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Editorial

ARDEOLA, A SCIENTIFIC JOURNAL OF ORNITHOLOGY: COOPERATIVE SURVIVORSHIP WITHIN THE RED QUEEN GAME

ARDEOLA, UNA REVISTA CIENTÍFICA DE ORNITOLOGÍA: SUPERVIVENCIA COOPERATIVA EN EL JUEGO DE LA REINA ROJA

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Summary.—*Ardeola* is the scientific journal of the Spanish Ornithological Society. We analyse historical changes in citation, topics and foreign authorship of articles published in *Ardeola* from its first publication in 1954 up to last year, 2015, to test to what extent the persistence of the journal

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during the last 61 years has been due to support of authors, Society members, readers, editors or the whole ornithological community. Analyses were done within the context of the Red Queen game played by scientific journals competing for the best and more cited articles. The impact factor of *Ardeola* has increased from 1985 onwards both in absolute and relative terms. Thematic changes have followed trends of the general ornithological literature, without the journal specialising in particular topics or geographical regions. Foreign authorship decreased from 1954 up to the end of the 20th century, subsequently increasing again, a trend fuelled by coverage by Current Contents and the JCR, the establishment of English as the language of publication and recent Internet access through the BioOne platform. *Ardeola* is a traditional scientific journal, backed by a scientific society, whose future will be guaranteed by a reputation for rigour and quality sought by authors, reviewers and editors, supported by the members of the Spanish Ornithological Society and retaining its original objective: 'to be a journal at the level of the best…, looking for a strong collaboration with foreign authors to promote the benefit of the Ornithology'.

Key words: authors, citizen science, editors, historical change, impact factor, referees, research topics, scientific societies.

RESUMEN.—*Ardeola* es la revista científica de la Sociedad Española de Ornitología (SEO/BirdLife). Analizamos los cambios históricos en citación, temática y contribución de autores extranjeros a los artículos publicados en *Ardeola* desde sus inicios en 1954 hasta el año pasado, 2015, con el objetivo de evaluar si el mantenimiento de la revista a lo largo de los últimos 61 años se ha debido al apoyo de los autores, de los miembros de SEO/BirdLife, de los lectores, de los editores de la revista, o de los ornitólogos en general. Los análisis de este mantenimiento se realizan en el contexto del juego de la reina roja en el que están implicadas las revistas científicas, que compiten por publicar los mejores artículos más citados. El factor de impacto de *Ardeola* ha aumentado desde 1985 en adelante, tanto en términos absolutos como relativos. En la actualidad es de 0,6-0,8, situándose en el tercer cuartil de las revistas de ornitología cubiertas por el Journal Citation Reports (JCR). Los cambios temáticos han seguido en general los del resto de la literatura ornitológica, sin especializarse en temas o áreas geográficas particulares. La proporción de autores extranjeros disminuyó desde 1954 hasta finales del siglo pasado, recuperándose a continuación a niveles del 30%-40%, una tendencia que sin duda se ha acelerado por la cobertura de *Ardeola* por Current Contents y el JCR, el establecimiento del inglés como idioma de publicación y el acceso reciente por Internet a través de BioOne. *Ardeola* es una revista científica clásica, sostenida por una sociedad científica, cuyo futuro será garantizado por el sello riguroso de calidad mantenido por autores, revisores y editores, y mantenido por los miembros de SEO/BirdLife con el mismo espíritu con el que fue creada in 1954: 'para ser una revista del nivel de las mejores…, buscando una intensa colaboración con autores extranjeros para promover el beneficio de la Ornitología'.

Palabras clave: autores, cambio histórico, ciencia ciudadana, editores, factor de impacto, revisores, sociedades científicas, temas de investigación.

