

— REVIEW ARTICLE —

## Trends in current ornithology in Greece

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Received: 4 January 2007

Accepted after revision: 6 July 2007

Although the ancient Greeks have left us the earliest known written texts on the study of birds, ornithology in modern Greece is a relatively recent scientific discipline. A few Greeks and many foreign ornithologists, and in particular the Germans, contributed to the development of ornithology in our country during the 19<sup>th</sup> and 20<sup>th</sup> centuries. The period following the decade of the 1980s however, seems to have been the most fruitful for this scientific domain in Greece. This review examines the interests of current ornithology in Greece and identifies any gaps in ornithological research. Surveys and biological studies with a conservational orientation were the main subjects for most of the 692 publications that appeared during the period 1980-2005. The majority of these works were published in international scientific journals, while the number of doctoral or other dissertations and papers on conference proceedings has constantly been increasing. Bird species of conservation interest such as *Falco eleonora*, *Pelecanus crispus*, *Egretta garzetta* and *Alectoris graeca* were among the most studied. The majority of studies were carried out in wetlands, especially those of northern Greece, since waterbirds seem to be the most attractive bird group to ornithologists. Only in certain locations are mountainous and forested areas well studied, i.e. Crete and Dadia. Although ornithology in Greece has made a big step forward during the last 26 years, there are still many unexplored fields. The challenge for future research must be directed towards filling the gaps in our knowledge on certain bird species and their habitats, organizing our efforts in order to predict avian responses to environmental pressure, and being prepared to deal with any changes that may occur in nature at large, both in Greece and worldwide.

**Key words:** ornithology, Greece, history of ornithology.

### INTRODUCTION

The first known study on birds was made by the outstanding ancient Greek philosopher and zoologist Aristotle (384-323 B.C.). In his monumental work *History of Animals*, which is the best ancient text on birds, he describes at least 183 bird species, also providing information about their habits and biology. After him, from antiquity until the Byzantine Era, a significant number of other Greek philosophers and authors described many bird species in their texts, according to Pollard (1977) and Markou (1999). In

modern Greece, however, ornithology is among the most recent scientific disciplines. The modern history of ornithology in Greece begins after the establishment of the Greek State, in 1830. The first scientific publication about birds in the newly formed Greek State appeared relatively early, in 1832, in Paris. It was written by a French doctor following a scientific expedition to the Peloponnese (Moree) and included the first list of bird species found there (Saint-Hilaire Geoffroy, 1832). Until the early 20<sup>th</sup> century, many, mainly German ornithologists and naturalists traveling, studying or living in Greece recorded numerous bird species in various areas and published their findings in their native language (Handrinos & Akriotis, 1997). The first book on

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birds in Greece was written by a Greek amateur naturalist and was published in 1880, in Athens. Entitled “On the usefulness of birds”, the book describes the contribution of birds to human life, also providing information about the biology and ecology of at least 67 species (Maroudis, 1880). The great diversity of the Greek natural environment and the great variety of birds, attracted naturalists and ornithologists, mainly from Germany, who occupied the unexplored field of ornithology for many years: from the beginning of the 20<sup>th</sup> century, during and after the Second World War well into the 50s and 60s. It is characteristic that among 320 scientific publications about birds in Greece until 1970, the vast majority were in German and, with the exception of Maroudis (1880), there were only three other works written by Greek ornithologists: two by Hatzissarantos & Kanellis (1947/1948, 1959) and one by Kanellis (1969) who, in *Catalogus faunae Graeciae: Pars II Aves*, with the contribution of five German ornithologists, provided information on the occurrence and distribution of 379 bird species. During the 1970s, Greek ornithologists gradually started appearing in the local and international literature with bird surveys from specific areas. At the same time, ornithologists from Germany, England, France, the Netherlands, USA and elsewhere, stimulated by bird diversity and lack of information from Greece, continued their valuable contribution to ornithology in this country.

