Routledge
Taylor & Francis Group

Journal of Biological Education

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rjbe20

Changing social awareness of the illegal killing of migratory birds in the Ionian Islands, western Greece

Georgios Karris , Aristotelis Martinis , Katerina Kabassi , Aggeliki Dalakiari & Malamo Korbetis

To cite this article: Georgios Karris , Aristotelis Martinis , Katerina Kabassi , Aggeliki Dalakiari & Malamo Korbetis (2020) Changing social awareness of the illegal killing of migratory birds in the Ionian Islands, western Greece, Journal of Biological Education, 54:2, 162-175, DOI: 10.1080/00219266.2018.1554597

To link to this article: https://doi.org/10.1080/00219266.2018.1554597

JOURNAL OF BIOLOGICAL EDUCATION
2020, VOL. 54, NO. 2, 162–175
https://doi.org/10.1080/00219266.2018.1554597

Routledge
Taylor & Francis Group

Changing social awareness of the illegal killing of migratory birds in the Ionian Islands, western Greece

Georgios Karris[a], Aristotelis Martinis[a], Katerina Kabassi[a], Aggeliki Dalakiari[a] and Malamo Korbetis[b,c]

[a]Department of Environment, Ionian University, Zakynthos, Greece; [b]NEEMO GEIE, Athens, Greece; [c]Hellenic Ornithological Society, Athens, Greece

ABSTRACT

The current study aims at monitoring, measuring and evaluating the 'Safe havens for wild birds' campaign, implemented within the framework of the LIFE programme, in Greece and more specifically in the Ionian Islands. The study detects attitude changes that occurred in three target groups (pupils, local hunters and residents) on three islands where the phenomenon of illegal spring killing is more intense. A questionnaire-based survey was conducted in two phases, just before the launch (2013) and after the completion of the campaign (2015), to enable a comparison of answers and data. The results show that pupils and to a lesser extent residents, enhanced their knowledge and awareness of poaching, the migration of avifauna and the consequences of illegal killing on migratory birds, while this aspect of attitude change was not observed in the hunting community which still believes that spring poaching should be treated as a legal activity and part of local culture.

KEYWORDS

Poaching; migratory birds; Mediterranean; education; awareness campaign

Introduction

The Palearctic-African migration system is characterized by huge numbers of birds travelling between Europe and Africa, twice each year (Hahn, Bauer, and Liechti, 2009). The Mediterranean Sea constitutes an extra ecological barrier that migratory birds are forced to cross after the Sahara desert crossing during their northward journey towards the breeding grounds every spring. Unfortunately, illegal shooting/trapping of migratory birds in countries across the Mediterranean increase the challenge for them and is considered as a severe threat for the viability of their populations (Brochet et al., 2016). Various techniques of poaching during bird migration are applied in different regions, based on local, social and economic parameters, along with the cultural status and the target species (Barca, Lindon, and Root-Bernstein, 2016). Islands and remote islets of the Mediterranean, which are situated along the main migratory routes, are crucial stopover sites and are used by birds for resting and refuelling. On the other hand, the significant consumption of energy required for the migration and the lack of alternative migration pathways make birds quite vulnerable and an easy target for illegal poachers. For example, the problem of poaching is quite severe on islands such as Malta, Cyprus and Sardinia along with the Ionian Islands, and constitutes a big threat for the protection of avifauna biodiversity (Gavin, Solomon, and Blank, 2010; St. John et al., 2010; Brochet et al., 2016), but also an issue with legal and ethical dimensions at local and international scale (Murgui, 2014; BirdLife International, 2015a; Veríssimo and Campbell, 2015).