INTRODUCTION

Scientific journals are nowadays the backbone of scientific endeavour, enabling closer scrutiny by the scientific community than conference proceedings and faster publication than scientific books (Robertson, 2009; Torre *et al*., 2014; Nguyen *et al*., 2015). The relative number of recent citations in the subset of journals giving and receiving most citations (the impact factors published yearly by the Journal of Citation Reports –JCR–; Garfield, 2007; Bollen *et al*., 2009) is the most common estimate of the scientific per-

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formance of individual scientists, journals and even institutions or countries (Eyre-Walker and Stoletzki, 2013). For this reason, authors try hard to publish in the most cited journals to increase their own citation prospects, just as journals try to attract highly-cited authors. This positive feedback between authors and journals has not been countered by evidence of biases of citation analyses for estimating research quality (Kokko and Sutherland, 1999; Leimu and Koricheva, 2005), nor by the recent development of alternative tools for citation analyses in much larger publication databases (e.g. Scopus), even those freely available on the Internet (e.g. Google Scholar), nor by the increasing availability of open access journals (Bakkalbasi *et al*., 2006; Björk *et al*., 2010).

Under these conditions, the utility, prestige and even the existence of scientific journals are subject to a Red Queen game (Van Valen, 1973), where increasing effort has to be invested just to maintain the position of a given institution or entity in a competitive environment (Barnett and Hansen, 1996). Paradoxically, the observed exponential increase in the number of scientific publications worldwide does not seem to facilitate survival within this game. Instead, it seems to have increased citation differences between top papers (and journals) and the rest (Park *et al*., 2014). Individual researchers are not the only ones who 'publish or perish'. Journals are also continually forced to improve their attractiveness to highly-cited authors to publish articles of high citation prospects. Otherwise, the positive feedback on increasing citation will become a decreasing citation feedback loop, reducing the use of the journal and eventually compromising its utility as a conveyor of significant scientific discoveries.

A way of alleviating Red Queen games is to relax competition by specialising in fields or topics that are less covered by others (Barnett and Hansen, 1996). This usually means that new journals focus on specific subtopics or geographical areas. Recent examples from within the field of ornithology are *Bird Conservation International* and *Avian Conservation Ecology*, and *Ornitología Neotropical* and *Revista Brasileira de Ornitologia*, respectively. The opposite strategy is also possible: making a journal as general as possible to attract contributions of the widest potential citation, as well as broadening the potential readership. Examples of this strategy are the name change of *Ornis Scandinavica* to become the *Journal of Avian Biology* in 1994 in order to emphasise its wide scope, or the more recent linguistic change of the *Journal für Ornithologie* to become the *Journal of Ornithology* in 2003. While specialisation of topics somewhat alleviates competition, the expansion strategy exacerbates it, so that additional marketing is usually necessary to convince authors to allocate part of their potential high-quality studies to the journal while it increases its citation prospects (e.g. Woolfenden *et al*., 1998). Such investment may come from the members of the scientific societies that support the journals, or from scientific publishing companies that are potentially interested in them.

Ardeola, the scientific journal of the Spanish Ornithological Society (SEO/BirdLife), has explored almost all these ways of surviving the Red Queen game since its first publication in 1954. This paper analyses briefly how *Ardeola* has dealt with the historical changes in Spanish and global ornithology during these 61 years, to maintain its scientific utility. Our main aim is to analyse the roles of readers, authors, referees, editors and the Society itself in achieving its persistence. We think this exercise may be useful for a better understanding and improvement of these roles. The members of the Scientific Committee of the Society have been primarily responsible for the Journal

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since 2001. The authors of this contribution, the members of that Committee during 2011-2015, would also like to take this opportunity to acknowledge the support given by authors, editorial boards, referees and non-scientific society members towards reaching the goal of maintaining *Ardeola* as a useful scientific journal. This support has been essential in Spain, a scientifically productive country whose scientific activity, however, has been weakly supported by its successive Governments (Díaz *et al*., 2001; Santamaría *et al*., 2013).