The last 26 years, from 1980 to 2005, seem to have been the most fruitful period for ornithology in Greece. Greek ornithologists did not only start studying birds in Greece, but also had their studies published in international journals. At the beginning of the 1980s, the Hellenic Ornithological Society was founded and later on, the Hellenic Bird Ringing Centre (the descendants of the ornithological team established within the first environmental protection society in Greece, in 1953, the Hellenic Society for the Protection of Nature). Both organizations played an important role in raising awareness to wild birds, as well as in bringing to the forefront ornithological issues in management and protection of the Greek environment, which had started during this period to be negatively affected by human activities.

The list of articles and publications regarding ornithology in Greece has been published twice during the last 15 years (Matsakis, 1992; Handrinos *et al.*, 2001). However, the present review is the first to include an analysis on the subject of each publication.

The aim of this research is to examine our local

knowledge and take a closer look at what was performed in Greek ornithology from 1980 to 2005 in order to document the interest of current ornithology as a scientific discipline in Greece, as well as to detect the gaps concerning both the species of birds and the type of research conducted. Furthermore, I wish to explore the extent to which these ornithological studies and publications have contributed to bird conservation in Greece.

## METHODS

All scientific publications on the Hellenic avifauna published between 1980 and 2005 were recorded in a specially designed database which included information about the year, the kind of publication, the type of study and the species studied, as well as the area and habitat. Publications from the following categories were included: those published in international or Greek scientific journals with referees (whether in journals of the Science Citation Index or not), doctoral and postgraduate theses, books, chapters in books and proceedings of international or national conferences (full articles). Project reports, undergraduate theses and articles in non-scientific or popular magazines were not included. My intention was to include only those publications that have been reviewed.

The subject of each publication was classified according to the following broad categories: population or species surveys, conservation, biology-ecology (breeding biology, habitat use, feeding, and diet), pesticides-toxic, chemicals, monitoring, behavior, hunting, ringing, migration-wintering, distribution, reviews and miscellaneous.

The term “protected species” refers to species in Annex I of the European Union Directive 79/409 (about the protection of birds and their habitats). Threat categories are according to the Red Data Book of Threatened Vertebrates of Greece (Handrinos, 1992).

## RESULTS

### *Number and type of publications*

The total number of publications on birds during the period 1980-2005 was at least 692. Most of these were articles in international scientific journals (414 or 59.8%) of which, those published in journals of the Science Citation Index (SCI) were 107 overall (15.5% of the total publications). The absence of an exclusively ornithological journal in Greek language had as

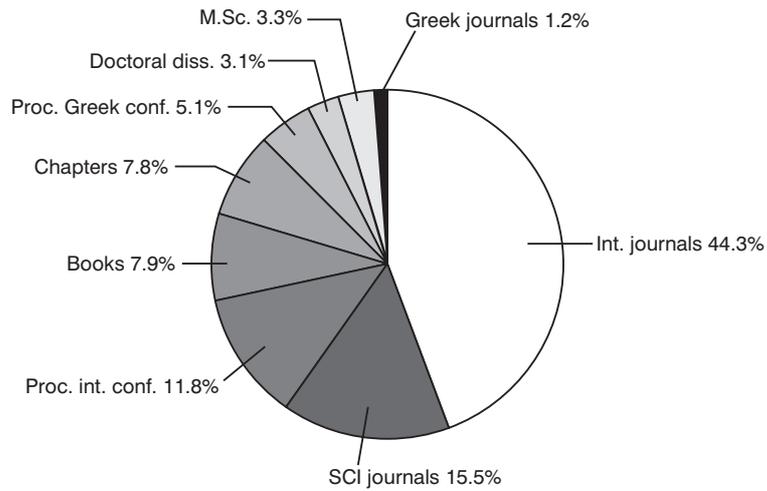


FIG. 1. Types of publications on ornithology in Greece during the period 1980-2005.

