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Chapter 1 : Bird vocalization - Wikipedia

Acoustic Communication in Birds, Volume 1: Production, Perception, and Design Features of Sounds presents the scientific study of bird vocalizations. This book discusses the relations between the physical structure of bird vocalization and their quality as perceived by the recipient.

Communication through bird calls can be between individuals of the same species or even across species. Birds communicate alarm through vocalizations and movements that are specific to the threat, and bird alarms can be understood by other animal species, including other birds, in order to identify and protect against the specific threat. These calls are characterized by wide-frequency spectra, sharp onset and termination, and repetitiveness that are common across species and are believed to be helpful to other potential "mobbers" by being easy to locate. The alarm calls of most species, on the other hand, are characteristically high-pitched, making the caller difficult to locate. Many birds that nest in colonies can locate their chicks using their calls. Many birds engage in duet calls. In some cases, the duets are so perfectly timed as to appear almost as one call. This kind of calling is termed antiphonal duetting. Sometimes, songs vocalized in post-breeding season act as a cue to conspecific eavesdroppers. The post-breeding song therefore inadvertently informs the unsuccessful males of particular habitats that have a higher likelihood of reproductive success. The social communication by vocalization provides a shortcut to locating high quality habitats and saves the trouble of directly assessing various vegetation structures. A mated pair of white-naped cranes Grus vipio performing a "unison call," which strengthens the pair bond and provides a territorial warning to other cranes. Some birds are excellent vocal mimics. In some tropical species, mimics such as the drongos may have a role in the formation of mixed-species foraging flocks. Many hypotheses have been made on the functions of vocal mimicry including suggestions that they may be involved in sexual selection by acting as an indicator of fitness, help brood parasites, or protect against predation, but strong support is lacking for any function. It is not known if they can hear these sounds. The acoustic adaptation hypothesis predicts that narrow bandwidths, low frequencies, and long elements and inter-element intervals should be found in habitats with complex vegetation structures which would absorb and muffle sounds , while high frequencies, broad bandwidth, high-frequency modulations trills , and short elements and inter-elements may be expected in open habitats, without obstructive vegetation. High frequency calls with rapid modulations are optimal for open habitats because they degrade less across open space. Narrow-frequency bandwidth notes are increased in volume and length by reverberations in densely vegetated habitats. This idea has been termed the "acoustic niche". Sample of the rich repertoire of the brown thrasher. The songs of different species of birds vary and are generally typical of the species. Species vary greatly in the complexity of their songs and in the number of distinct kinds of song they sing up to in the brown thrasher ; individuals within some species vary in the same way. As early as , it was established that birds learned calls, and cross-fostering experiments succeeded in making linnet Acanthis cannabina learn the song of a skylark, Alauda arvensis. Soon after, the juvenile song shows certain recognizable characteristics of the imitated adult song, but still lacks the stereotypy of the crystallized song â€” this is called "plastic song". Further, the PDP see Neuroanatomy below has been considered homologous to a mammalian motor pathway originating in the cerebral cortex and descending through the brain stem , while the AFP has been considered homologous to the mammalian cortical pathway through the basal ganglia and thalamus. Other species such as the canaries can develop new songs even as sexually mature adults; these are termed "open-ended" learners. Posterior descending pathway vocal production: Information in the posterior descending pathway also referred to as the vocal production or motor pathway descends from HVC to RA, and then from RA to the tracheosyringeal part of the hypoglossal nerve nXIIts , which then controls muscular contractions of the syrinx. Other current research has begun to explore the cellular mechanisms underlying HVC control of temporal patterns of song structure and RA control of syllable production. Some of the known types of dimorphisms in the brain include the size of nuclei, the number of neurons present, and the number of neurons connecting one nucleus to another. Female zebra finches treated with estradiol after hatching followed by testosterone or dihydrotestosterone DHT treatment in adulthood will develop an RA and