THE IMPACT FACTOR OF *ARDEOLA*

The impact factor of *Ardeola* was first analysed in 1998, for the period 1983-1996 (Carrascal and Díaz, 1998), using methodology proposed by Garfield (2007) and followed by the Institute of Scientific Information in its influential publication JCR (http://thomsonreuters.com/en/products-services/scholarly-scientific-research/research-management-and-evaluation/journal-citation-reports.html). This journal publishes yearly the impact factors (IFs) of a selection of scientific jour-

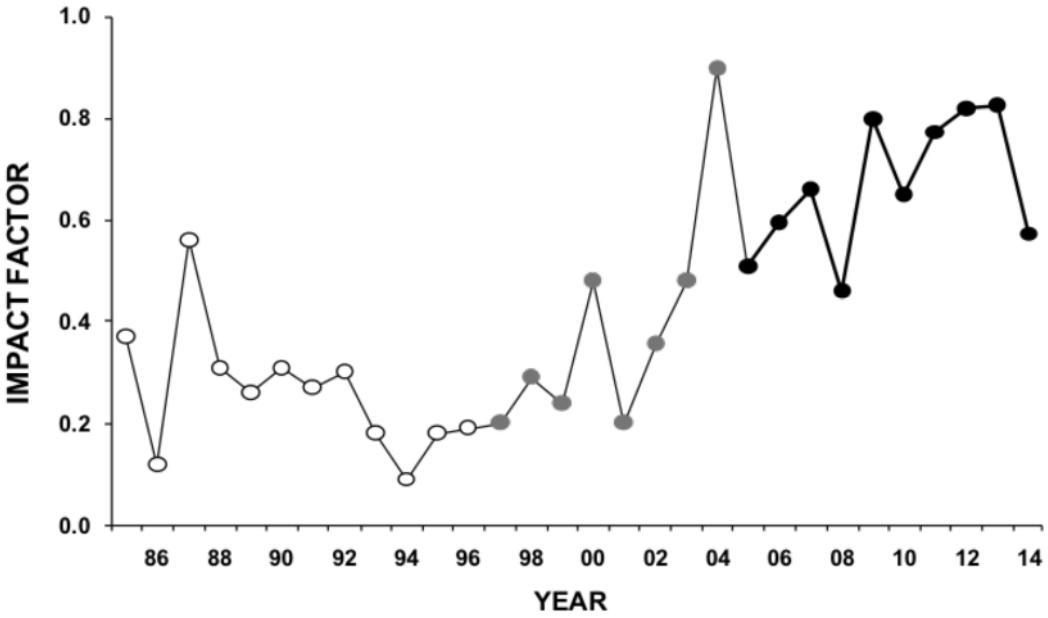


FIG. 1.—Impact factors of *Ardeola* from 1985 to 2014, computed according to Garfield (2007). Sources: white: Carrascal and Díaz (1998); black: published by the Journal Citation Reports (JCR) since its first coverage of *Ardeola* in 2005; grey: computed from data published by the Institute of Scientific Information (citations of *Ardeola* in the journal covered by the JCR) and from citations of *Ardeola* papers both within the journal itself and in papers in JCR journals. See text for details.
[Factores de impacto de Ardeola *entre 1985 y 2014, calculados siguiendo a Garfield (2007). Fuentes: blanco: Carrascal y Díaz (1998); negro: publicado por el Journal Citation Reports (JCR) desde su cobertura de* Ardeola *en 2005; gris: calculado a partir de los datos publicados por el Institute of Scientific Information (citas de* Ardeola *en las revistas cubiertas por el JCR) y de las citas de artículos publicados en* Ardeola *tanto en* Ardeola *como en las revistas cubiertas por el JCR. Véase el texto para más detalles.]*

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nals. For this, they estimate the average number of citations received by papers in the journals covered by the JCR in the two years following their publication. IFs for any given year and journal are calculated by dividing the number of current year citations by the number of items published in that journal during the previous two years (Garfield, 2007). For journals not covered by JCR, IFs can be computed by summing the citations of that journal in the journals covered by the JCR (published by the Institute of Scientific Information through its platform Web of Science) and the self-citations of the target journal, divided by the number of papers published in the corresponding time period (Carrascal and Díaz, 1998; Torre *et al*., 2014). According to this criterion, *Ardeola*