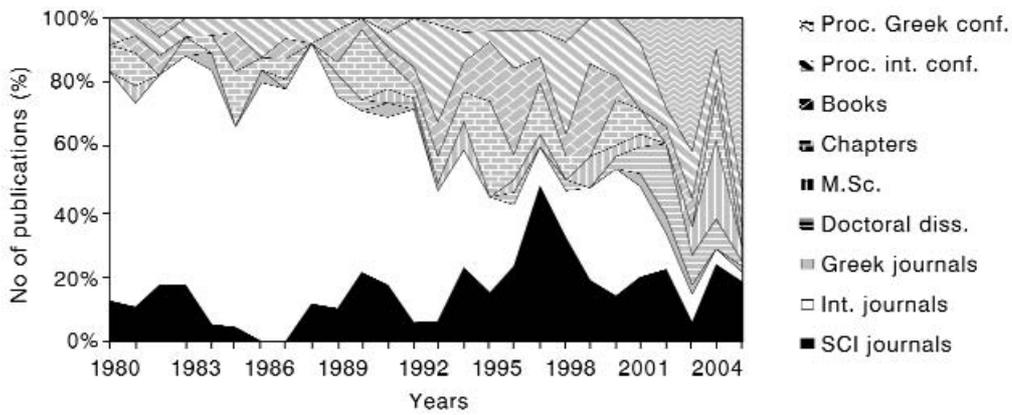


FIG. 2. Percentages of publication types on ornithology in Greece and their changes from 1980 to 2005.

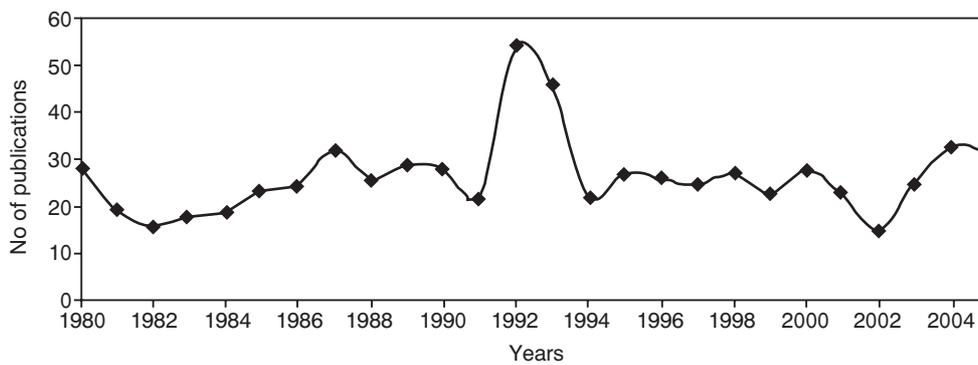


FIG. 3. Trends in number of publications on ornithology in Greece during the period 1980-2005.

an outcome that a very small number of publications (8 or 1.2%) were published in Greek scientific journals of general environmental interest. Publications on proceedings of conferences (117 or 16.9%) were mostly those of international conferences (82 or 11.8%), while Greek conference proceedings numbered only 35 (5.1%). Doctoral and M.Sc. dissertations that were completed in Greek, other European or USA universities were 44 in total (6.4%), while 55 (7.9%) books on birds and 54 (7.8%) chapters in Greek or international books were published (Fig. 1). Publications in international journals prevailed up to the mid 1990s, moreover, in the following years the number of publications in SCI journals and in conference proceedings increased considerably (Fig. 2).

The mean number of publications every year during the study period was 26.6 ( $\pm 8.4$ ), ranging from 15 to 33, with the exception of the years 1992 and 1993

when an exceptionally high number of publications were recorded (Fig. 3).

#### *What species or bird groups have been studied?*

Overall, 135 species appear in the publications from a total of 422 species that have been recorded in Greece until the end of the 20<sup>th</sup> century (Handrinos & Akriotis, 1997). Although numerous species are referred in the publications, only those that are mentioned in the title are included. With regard to bird groups that have been studied so far, waterbirds appear to be the most popular among researchers. This group comprises 35.4% of the publications, followed by raptors (18.8%) and passerines (13.6%). Non-passerine species appeared only in a few publications (5.3%), whereas publications on birds in general accounted for 26.9% (Fig. 4).

