Wildlife research—science for a changing environment

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Introduction

Landscapes are changing fast, and research is needed in order to find a balance between conservation and the increasing demand of natural resources. Problems and challenges are similar in different regions of the world and might benefit from joint scientific approaches. In parallel, wildlife research has also rapidly evolved. Knowledge in this field is no longer concentrated in less than ten scientific journals, but spread over more than 100. As editor of the European Journal of Wildlife Research (EJWR), I would like to identify some trends in this research field and give suggestions for the coming years. To achieve this, I shortly analyzed the 606 articles published in EJWR since 2004, as well as selected keywords from the global scientific literature.

Recent trends in wildlife science

European contributions to EJWR are still the main part. However, contributions from North America already represent 10%, more than for instance from France or Italy. Moreover, contributions from China, India, and South America, notably Argentina and Brazil, are steadily growing. Thus, the “European” EJWR is slowly losing its “E.” This was actually one aim of the current editorial board: EJWR is becoming truly international. However, EJWR still is the journal with most articles on representative European small game species such as the red-legged partridge (Alectoris rufa; n=16). It is also the second journal by number of articles on the Eurasian wild boar (Sus scrofa; n=63). Interestingly, the first one is Veterinary Microbiology (n=76), indicating the key role of wild boar as disease reservoirs. Even less traditional taxa for a wildlife research journal, such as bats, amphibians, or fish, are increasingly present. In fact, a review on sturgeon conservation genetics (Ludwig 2006) is among the journal’s most cited papers! The terms “woodland” or “forest” are cited 99 times in EJWR. With about 1,000 million hectares, Europe’s woodlands represent about 25% of the world’s total, and the growth in the last decades of the forested land has continued. This has consequences on wildlife. Roe deer (Capreolus capreolus) and wild boar, for instance, have expanded their range throughout Europe, and also their densities are increasing. Also, in EJWR, articles on ungulates appear more often than those on other wildlife, and wild boar, red deer (Cervus elaphus), and roe deer are the three most frequently studied species (n063, 65, and 43, respectively). The exponential increase of European wild boar populations (Sáez-Royuela and Tellería 1986) has increased the conflicts with agriculture and other interests (Bueno et al. 2010). In some species like the red deer, these high densities lead easily to undesirable overabundance situations (Gortazar et al. 2006). Overabundant wild ungulate populations, which are in part a consequence of artificial management through fencing or feeding, have consequences for the environment, other wildlife, and for livestock, often in the form of shared diseases. Tuberculosis, which can nowadays be found in wildlife even in most developed countries, constitutes a good example of diseases shared with wildlife (Gortazar et al. 2012). Wildlife diseases are acquiring increasing relevance in the wildlife field in the last years.

This includes verctorborne diseases such as bluetongue (Falconi et al. 2011) or zoonoses such as the tapeworm Echinococcus multilocularis (Janko et al. 2011). The terms “disease” or “parasite” appear 107 times in EJWR, more than any single wildlife species and even more than “woodland.” Often, EJWR contributions on disease aspects refer methods for wildlife disease surveillance (Boadella et al. 2011; Tavernier et al. 2011), propose tools for disease control in wild boar (Ballesteros et al. 2011) or Eurasian badgers (Meles meles, Kelly et al. 2011), or deal with the novel field of conservation medicine (Santiago-Moreno et al. 2011). A general impression is that wildlife disease research is moving from descriptive epidemiology to risk analysis anddisease control. Europe’s traditional agricultural landscapes are being lost, both in the Mediterranean (Schmitz et al. 2003) and in Central Europe, where open landscapes without intensive modern agriculture are a rarity (Svenning 2002). Hence, opposite to ungulates, small species such as the grey partridge (Perdix perdix) are declining, and hunters are more dependent on releases of farm-reared birds (Vidus-Rosin et al. 2010). Long time series on key species and habitats are particularly valuable in this context. Also, tools for analyzing such data, as well as new or improved census methods, are still high in the ranking (Barrio et al. 2010). For similar reasons, restockings and translocations are growing in popularity. Alone in the province of Ciudad Real in central Spain, some 2.5 million red-legged partridges are released for hunting annually. This in turn carries risks, for instance of introducing new pathogens from the farm to the field (Díaz-Sánchez et al. 2012), but also through the loss of the genetic characteristics of autochthonous birds (Barilani et al. 2007) or through indirect effects on predator conservation. The whole field of wildlife translocations, both for hunting and for conservation, deserves more research. Many predators have changed their range and abundance in the last decades. For instance, a look on rabies and red fox (Vulpes vulpes) population data in Germany shows a spectacular effect of oral vaccination (Müller et al. 2005), along with an increase in fox densities that must in turn have consequences for ground nesting birds and other wildlife. The generalized expansion of wild ungulates (e.g. Mattioli et al. 2011) has probably contributed to the recovery of the wolf (Canis lupus). This in turn has consequences in the form of conflicts with livestock breeders (Bisi et al. 2010). Thus, conflict mitigation is becoming an important concept in wildlife management (see for instance the last 2010 issue of the journal Wildlife Research). Endangered predators are often limited by habitat fragmentation, and metapopulations suffer a loss of genetic variability. Studies on roads and other infrastructures, such as wind parks, and their effects on wildlife ecology and population genetics are thus needed (Rydell et al. 2010; Carvalho and Mira 2011). A further growing field is the invasive species, as well as pest species (Bertolino et al. 2011). The raccoon dog Nyctereutes procyonoides) for instance has expanded rapidly through north and central Europe (Pitra et al. 2010) and may complicate rabies control in certain regions. Hence, invasive species, pest species, but also overabundant wild ungulates constitute an increasing concern. Here, the common goal is controlling wildlife. But are there enough hunters? In hunting preserves of the Cantabrian Mountains in Spain, for instance, only 15% of the available territory is actually used for wild boar hunting, and only 2% to 15% of the red deer population is harvested yearly. This obviously leads to huge increases in wild ungulate densities and damages. Similar situations probably occur in different regions throughout the northern hemisphere.