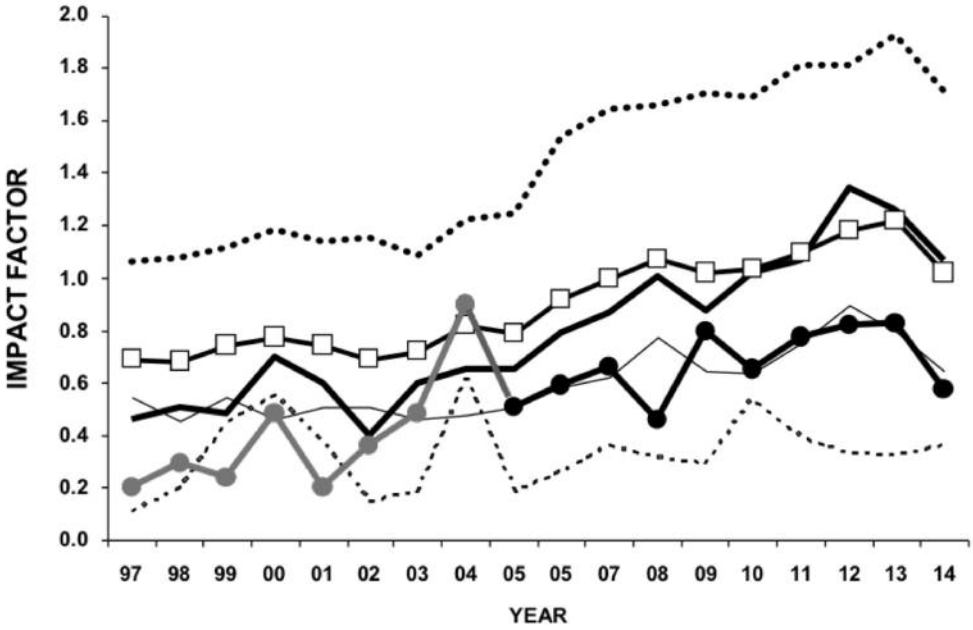


FIG. 2.—Impact factors of *Ardeola* from 1997 to 2014 (filled circles; see fig. 1) compared with the mean values of all journals covered by the category 'Ornithology' of the JCR (open squares; n = 18, excluding *Ardeola* and four journals either not covered currently –*Colonial Waterbirds*– or covered since 2010 only –*Avian Conservation Ecology*, *Revista Brasileira de Ornitologia* and *Ornithological Science*). Means according to the relative citation in 2014 are also included as a dotted line (journals with IFs in the upper quartile in 2014, Q1; n = 6 journals), a continuous thick line (Q2, n = 3), a continuous thin line (Q3, n = 5), and a dashed line (Q4, n = 3). Source: Journal Citation Reports, 2014 edition.
[Factores de impacto de Ardeola *entre 1997 y 2014 (círculos rellenos; véase la fig. 1) en comparación con los valores medios para todas las revistas incluidas en la categoría 'Ornithology' del JCR (recuadros vacíos; n = 18, excluyendo* Ardeola *y cinco revistas más, desparecidas en la actualidad* –Colonial Waterbirds– *o incluidas sólo desde 2010* –Avian Conservation Ecology, Revista Brasileira de Ornitologia *y* Ornithological Science*). Las medias de grupos de revistas según su citación relativa en 2014 también se incluyen como una línea de puntos (revistas con factores de impacto en el primer cuartil, Q1, en 2014; n = 6 revistas), una línea gruesa continua (Q2, n = 3), una línea continua fina (Q3, n = 5) y una línea discontinua (Q4, n = 3). Fuente:* Journal Citation Reports*, edición de 2014.]*

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has improved its performance since 1985 (r_{30} = 0.720, p << 0.00001; fig. 1), from 0.1-0.3 citations per article in the two years following publication in the late 1980s-early 1990s to the current 0.6-0.8 citations.