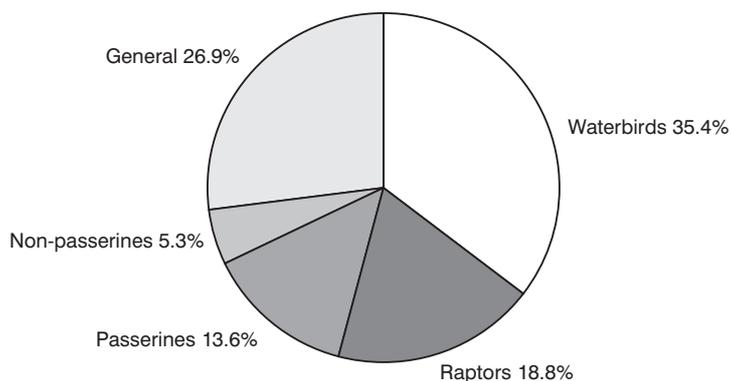


FIG. 4. Percentages of the bird groups studied in Greece during the period 1980-2005.

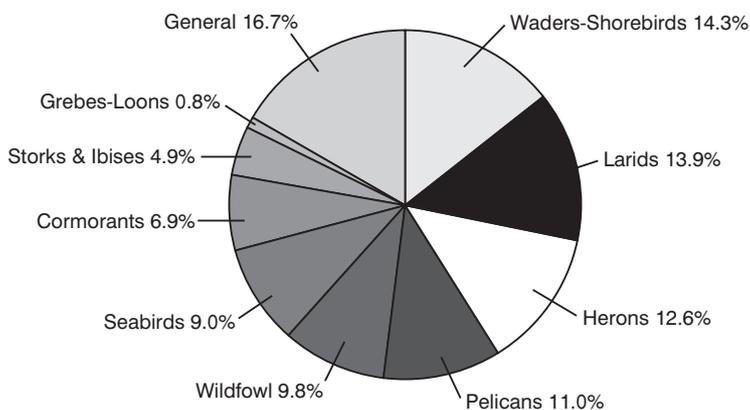


FIG. 5. Percentages of the categories of waterbirds studied in Greece during the period 1980-2005.

Among waterbirds, waders (Charadriidae, Scolopacidae, Recurvirostridae), herons (Ardeidae), larids (Laridae and Sternidae) and pelicans (Pelecanidae) were the groups of greatest interest to Greek ornithologists (Fig. 5). It is worth mentioning that on herons alone, five doctoral dissertations (out of 21 such dissertations in total) were published in the last 15 years.

Concerning the publications on raptors, 61.1% dealt with the diurnals and especially those of the family Falconidae, while the remainder concerned vultures and owls, whose diet appears to have been the most popular subject (Fig. 6).

The publications on passerines were mostly surveys and records in specific sites. Warblers (15.1% of all publications on passerines) and thrushes (12.9%) were the groups of greatest interest, while papers on passerines in general comprised 19.4% (Fig. 7). Non-passerines of interest were rock and grey partridges,

pheasants and quails.

Concerning specific species, *Falco eleonorae* is the most well studied species in Greece and appears in at least 34 publications. Other species of interest to ornithologists in Greece are *Pelecanus crispus* (appears in 18 publications), *Egretta garzetta* (14), *Alectoris graeca* (14), *Gypaetus barbatus* (13), *Phalacrocorax carbo* (12), *Pelecanus onocrotalus* (12), *Calonectris diomedea* (11), etc.

#### What is the subject of the publications?

The findings show that the most popular kind of research was the “Population or Species Surveys” which was the subject of 24.2% of the publications (Fig. 8). On account of these surveys, the level of knowledge has significantly increased on the distribution, number and status of many bird species such as gulls (*La-*

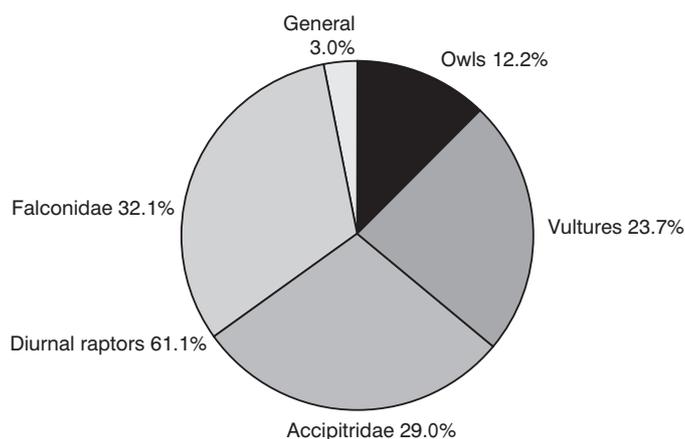


FIG. 6. Percentages of the categories of raptors studied in Greece during the period 1980-2005.