Therefore, means for population control such as immune contraception (Kirkpartick et al. 1997) are increasingly needed in order to keep the artificial balance in a “first world” with less hunters. Further new fields in wildlife ecology include conservation genetics and other links to molecular biology. Noninvasive methods, able to extract valuable information from droppings or hair samples, are gaining popularity (Swenson et al. 2011). Also, geographical information systems technology is gaining importance in wildlife research. Add also the whole field of environmental chemistry and toxicology, be it for hormone detection, biomarker use, or as a tool for contaminant monitoring in an ever-changing environment. A conclusion is that wildlife research is progressively more dependent on technology. Last but not least is public opinion. Urban people are progressively losing contact with the rural values. This implies, among other aspects, a growing anti-hunting feeling known as the “Bambi syndrome.” Social research is thus of paramount importance and will bring many novelties.

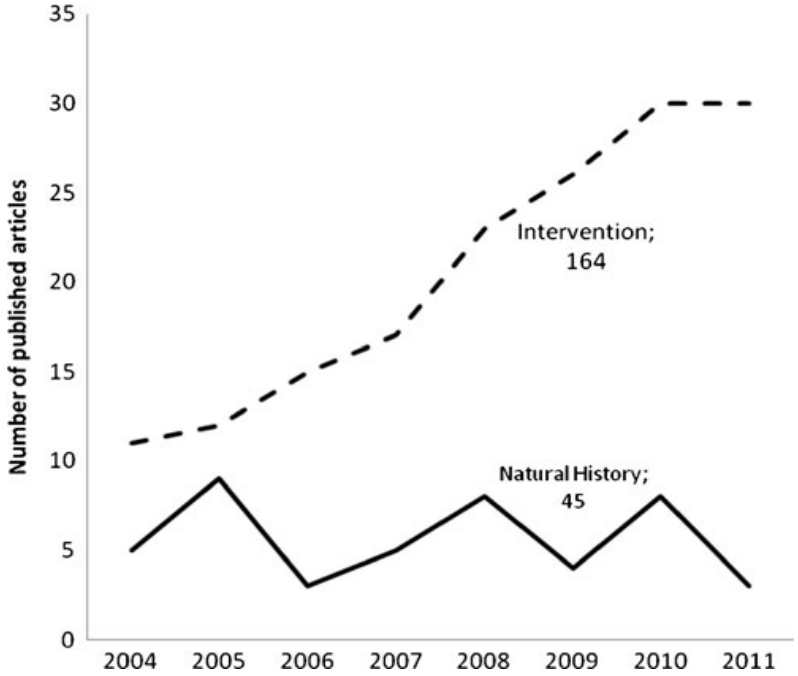

Fig. 1 Number of articles found in the ISI Web of Science that include the terms “wildlife” and either “intervention” or “natural history.” The search was limited to the time when the European Journal of Wildlife Research started (since 2004) and was performed on December 9, 2011 excluding some of that year’s articles. It becomes evident that intervention is a growing concept in wildlife research, as compared to traditional natural history

Conclusions

Wildlife ecology research is changing. Former studies were often descriptive and included many case reports. Today, experimental and hypothesis-driven studies are more frequent. Most former studies were mono-disciplinary in fields such as zoology, veterinary medicine, or forestry. In contrast, modern wildlife research is largely cross-disciplinary. One example is “Linking habitat quality with genetic diversity: a lesson from great bustards in Spain” (Pitra et al. 2011), which represents a nice mix of population genetics and field ecology: typical cross-disciplinary and typical high-tech. In summary, the following three conclusions emerge regarding future research in wildlife management: First, long time series are extremely valuable in an everchanging environment; Second, management and intervention are urgent, and articles with this focus should be preferred to merely descriptive ones (e.g. Martinez-Haro et al. 2011). This is already happening in our scientific field, as evidenced in Fig. 1. This means that wildlife science must produce useful suggestions towards conflict mitigation, wildlife disease control, invasive species and overabundance, improved translocation methods, and so on; Third, wildlife science must be based on quality, promoting hypothesis-driven research, innovative methods, and a close international and cross-disciplinary collaboration.