The number of citations obviously depends on the number of journals and papers published per year, and hence it varies widely between different scientific fields (Althouse *et al*., 2009). Hence, journals are classified according to general subject categories to enable a proper within-category comparison. *Ardeola* is classified within the Ornithology category in the JCR, which currently covers 22 journals. The mean IFs of ornithological journals covered by the JCR have steadily increased since 1997 (r_{18} = 0.921, p << 0.00001; fig. 2), and *Ardeola* has followed this trend in the same period (r_{18} = 0.770, p = 0.0002). Until its official acceptance for coverage by the JCR in 2005, *Ardeola* IFs (as computed from data published by the Institute of Scientific Information and the reference sections of *Ardeola*) closely followed the mean values of journals with the lowest IFs (lower quartile) within ornithological journals (fig. 2). Thereafter, and up to the most recent JCR report, corresponding to 2014 (fig. 2), Ardeola's IFs have followed the trends of the third-quartile journals. Hence, *Ardeola* has improved not only its absolute but also its relative performance during the last twenty years.

Thematic change in *Ardeola* 1954-2015: specialisation or scope-widening?

Ardeola publishes papers on all aspects of ornithology, although special favouring of papers dealing with ornithology in areas of Mediterranean climate and on bird conservation was briefly attempted between 1997 and 2002, with only moderate success (Bautista and Pantoja, 2000). Barbosa and Moreno (2004) reviewed the thematic changes of *Ardeola* from 1954 to 2003 within 18 main topics. Here we update their analysis by reviewing issues up to 2015 (61 years; for methods see Barbosa and Moreno, 2004). We analysed whether the number of papers published each year on each topic has changed across successive ca. 15-year periods (1954-1969, 1970-1985, 1986-2000, and 2001-2015) by means of one-way ANOVAs (Electronic Supplementary Material, fig. S1). Studies on faunistics/biogeography, reproduction, trophic and foraging ecology, migration, habitat selection, conservation and population dynamics have dominated the publication history of *Ardeola* on average (fig. 3). It is interesting, however, that not all of these topics have changed in importance in the same direction. The number of faunistic studies has decreased significantly (fig. 3, fig. S1), passing from more than 65% of papers in 1954-1968 to barely 12.5% in 2001-2015. The opposite trend was observed for conservation studies, which were very rare from 1954 to 2000 but increased steadily from 2001 onwards (see also Bautista and Pantoja, 2000). Studies on reproduction and foraging increased until the 1986-2000 period, but decreased afterwards, whereas the first studies on population dynamics were published in the 1970s and have since maintained a stable importance. Finally, migration has always been an important topic in *Ardeola*, with similar and high proportions of published articles across the studied period (fig. 3, fig. S1).

Bautista and Pantoja (2000) concluded that these trends paralleled the general trends of ornithological research worldwide for the period 1978-1998, although *Ardeola* published a larger proportion of papers dealing with predation, foraging and habitat selection, and fewer papers on conservation and behaviour when compared to the entire ornithological literature during that period. It is worth mentioning that although topics defined by Bautista and Pantoja (2000),

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Barbosa and Moreno (2004) and this study do not fully correspond, most articles can be assigned to roughly equivalent topics (Electronic Supplementary Material, table S1) and such differences should not have influenced the comparisons below.

We then applied the key-word searching protocols of Bautista and Pantoja (2000) to Web of Knowledge databases, to quantify the relative publication effort in ornithology, with respect to the topics and periods considered here (table S1). Behaviour, reproduction, population dynamics and foraging have been the main topics addressed by the roughly 600,000 ornithological articles published between 1954 and 2015, a pattern that is completely unrelated to the mean values for *Ardeola* in the same period (fig. 3; $r_{14} = 0.08$, $P = 0.788$). However, the change trends of the seven major topics addressed by *Ardeola* were positively correlated across 15-year time periods ($r_4 = 0.49, 0.67, 0.66, 0.78, 0.98, 0.76$ for reproduction, foraging, migration, habitat selection, conservation