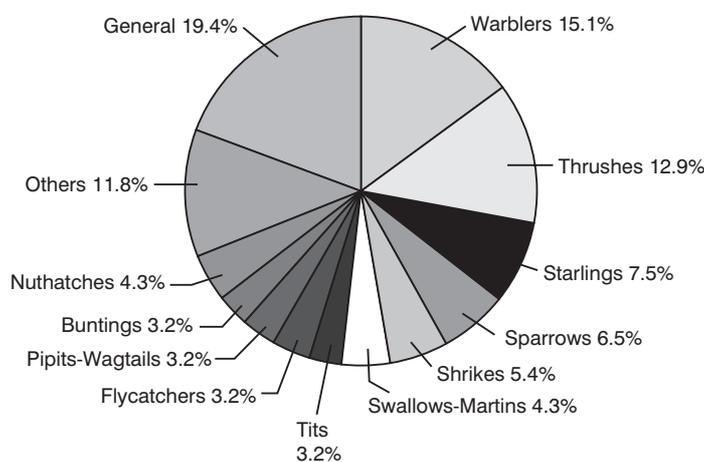


FIG. 7. Percentages of the categories of passerines studied in Greece during the period 1980-2005.

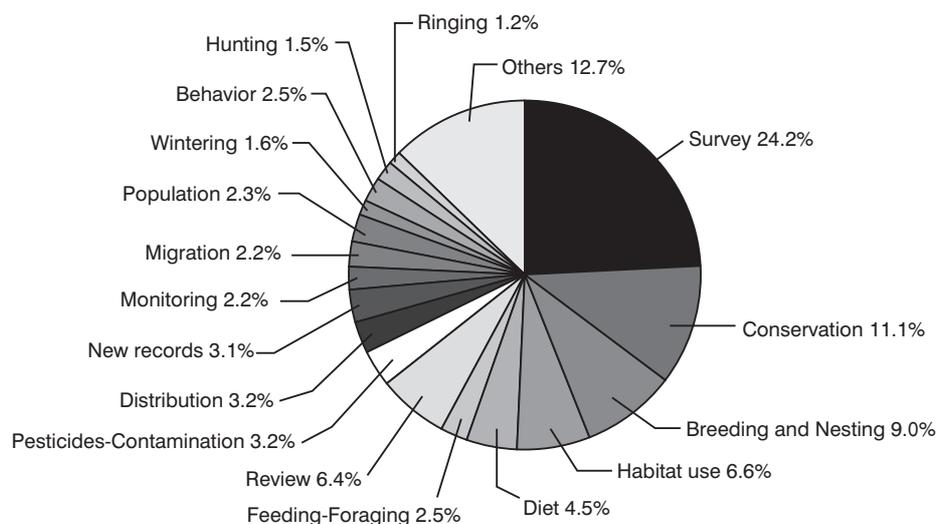


FIG. 8. Types of ornithological studies in Greece during the period 1980-2005.

*rus audouinii*) and eagles in many areas of Greece (Hallmann, 1989; Oro *et al.*, 1998). Furthermore, these surveys have contributed to current understanding of the importance of the role that Greece plays for these species. The “Biology-Ecology” category comprised 22.6% of the publications. The breeding ecology of species such as *Egretta garzetta*, *Nycticorax nycticorax*, *Pelecanus crispus*, *Phalacrocorax carbo*, of waders such as *Recurvirostra avosetta* and *Haematopus ostralegus* and of raptors such as *Aquila pomarina* and *Buteo rufinus*, has been very well documented (Goutner, 1983; Vlachos, 1989; Alivizatos, 1996; Kazantzidis *et al.*, 1997; Crivelli *et al.*, 1998; Liordos, 2004). It is thanks to studies on “Conserva-

tion” (11.1% of the total publications), that conservation measures for certain, especially endangered, species have been proposed. In some cases, for species such as *Gypaetus barbatus*, *Pelecanus crispus* and *Alectoris graeca*, many of these proposals have already been implemented (Pyrovetsi, 1997; Catsadorakis, 2002; Xirouchakis, 2003; Sokos & Birtsas, 2005). Some papers naturally cover more than one of these categories. Behavior, hunting or ringing studies were rarely the subject of research in Greece, while publications on the effects of pesticides on birds (especially on waterbirds) although not numerous, have increased during the last five years (Albanis *et al.*, 1996; Goutner *et al.*, 2001, 2005) (Fig. 8).

