They also point out that contrary to long-held belief, most birds have a good sense of smell and many probably use olfaction in social interactions, for example in species and kin recognition.

Chapters 2-6, the core of the book, deal with communication in a variety of contexts: territoriality and dominance, interactions between the sexes and parents and their offspring, anti-predator behaviour and social groups. Space limitations preclude me from doing justice to the huge range of material reviewed here, so I will just highlight a few of the more intriguing findings summarised by the authors. They note that the food-begging displays of nestlings include sounds, postures and mouth colours. There is evidence that in food-rich environments begging displays often indicate the degree of hunger of chicks: in several species, experimentally depriving brood-members of food makes them beg more or emit higher frequency begging calls or have a more brightly coloured gape, and the parents respond by feeding them more often. In food-poor environments, food-begging displays can signal the quality of the young, essentially informing parents which brood-members are most likely to survive and therefore most valuable in fitness terms, and parents respond by biasing their feeding towards these larger and healthier chicks. Food-begging displays can also provide information about species' identity. Superb Fairy-wren broods are often parasitised by Horsfield's Bronze Cuckoos, but fairy-wren chicks learn a unique vocal signal from adult females while still in the egg which they then emit after hatching, enabling provisioning adult fairy-wrens to recognise which nestlings to feed, as the parasitic cuckoo chicks do not learn this call. Begging displays can also communicate information facilitating parent-offspring recognition. In some bird species that nest in tightly packed colonies and whose young are quite mobile after hatching, parents and chicks find each other after separation through mutual call recognition, so that the non-adaptive mistake of feeding unrelated young rarely occurs.

Sexual selection, first proposed by Charles Darwin, is thought to be responsible for the evolution of morphological and behavioural traits, usually but not always in males, that are used in sexual competition with rivals (intra-sexual selection) or the attraction of mates (inter-sexual selection). The authors describe how sound playback experiments have demonstrated that in many birds song plays an important role as a threat in defence of breeding territories. For example, song playback on Red-winged Blackbird territories from which the male owner has been removed is effective in preventing intrusions by rival males. But what information does singing provide that makes it effective as a threat? Generally, larger birds are more successful in aggressive interactions than smaller birds. The inverse correlation between the sound frequency of vocalisations and body size in birds thus means that song may indirectly convey information about fighting ability. There is also evidence for some species that larger males have larger song repertoires or are more able to perform songs that are physically demanding to produce, further cues that could enable rivals to indirectly judge the size and likely fighting ability of a singing territorial male. However, fighting is costly energetically and in terms

of the risk of injury, so it is not surprising that males of many songbird species can distinguish between the songs of males that constitute a real threat to their territory ownership (strangers that may not possess a territory) and those that do not (neighbours that are 'known' to possess a territory already) and respond appropriately.

Two examples of so-called extravagant male traits involved in the attraction of mates that are thought to have evolved through inter-sexual selection occur in species with which many *Corella* readers will be familiar. Male Superb Lyrebirds have elaborate tail plumage and attract females by performing courtship 'dances' that show off this plumage and also involve complex movements and vocalisations. Ballentine and Hyman describe how recent research indicates that males precisely co-ordinate the dance movements with the vocalisations and that this coordination may be learned and may act as an index of male quality that females use in mate selection. Male Satin Bowerbirds construct an avenue bower of sticks and decorate the surrounding area with blue objects, including the feathers of other species. Research indicates that the owners of the neatest, most densely constructed bowers that have lots of associated blue decorations are preferred as mates by females. In this case, the extravagant male traits have been largely externalised, although males do display and vocalise too during courtship. Here again, these traits may signal male quality to females because bower construction and maintenance is costly, especially as rival males visit the bower during the owner's absences and destroy the structure!

The final chapter discusses the challenges that birds face in communicating in 'noisy' environments. Noise in this context is any extraneous information that masks the signal, decreasing the probability that it will be detected correctly. It can be generated naturally by biological and non-biological sources (e.g. sound produced by other animals, rain or wind) or anthropogenically (e.g. sound created by vehicular traffic and industrial machinery). A common source of background noise for singing birds is the song of other species, particularly during the multi-species chorus at dawn when atmospheric conditions are optimal for sound transmission. Male Nightingales often effectively counteract this noise by singing at night, and playback experiments have also shown that they tend to avoid singing at the precise time when heterospecific song is produced. Both these strategies presumably reduce the acoustic masking of their own song by that of cohabiting species. Another strategy that reduces masking by other species' vocalisations is simply to vocalise more loudly than they do: territorial Bellbirds in Central America produce the loudest vocalisations of any birds, a deafening 125 dB call that is as loud as the sound of a jet engine!

Anthropogenic acoustic noise has its highest amplitudes at the low sound frequencies (1-2 kHz) at which many birds vocalise and thus could greatly impede efficient vocal signalling, especially in cities. Many urban birds appear to respond to such noise by using higher sound frequencies in their vocalisations, perhaps because this makes it easier to sing louder and thus reduce masking by urban noise. However, such a strategy may involve genetic fitness costs for both signallers and receivers. As mentioned above, the sound frequency of vocalisations is inversely related to body size in birds, so males that increase the sound frequency of their vocalisations in response to low frequency anthropogenic noise may be perceived by competitors as being smaller and less of a threat than they actually are, and consequently attacked more often! Experiments have also shown that whilst the songs of males learned in anthropogenically noisy environments are less masked by such noise because they have higher sound frequencies, the downside is that they are also less effective in attracting females!

The authors of this book are professional ornithologists based at West Carolina University and have clearly researched and know their material very thoroughly. The text is well written and organised, and mostly very easy to read. It is illustrated by many colour photographs, mostly of excellent quality. Many of these images illustrate the signalling being discussed; others are simply photographs of the species involved, but even these are helpful because the examples used in this book are drawn from all over the world and thus many readers may be unacquainted with some of the species whose communication is being discussed. There are also a few helpful explanatory diagrams (e.g. the sequence of escalation in territorial disputes), although this aspect of the book's illustration could profitably have been increased.

I had a few reservations about the text. Identifying the adaptive significance of a signal is necessarily often a speculative business, although the speculation adds interest; I just felt that it was a little overdone at times here. It is also surprising and a bit frustrating in a text so firmly rooted in natural selection theory to find purposive language used so often. There were also a few minor grammatical errors (mainly in the use of the singular versus the plural case). It would have been cumbersome to clutter the text with the scientific names of all the species mentioned, but an index of such names would have been valuable. Finally, although some key references for further reading are given, the bibliography could usefully have been expanded somewhat to enable readers to track down and further explore examples in which they are particularly interested. However, these are all minor criticisms of what is an impressive, scholarly and eminently readable book. Readers of *Corella* who are not professional ornithologists or students of animal behaviour will find that this book provides an excellent review of avian communication from an adaptive perspective and is very stimulating reading.

Alan Lill