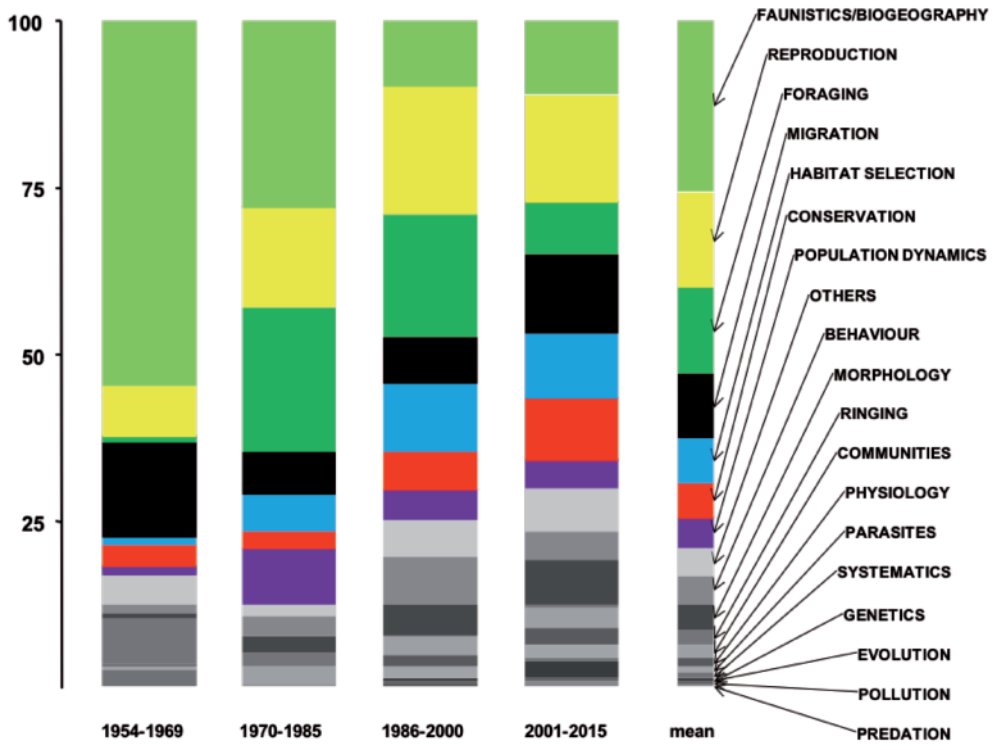


FIG. 3.—Proportion (%) of articles published in *Ardeola* from its first publication in 1954 up to 2015, according to the 18 main topics established by Barbosa and Moreno (2004). Mean values for the whole 61-year period are shown in the far-right bar, and changes in proportions according to four consecutive ca 15-year periods in the other bars. N = 1009 articles.
[Proporción (%) de artículos publicados en Ardeola *desde su origen en 1954 hasta el año pasado, 2015, según los 18 temas principales establecidos por Barbosa y Moreno (2004). Los valores medios para todo el periodo de 61 años se muestran en la barra de la derecha, y los cambios en las proporciones según cuatro periodos consecutivos de unos 15 años en las barras de la izquierda. N = 1.009 artículos.]*

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and population dynamics, respectively), with the exception of faunistic studies ($r_4 = -0.62$), which have been slightly increasing during the last 60 years in the wider ornithological literature. Overall, then, *Ardeola* has followed the major thematic adjustments within the field of ornithology, and its objective of increasing the coverage of conservation topics has been reached, in parallel with the increased consideration of this issue by ornithologists worldwide.

Authorship trends: from worldwide to national scope and backwards

Ardeola was first published as the official scientific publication of the Spanish Ornithological Society in December 1954, just a few months after the Society's foundation in May 1954 (Bernis, 1954). In spite of this national basis, many foreign ornithologists of worldwide repute published their studies on migration, faunistics, reproduction and systematics in *Ardeola* during the 1950s and early 1960s. In fact, 33% of the papers published during 1954-1969 were authored or co-authored by leading foreign ornithologists (e.g. Géroudet, 1955; Owen *et al*., 1955; Moreau, 1956; Corley-Smith and Bernis, 1956; Barnes, 1956; Murray, 1958; Sibley, 1960; fig. 4). Professor F. Bernis, the most prominent founder of the Society and its main scientific supporter until the early 1970s (Fernández, 2004), played a key role in these international contributions as he translated