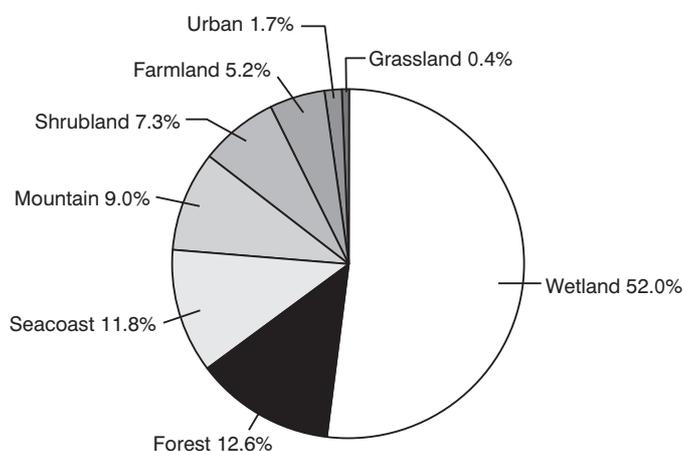


FIG. 9. Habitat types where the ornithological studies took place in Greece during the period 1980-2005 (the percentages are based on 467 publications which are referred to specific habitats).

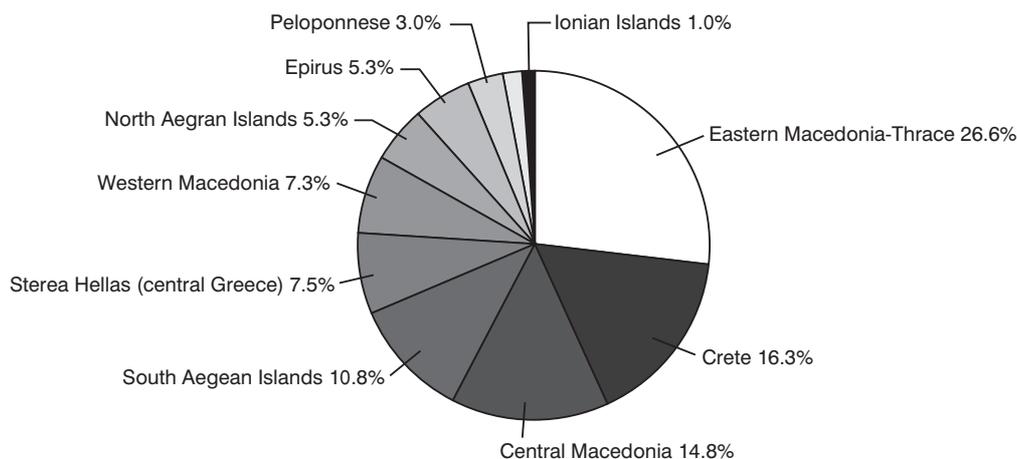


FIG. 10. Regions in Greece where the ornithological studies took place during the period 1980-2005 (the percentages are based on 408 publications which are referred to specific regions or locations).

### *The habitat type*

Despite its small size, Greece is very rich in natural habitat types. Marine and coastal habitats, wetlands (both coastal and inland including deltas, lakes and marshes), forests, shrublands (including maquis and phrygana), grasslands, farmland, mountainous habitats (rocky and alpine meadows), as well as urban areas are all covered by publications on birds (Fig. 9).