HVC similar in size to males and will also display male-like singing behavior. Furthermore, other research has shown results that contradict what would be expected based on our current knowledge of mammalian sexual differentiation. For example, male zebra finches castrated or given sex steroid inhibitors as hatchlings still develop normal masculine singing behavior. In canaries Serinus canaria , females normally sing less often and with less complexity than males. However, when adult females are given androgen injections, their singing will increase to an almost male-like frequency. Several other studies have looked at seasonal changes in the morphology of brain structures within the song system and have found that these changes adult neurogenesis, gene expression are dictated by photoperiod, hormonal changes and behavior. When birds are raised in isolation, away from the influence of conspecific males, they still sing. While the song they produce, called "isolate song", resembles the song of a wild bird, it shows distinctly different characteristics from the wild song and lacks its complexity. Birds deafened before the song-crystallization period went on to produce songs that were distinctly different from the wild type and isolate song. This study offered further support for role of auditory feedback in maintaining adult song stability and demonstrated how adult maintenance of crystallized birdsong is dynamic rather than static. Currently, there are two competing models that elucidate the role of LMAN in generating an instructive error signal and projecting it to the motor production pathway: If this is true, then the firing rates of LMAN neurons will be sensitive to changes in auditory feedback. Efference copy model of error correction An efference copy of the motor command for song production is the basis of the real-time error-correction signal. During singing, activation of LMAN neurons will depend on the motor signal used to generate the song, and the learned prediction of expected auditory feedback based on that motor command. Error correction would occur more rapidly in this model. Leonardo [83] tested these models directly by recording spike rates in single LMAN neurons of adult zebra finches during singing in conditions with normal and perturbed auditory feedback. His results did not support the BOS-tuned error correction model, as the firing rates of LMAN neurons were unaffected by changes in auditory feedback and therefore, the error signal generated by LMAN appeared unrelated to auditory feedback. Moreover, the results from this study supported the predictions of the efference copy model, in which LMAN neurons are activated during singing by the efference copy of the motor signal and its predictions of expected auditory feedback , allowing the neurons to be more precisely time-locked to changes in auditory feedback. Neurons fire when the primary song type is either heard or sung. Neurons do not fire in response to the other song type, regardless of whether it is heard or sung. They exhibit both sensory and motor properties. They are action-specific â€" mirror neurons are only active when an individual is performing or observing a certain type of action e. Because mirror neurons exhibit both sensory and motor activity, some researchers have suggested that mirror neurons may serve to map sensory experience onto motor structures. Mirror neurons may be mediating this comparison of what the bird hears, how it compares to a memorized song template, and what he produces. In search of these auditory-motor neurons, Jonathan Prather and other researchers at Duke University recorded the activity of single neurons in the HVCs of swamp sparrows. These neurons also fire in similar patterns when the bird is singing that same song. Swamp sparrows employ different song types, and the neural activity differs depending on which song is heard or sung. The HVCX neurons only fire in response to the presentation or singing of one of the songs, the primary song type. They are also temporally selective, firing at a precise phase in the song syllable. In other words, the bird becomes "deaf" to his own song. This suggests that these neurons are producing a corollary discharge , which would allow for direct comparison of motor output and auditory input. Overall, the HVCX auditory motor neurons in swamp sparrows are very similar to the visual motor mirror neurons discovered in primates. Like mirror neurons, the HVCX neurons: Are located in a premotor brain area Exhibit both sensory and motor properties Are action-specific â€" a response is only triggered by the "primary song type" The function of the mirror neuron system is still unclear. Some scientists speculate that mirror neurons may play a role in understanding the actions of others, imitation , theory of mind and language acquisition , though there is currently insufficient neurophysiological evidence in support of these theories. In addition to the implications for song learning, the mirror neuron system could also play a role in territorial behaviors such as song-type matching and countersinging. The specificity of bird calls has been used extensively for species identification. The calls of birds have been described using words or nonsense syllables or line diagrams. In addition to nonsense words, grammatically correct phrases have been constructed as likenesses of the vocalizations of birds. For example, the barred owl produces a motif which some bird guides describe as Who cooks for you? Who cooks for you all? This was adopted by early researchers [93] including C. Bailey who demonstrated its use for studying bird song in Borror [95] and developed further by others including W. Beginning in , some field guides for birds use sonograms to document the calls and songs of birds. Sonograms can also be roughly converted back into sound. Many allopatric sub-species show differences in calls. These differences are sometimes minute, often detectable only in the sonograms. Song differences in addition to other taxonomic attributes have been used in the identification of new species. Bird language[edit] The language of the birds has long been a topic for anecdote and speculation. That calls have meanings that are interpreted by their listeners has been well demonstrated. Domestic chickens have distinctive alarm calls for aerial and ground predators, and they respond to these alarm calls appropriately. Studies to demonstrate the existence of language have been difficult due to the range of possible interpretations. For instance, some have argued that in order for a communication system to count as a language it must be "combinatorial", [] having an open ended set of grammar-compliant sentences made from a finite vocabulary. Research on parrots by Irene Pepperberg is claimed to demonstrate the innate ability for grammatical structures, including the existence of concepts such as nouns, adjectives and verbs. Studies on starling vocalizations have also suggested that they may have recursive structures.

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Chapter 2 : visual and acoustic communication signals in birds | Download eBook pdf, epub, tuebl, mobi

Acoustic Communication in Birds, Volume 2: Song Learning and Its Consequences investigates acoustic communication in birds, with emphasis on song learning and its consequences. Some issues in the study of bird sounds are discussed, with particular reference to evolutionary considerations.