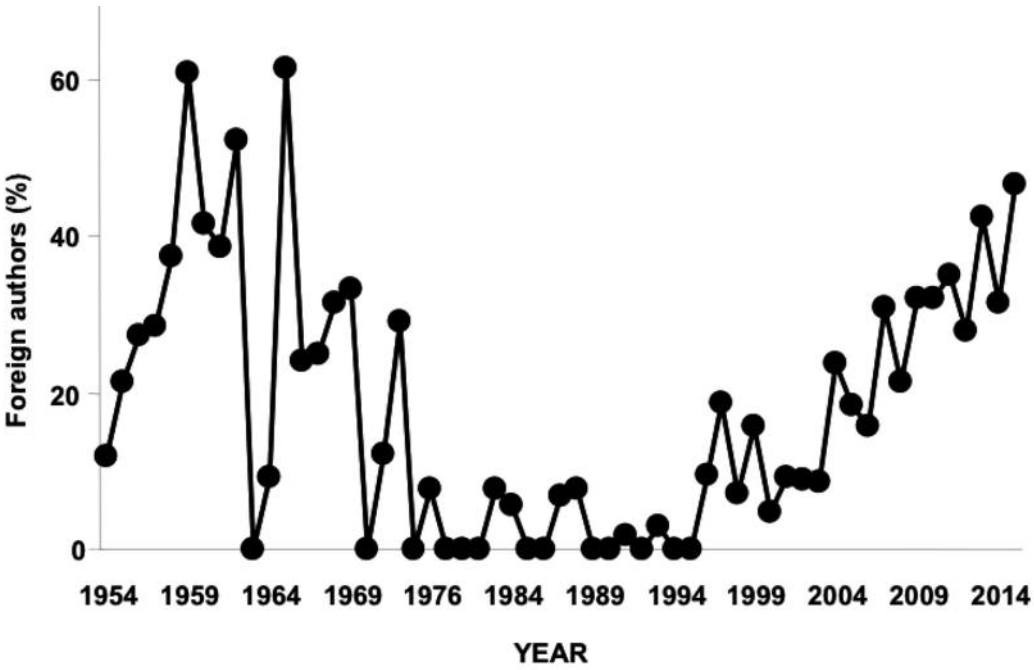


Fig. 4.—Proportion (%) of foreign authors in articles published in *Ardeola* from its first publication in 1954 up to 2015. N = 1009 articles, mean = 18 articles/year (range 4-33).
[Proporción (%) de autores extranjeros en los artículos publicados en Ardeola *desde su origen en 1954 hasta el año pasado, 2015. N = 1.009 artículos, media = 18 artículos por año (rango: 4-33).]*

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papers into Spanish in order to make these studies available to Spanish ornithologists. After those early international years, foreign authors practically disappeared as contributors to *Ardeola* (fig. 4). That trend changed post-2000 and the proportion of foreign authors publishing in *Ardeola* is nowadays similar to that in 1954-1969 (fig. 4). The coverage by Current Contents since 2003 and by the JCR since 2005, and the establishment of English as the language of publication in 2009, has surely fuelled this trend.

THE FUTURE OF *ARDEOLA*, AN INTERNATIONAL JOURNAL OF ORNITHOLOGY

It seems clear that *Ardeola* has been able to survive the Red Queen game of scientific publications. The journal ranks nowadays within the third quartile of the most cited ornithological journals worldwide, after a crisis in the 1990s when it was rated among the worst (see also Carrascal and Díaz, 1998). Survival has been due neither to thematic specialisation nor to greater use by the international scientific community. Changes in the main topics covered by *Ardeola* have been in fact similar to those covered by other ornithological journals (Bautista and Pantoja, 2000; Barbosa and Moreno, 2004). The publication in *Ardeola* of papers by foreign authors was first encouraged by the personal contacts of its first editor, F. Bernis, and more recently (post-1990) by editorial changes involving publication in English, coverage by Current Contents and the JCR and, in the last few years, Internet access through the BioOne platform. The journal did not receive financial or marketing support from Spanish governmental agencies to help attracting authors and readers, in spite of official acknowledgement of its significant scientific utility (Díaz *et al*., 2001).