The majority of the research on birds has been carried out in the wetlands (of which Greece has an abundance, with more than 400 species recorded, Zallidis & Matzavelas, 1994), which explains why waterbirds are the most studied species. River deltas such as Evros and Axios, lakes such as Prespa and Kerkini, lagoons such as Porto Lagos and Messolonghi, are among the wetlands, which most publications refer to. Mountainous habitats especially those of Crete, where raptors have mainly been studied, are the second most popular for ornithologists in Greece, followed by forests such as those in Dadia and Lesvos where raptors and passerines have particularly been studied. Research on marine-coastal habitats (mainly surveys) has increased in the last ten years and covers a large percentage in Greek bibliography. On the other hand, very few studies have been carried out on shrublands and grasslands. In addition, avifauna on farmland, an ecosystem that occupies a high proportion of Greece's total area (approximately 30%), despite its diversity, is not well studied. Only a few papers deal with birds in urban areas, especially around the historical monuments of Athens (Fig. 9).

### *Location of the studies*

The sites in Greece where studies have been carried out are mainly those with conservational importance in the regions of eastern Macedonia and Thrace, Crete, and central Macedonia. Many protected areas are located in these regions and their bird diversity is high. By contrast, Epirus, the Ionian Islands, Thessaly and the Peloponnese where the avian diversity is also high, have not been investigated and our knowledge about these regions is very limited (Fig. 10). More specifically, Crete is the most studied area (appears in at least 64 publications), followed by the Evros Delta (35), Prespa (24), Dadia Forest (23), the Axios Delta (22), the Cyclades islands in the Aegean Sea (21), the Porto Lagos lagoon-lake Vistonida (21) and lake Kerkini (18).

### *Who studies birds in Greece?*

At least 505 authors appear in publications related to birds in Greece. A percentage of 39.8% (201 names) are Greeks and the rest are foreigners. However, Greek authors appear in more publications indicating that there is a continuous investment by Greek ornithologists. Most of the names appear in one or two publications. At least 54 authors appear more than five times and only 24 appear over ten times. In both cases, most of the authors are Greeks accounting for 66.7% and 66.6%, respectively.

## DISCUSSION

Without any doubt, there has been a spectacular increase in knowledge regarding birds in Greece during

the last 26 years. Both the country's economic growth and technical development have contributed considerably. Additionally, funds that became available after Greece joined the European Union in 1980, have also greatly contributed to the research of many, especially endangered, species as well as to the conservation of protected areas. The results of many of these projects have been published, while a body of important information still remains unpublished in reports.

The number of people engaged in ornithological research has increased considerably, in relation to the period before 1980, and the trend seems to be positive thanks to the three Schools of Biology in three major Greek Universities (Athens, Thessaloniki and Patras), the School of Forestry and Environment of the Aristotle University and the School of Environmental Studies of the Aegean University. Ornithology is a part of their educational program and research projects on ornithology are widely available to students (Goutner, 2004). The first doctoral dissertation on birds was published at the Aristotle University of Thessaloniki and was carried out on waders in the Evros Delta (Goutner, 1983). This was the primary thesis and it set an example for the many others that followed a few years later. At the School of Biology of the Aristotle University, a group of biology students established a very active and promising core of scientific research in ornithology in Greece. However, not only experienced ornithologists, but also many amateurs have greatly contributed to spreading the idea of protecting birds and their habitats, as well as emphasising the necessity for study and research. In this, the various ornithological organizations have played a crucial role and the voluntary team of the Hellenic Ornithological Society in Thessaloniki was not only one of the first but also the most active, especially in the late 1980s-early 1990s. Its varied activities included raising public awareness by publishing its own newsletter.

During the 1990s and particularly after the year 2000, although publications did not increase greatly in number in comparison with the 1980s, they did, however, improve in quality as the number of articles published in international journals of the Science Citation Index grew. On the other hand, there has been an increase in the number of doctoral and M.Sc. dissertations, most of which (26 or 59.1%) have been published within the last six years. Furthermore, the number of publications in proceedings has likewise risen in the last 15 years indicating that ornithologists

in Greece began to participate in international conferences and also, more conferences of international or national interest were being held in Greece. With regard to books, the findings of many of the species and population surveys carried out throughout the country were summarized in the publication *Important Bird Areas in Greece* (Hellenic Ornithological Society, 1994) and an updated version (Bourdakis & Varelzidou, 2000) was included in *Important Bird Areas in Europe* (Heath & Evans, 2000). Furthermore, all these data have been well recapitulated in *The Birds of Greece* (Handrinos & Akriotis, 1997) one of the 55 books published during the study period. Still missing however, is an atlas of the birds of Greece which describes the status, distribution and population estimates of every bird species which breeds, winters or is even year-round in Greece. This would be a major work of great importance especially from the conservation and scientific points of view. Needless to say the production of such an atlas is extremely time-consuming and requires a lot of field and office work by many ornithologists and volunteers. This is probably the reason that it has not yet appeared in Greece.

