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„Links and Perspectives in European Ornithology"

Abstract Volume

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Plenary Abstracts

Ornithology and the genesis of the Synthetic Theory of Evolution

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The evolutionary synthesis of the 1930s and 40s was one of the most successful scientific theories of the twentieth century. With its acceptance many of the controversies that had shaped the discussions about evolution since DARWIN's Origin of Species came to an end. This unification of evolutionary biology was achieved on a Darwinian basis. Together with selection, which was regarded as the only causal factor leading to adaptation, further evolutionary factors were integrated. Mutation and recombination were identified as the sources of genetic variability. The important effects of population size were stressed, in particular for small populations, where chance effects limit the power of selection. In addition geographic isolation was seen as an important prerequisite for the splitting of a species into two separate species. This synthetic theory of evolution or Synthetic Darwinism has dominated evolutionary biology since the early 1950s.

A closer look at the main representatives of the new theory, its „architects", reveals that ornithologists played a vital part in its formulation. Both BERNHARD RENSCH (1900–1990) and ERNST MAYR (* 1904) based much of their evolutionary theorising on ornithological data. The British zoologist JULIAN HUXLEY (1887–1975) did intense research on the ecology of birds. On the other hand the leading ornithologist ERWIN STRESEMANN (1889–1972), teacher of both RENSCH and MAYR, never really accepted the new Darwinian theory. In my talk I will discuss the question if the connection between modern synthetic Darwinism and ornithology is more than a historical coincidence. How did RENSCH and MAYR see this relationship? Was the empirical data or the theoretical distinctiveness of ornithology especially suited to accommodate a Darwinian interpretation? By comparing the ideas of RENSCH, MAYR, and STRESEMANN, I will discuss in what respect we can speak of a especially close relationship between ornithology and the synthetic theory of evolution in the 1930s and 40s.

Warblers in secondary contact – from the view of molecular markers

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Avian taxonomists once saw hybrid zones as nuisances. The existence of hybrids and backcrossed individuals was obstructing the ambition to eventually enabling naturalists to unequivocally label every specimen with a scientific name. Over the last few decades, it has become increasingly clear that hybrid zones offer excellent opportunities to study the process of speciation, providing rich examples of the mechanisms of evolution and the genetics of adaptations. A secondary contact of populations may eventually reach a stable situation, which might include complete mixing of the two populations, formation of a hybrid zone, extinction of one of the populations or co-existence without mixing. Important predictors to the outcome are the fitness of hybrids and initial population divergence. Both these variables should roughly correlate with the time in isolation before the secondary contact, and, might be approximated by the divergence in mtDNA. I will examine four cases of warbler secondary contact zones that differ dramatically in the level of mtDNA cytochrome b gene divergence: *Hippolais icterina* and *H. polyglotta* (6.5 %), *P. throchiloides viridanus* and *P. t.*

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plumbeitarsus (5.4 %), *Phylloscopus c. collybita* and *P. c. brehmii* (4.6 %), and *P. trochilus trochilus* and *P. t. acredula* (0 %). Each of these hybrid zones has been examined for divergence and introgression of mtDNA and nuclear DNA using microsatellites and/or AFLP. I will look for common patterns, discuss evidence of pre- and post-mating isolation and identify variables that contribute to reduced gene flow between the taxa.

Family relations

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(Abstract not available in time)

Large scale networks in the study of bird migration: pitfalls and prospects

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Recoveries of ringed birds unveiled many aspects of the migration of birds. What is missing are detailed analyses of environmental factors controlling bird migration as well as the temporal and spatial course of the migratory journeys across a wider geographical scale. Large-scale coherent networks can provide these data. The comparative analysis of seasonal patterns of occurrence of migrants at various study sites along the migration routes and at wintering grounds, the comparative analysis of biometrical measurements which are likely to reflect population-specific differences in body features, and the comparative analysis of body mass and fat reserves as well as of the environmental circumstances at the various study sites enable much more detailed insights in the different strategies of migratory birds than single site studies can achieve. They can also contribute to studies of differential migration giving more emphasis to population specific migration routes, and the migration of age groups and gender.

However, large-scale networks can achieve their potentials and goals only if they are following a strict standardized methodology, and a common protocol. An other ultimate prerequisite is training and calibration to secure the standardized measurements and to minimize between-site observer variability. If these basic requirements are fulfilled, large-scale networks are a unique approach to study patterns and processes in bird migration at a much more sophisticated level. They enable a new scale in the study of songbird migration. Training and calibration as well as coordination provided, they could also make use of the many skilled and enthusiastic volunteer ringers, and linking the many bird observatories. However, some concern must be given towards designing networks. Most of the recent large-scale networks are faced with some considerable bias regarding the participating sites, with a dominance of coastal sites and comparatively few inland sites. Coastal sites are often attracting many birds but they may offer less good feeding conditions. In contrast, many inland sites are adequate feeding sites but there is often a considerable overlap between local breeding birds and passage migrants. Thus, locality of the study site may have a considerable influence on the composition of the migrants bird community as well as on stopover ecology and behaviour.

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Population regulation: is there anything new since David Lack?

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DAVID LACK's views of population regulation in birds were laid out in two books, published in 1954 and 1966. For several decades, his ideas dominated research in bird population ecology. In this talk, I shall examine the extent to which his ideas have withstood the test of time, and to what extent they need to be modified by new information and understanding. I shall concentrate on three main aspects, namely (1) the role of territorial and other behavioural interactions as proximate mechanisms in density regulation; (2) the evidence for density dependent processes in bird populations; and (3) the role of external factors, such as food-supply, parasites and predators, in limiting densities.

Since LACK's time, much evidence on the role of various external factors has arisen from large-scale experiments, in which supplies of food or nest sites have been augmented, or in which predators and parasites have been removed, and the response of the population has been monitored. These various experiments have confirmed that all main potential limiting factors have indeed affected breeding density in one bird species or another. They have also confirmed that the same species has been limited by different factors in different areas or years.

With longer runs of data, and improved statistical methods, density dependent processes have now been detected in many bird populations, affecting all aspects of population demography, from reproduction and mortality to movements and recruitment. Aspects unknown in LACK's time that have developed since then include the various metapopulation phenomena associated mainly with fragmented habitats, and the effects on populations of interactions between different limiting factors.

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