This review addresses the impacts of the noise, the vital role of acoustic communication and the response of the bird in overcoming the increased anthropogenic noise. The rapid development human activities nowadays induce the noise that interrupt the acoustic communication of birds. Disturbance of the signals transmission causes detrimental impact on the birds as they are highly depending on the acoustic communication for their survival, territory defense and reproduction. Continuous exposure of the noise then results in the declination of species richness of which have been stated by several past studies. Although most of the studies stated that the negative impact as a consequences from the anthropogenic noise, however there is positive effect contributed by the noise of which are also recorded in other studies. Moreover, the impacts other variables such as vegetation density that cause major changes to the bird population as compared to noise have also been highlighted in several studies. This indicates that considering several influencing factor is important in measuring impact that leads to the changes that occur within the bird population. Thus, in depth studies on the impacts of anthropogenic noise towards the species of birds by taking into account other contributing variables is important to enable the noise management to be conducted effectively especially in development areas as way in conserving the biodiversity of the bird population. Experimental evidence for an impact of anthropogenic noise on dawn chorus timing in urban birds. The costs of chronic noise exposure for terrestrial organisms. Impacts of chronic anthropogenic noise from energy-sector activity on abundance of songbirds in the boreal forest. Conservation Biology 22 5 , pp. Impacts of Anthropogenic Noise on Wildlife: Research Priorities for the Development of Standards and Mitigation. Conservation Biology 26 3 , pp. Conference Inter-noise , pp. The impact of environmental noise on song amplitude in a territorial bird. The evolution of the Lombard effect: Increased amplitude and duration of acoustic stimuli enhance distraction. On the relation between loudness and the increased song frequency of urban birds. Animal Behaviour 82, pp. Serins respond to anthropogenic noise by increasing vocal activity. The effects of highway noise on birds. Jones and Stokes Associate, California. Anthropogenic outdoor sound and wildlife: Roads and their major ecological effects. Noise pollution changes avian communities and species interactions. Current Biology 19, pp. Vocal frequency change reflects different responses to anthropogenic noise in two suboscine tyrant flycatchers. Proceedings of the Royal Society B: Biological Sciences , pp. Different behavioural responses to anthropogenic noise by two closely related passerine birds. Ornithological Monographs 74 , pp. Can human disturbance promote nestedness? Songbirdsand noise in urban parks as a case study. Effects of traffic noise on occupancy patterns of forest birds. Conservation Biology 25 2 , pp. Chronic industrial noise affects pairing success and age structure of ovenbirds Seiurus aurocapilla. Journal of Applied Science 44, pp. Low-frequency songs lose their potency in noisy urban conditions. Anthropogenic noise affects song structure in red-winged blackbirds Agelaius phoeniceus. Effects of road on the abundance of birds in Swedish forest and farmland. Impacts of traffic noise on anuran and bird communities. Urban Ecosyst 14, pp. Anthropogenic noise is associated with reductions in the productivity of breeding Eastern Bluebirds Sialia siali. Ecological Applications 22 7 , pp. The effects of rain on acoustic communication: The Royal Society , pp. Ambient noise increases missed detections in nestling birds. Biology Letters 8, pp. Urban noise and the cultural evolution of bird songs. Proceedings of Royal Society B: An experimental investigation into the effects of traffic noise on distributions of birds: Proceedings of The Royal Society , pp. Impact of chronic noise exposure on antipredator behavior: Response of avian communities in largeriver floodplains to environmental variation at multiple scales. Birds and Anthropogenic Noise: Are Urban Song Adaptive? The American Naturalist 4 , pp. Bird song and anthropogenic noise: Sleepless in town â€" drivers of the temporal shift in dawn song in urban european blackbirds. Impacts of traffic noise and traffic volume on birds of roadside habitats. Ecology and Society 14 1 , pp. Avian communication in urban noise: Auk 3 , pp. Lowland rainforest avifauna and human disturbance:

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Chapter 3 : Acoustic Communication in Birds : Donald E. Kroodsma :

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Chapter 4 : acoustic communication | Borneo Science

The article highlights the biological significance of songs and calls in birds. The structural diversity of songs and its relevance for social behaviour are described. Acoustic communication plays an important role in the life of birds and has proven useful in establishing phylogenetic and evolutionary relationships among species.

Chapter 5 : Animal Acoustic Communication | Technical Committee on Animal Bioacoustics

Acoustic Communication in Birds, Volume 1: Production, Perception and Design Features of Sounds presents the scientific study of bird vocalizations. This book discusses the relations between the physical structure of bird vocalization and their quality as perceived by the recipient.

Chapter 6 : Acoustic communication in birds | RSB

Acoustic Communication in Birds Differences in Songs and Calls, their Production and Biological Significance Anil K u m a r T h e article highlights the biological significance of songs and calls in birds. T h e structural diversity of songs and its relevance for social behaviour are described.