Regarding species, the most studied were the protected and/or endangered ones, such as *Falco eleonorae* (Wink *et al.*, 1985; Ristow & Xirouchakis, 2000), *Pelecanus crispus* and *P. onocrotalus* (Hatzilacou, 1992; Catsadorakis & Crivelli, 2001; Catsadorakis, 2002), *Gypaetus barbatus* (Xirouchakis & Nikolakakis, 2002) etc., as well as some not threatened species such as *Egretta garzetta*, *Alectoris graeca* and *Phalacrocorax carbo* (Kazantzidis, 1998; Manios, 2002; Liordos, 2004; Liordos & Goutner, 2007). However, there are many species that so far have not been studied at all. For example, there are no studies on numerous threatened waterbird species such as *Platalea leucorodia*, *Plegadis falcinellus* and marine species such as *Phalacrocorax aristotelis* and *Puffinus yelkouan*, or even raptors such as *Accipiter nisus*, *Falco subbuteo* and *F. peregrinus*. However, the field where our knowledge is very limited, with a few exceptions, is that of passerines. Another interesting component is the increasing number of publications on game species such as *Alectoris graeca*, *Coturnix coturnix* or *Phasianus colchicus* that have been studied mainly by game biologists (Vavalekas *et al.*, 1993; Tsachalidis *et al.*, 2004; Sokos & Birtsas, 2005).

Most research was carried out in protected areas, especially in those of high ornithological interest. Studies elsewhere, in non-protected areas, were scattered and mainly concerned species surveys. The

regions of Epirus, the Ionian Islands and Peloponnese seem to present little or no interest to ornithologists in Greece. The difficulty in access or even the inaccessibility of the mountainous and many of the forested areas (especially in eastern Macedonia and Thrace and along the northern borders) in relation to other habitats has meant that so far their bird life has remained unexplored. Woodland bird species and in particular passerines as well as small birds of prey in many parts of Greece have still not been investigated.

Regarding the effects of human activities on birds, apart from pesticides, chemical contamination or poisoning of certain bird species (Ristow *et al.*, 1980; Goutner & Furness, 1997; Xirouchakis *et al.*, 2000; Goutner *et al.*, 2005), no further investigation has been made so far. Thus, surprisingly, there is limited information about the impact of hunting (legal or otherwise), the second most important threat for birds in Europe according to Tucker & Heath (1994). Furthermore, bird trapping, a traditional practice on many Aegean islands especially during the migration period, is an activity whose impact on birds is still not well known (Handrinos & Akriotis, 1997). On the other hand, data on the impact of birds on human activities and research on human-bird interaction is confined to the conflict between cormorants and fishermen in certain wetlands in northern and western Greece (Goutner *et al.*, 1997; Athanasopoulos *et al.*, 2003; Kazantzidis & Naziridis, 2003).

Two major directions in ornithology in Greece can be distinguished, both strongly related to conservation: “Species and Population Surveys” and “Biological – Ecological Research”. Additionally, although research in Greece is influenced by the European policy for the protection of wild birds, there are many initiatives regarding the study of non-priority birds and their biology or ecology.

We must consider the fact that there are still unexplored sections and many questions need to be answered concerning our knowledge on avifauna in several geographical regions and habitats in Greece. In addition, we must take into consideration that global climatic changes will also affect the Greek natural environment. In the light of the above, we must aim our research not only at bridging the gaps regarding the less studied species and habitats, but also at organizing our studies (including promoting international collaborations) in order to predict avian responses to environmental stressors so as to be ready to deal with any changes that may occur in Greek wildlife.

## ACKNOWLEDGEMENTS

I am indebted to Dr Giorgos Catsadorakis for the discussions on this issue and to Professor Vassilis Goutner and Chrissoula Athanassiou for their comments and suggestions on an earlier version. Also, I am grateful to two anonymous referees for their helpful comments.

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