The survival and performance of *Ardeola* is therefore self-sustained by the resources of Spanish ornithologists. Financial support has always been provided by the enthusiastic subscriptions of society members. Sustaining members include professional scientists and amateur ornithologists, a fact that proves that citizen science can also comprise financial support to scientific journals. Editors, from Professor F. Bernis onwards, as well as international Editorial Boards, have been keen to ensure the scientific merit of articles as well as to implement changes that have increased the journal's appeal to both Spanish and foreign authors. Rapid evaluation by high-level peers, facilitated by adopting the English language, coverage by top databases and search engines, and access to summaries and full texts via the Internet are examples of these achievements.

Finally, many Spanish authors have contributed to the performance of *Ardeola* by 'investing' part of their scientific output in the journal in the form of articles and international collaborations with high citation prospects, a fact that demonstrates the high scientific level of Spanish ornithologists and their worldwide collaborators. This issue of *Ardeola* tries to build on this solid basis by publishing eight invited review papers written by leading Spanish teams on some of the topics that are most covered by both *Ardeola* and ornithological journals worldwide. Juan Carlos Illera and coworkers (Illera *et al*., 2016) have reviewed island biogeography patterns and processes, using the birds of the Canary Islands as a key case study. Juan Moreno (Moreno, 2016) has reviewed the little understood role of non-reproductive adults (floaters) in sexual selection, and Manuel Soler (Soler, 2016) has investigated how egg rejection behaviour mediated by body size may influence the coevolution between brood parasites and their hosts. The wide-scale ecological consequences of the foraging activity of avian frugivores are reviewed by Daniel García (García, 2016) within the context of modern

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network theory, and Alejandro Martínez-Abraín and coworkers (Martínez-Abraín *et al*., 2016) have evaluated how and why the effects of long-term protection strategies on population dynamics may differ depending on species' life-history traits, using waterbirds as model systems. Conservation issues are addressed by Manuel Morales and Juan Traba, and by José Antonio Donázar and co-workers, in two conceptually complementary reviews: Morales and Traba (2016) aimed to detect priority research for the conservation of the highly-endangered steppe birds through a literature review, whereas Donázar *et al*. (2016) have focused on the ecological consequences of raptor conservation and have analysed the important role of these birds in food webs. Lastly, Pascual López (López-López, 2016) closes this non-exhaustive but highly illustrative list of 'hot' topics with his review of the opportunities opened up by the rapid technological developments for tracking individual birds.

Ardeola is a traditional scientific journal, supported by a scientific society, which has followed, in its thematic orientation, the priorities of global ornithology. Its future will be guaranteed by the scientific rigour that authors and researchers, such as those contributing here, are able to provide. An expanding list of authors and reviewers will help to sustain the journal's influence and performance within the Red Queen context described above. Editors will also play a role both by providing clear statements of the journal's policy and by developing mechanisms to ensure the prompt publication of scientifically sound manuscripts. Last, but not least, the Spanish Ornithological Society and its members should continue supporting this journal with the same spirit in which it was created in 1954: 'to be a journal at the level of the best…, looking for a strong collaboration with foreign authors to promote the benefit of the Ornithology' (Bernis, 1954).

ACKNOWLEDGEMENTS.—The general idea of this essay and the volume it introduces was agreed at the annual meeting of the Scientific Committee of SEO/BirdLife in March 2015. We deeply acknowledge the support and encouragement of Asunción Ruiz, both personally and representing the Society as a whole, as well as the excellent work of authors invited to write reviews for this special issue. Andrés Barbosa kindly provided thematic data for *Ardeola* for the period 1954-2004. Ernest Garcia revised the English.

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Supplementary Electronic Material

Additional supporting information may be found in the on-line version of this article. See volume 63(1) on www.ardeola.org.

Figure S1: Mean (±SE) number of articles per year according to the main topic, or proportion of foreign authors, for the four consecutive ca. 15-year periods into which the full 61-year publication history of *Ardeola* was divided to analyse trends.

Table S1: Number of ornithological articles published in the journals covered by the *Journal Citation Reports* (JCR) from 1954 and 2015, both overall and within the four consecutive ca 15-year periods, according to the 14 main topics that coincide in the studies by Bautista and Pantoja (2000) and Barbosa and Moreno (2004) and this study.

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