CONTACT Georgios Karris gkarris@teiion.gr

The underlying causes of this illegal killing are largely related to the lack of information about the sustainability of the harvest of birds as well as of the relevant awareness among public authorities and local communities (Brochet et al., 2016). Local communities are unaware of the importance of migratory birds as a crucial part of European biodiversity and have limited access to knowledge about the relevant legislation and the detrimental effects of poaching in terms of its impact on avifauna, particularly in areas of spring passage through the eastern Mediterranean (Vickery et al., 2014). Law enforcement agencies are scarcely informed about the legal provisions of the Birds Directive 2009/147/EC and are unaware of the procedures that must be followed in order to address illegal killings of wild birds. Killing migratory birds during their prenuptial trip is illegal as is considered non-sustainable, given that it directly affects the breeding stock, which has already undergone a severe selection process during post-breeding migration and winter. Causing mass deaths in migratory birds with the highest fitness affects the recruitment process of populations and results in negative population trends. The use of traps and snares is also illegal as these methods are non-selective and cause the indiscriminate death of protected and huntable species alike. According to recent estimations, 11–36 million individual birds per annum are killed illegally in the Mediterranean region (Brochet et al., 2016). Although European legislation strictly forbids the killing and trapping of birds during the migration period, this illegal activity remains a matter of significant concern across Mediterranean regions, including the Ionian Islands (Murgui, 2014; Arizaga and Laso, 2015; Brochet et al., 2016; Barca, Lindon, and Root-Bernstein, 2016; Raine, Gauci, and Barbara, 2016; Jenkins, Mammides, and Keane, 2017).

In the Ionian region, poachers consider the spring illegal hunting of migratory birds as a culturally valued form of human-nature interaction and they believe that it has to be treated as part of their customs and a totally accepted activity with no significant detrimental effects to fauna biodiversity (HOS unpubl. data). The usual methods that local poachers follow are 'camps' and 'hunting posts' while the best poaching spots are rented out expensively between the end of March and early April. The game species of high interest during the spring migration is the Turtle Dove (*Streptopelia turtur*), a species that starts from regions under the Sahara desert and migrates towards Northern Europe (Eraud et al., 2013). Ringing data indicate a regular passage of Turtle Doves through Greek islands and islets between early April and late May and between early to late September (Schogolev and Dimaki, 1996; Dimaki and Alivizatos, 2015). The mean number of individual birds illegally killed/taken per year in Greece is about 704,000 individuals. This illegal activity is most intense in the Ionian region where, according to estimates, up to 100,000 birds are killed per year (Brochet et al., 2016).

Numerous studies have shown that social surveys constitute an essential tool for conservation strategies, not only for assessing people's behaviour and understanding the drivers of such behaviour (Nuno et al., 2013; St. John, Mai, and Pei, 2015; Whytock et al., 2018) but also for evaluating and possibly improving awareness campaigns focused on environmental issues (Staats, Wit, and Midden, 1996; Taylor et al., 2007; Kemp et al., 2017). When topics of significant conservation concern are illegal (e.g. poaching during the spring migration of birds), inferences drawn from survey data should be interpreted and used very carefully due to potential influences of non-response and social-desirability bias (Nuno and John, 2015). The current study obtained vital knowledge on the meanings attached to the practice of poaching during the spring migration in the Ionian Islands within the framework of the LIFE+ Information and Communication project 'Safe homes for the wild birds' (LIFE11INF/IT/253). Such data and knowledge is collected for the first time in Greece. The main objectives of the research were to:

- Assess people's behaviour and understand its drivers regarding spring illegal hunting of migratory birds;
- Identify and record possible changes in the attitude and behaviour of selected target groups after the public awareness campaign;
- Evaluate the role of educating and informing the local communities in tackling poaching.

Materials and methods

The LIFE11INF/IT/253 project

General information

The LIFE11 INF/IT/000253 'Safe haven for Wild Birds: changing attitudes towards illegal killing in the North Mediterranean for European biodiversity' project started on 01/08/2012 and ended on 31/10/2015. The project was implemented by the Lega Italiana Protezione Uccelli (LIPU), the Hellenic Ornithological Society (HOS), the Sociedad Española de Ornitología (SEO/BirdLife) and J. Walter Thompson Italia S.p.A. (JWT). The specific objectives of the project were to:

- Raise awareness of key stakeholder groups through a series of targeted communication tools organised into national campaigns for each one of the three involved countries, under the original title 'Leaving is Living'. The campaign targeted national audiences, the local authorities, the hunting community, the poachers/trappers and local residents along the migratory flyways of the species affected, informing them about the impacts of illegal killing.
- Change of socio-cultural attitudes towards illegal killing in the younger generation through Environmental Education (EE);
- Improve law enforcement, through increased awareness and better coordination among law enforcement authorities;
- Demonstrate, through the international campaign, the added value created by the collaboration of three countries across the Mediterranean to raise awareness of illegal killing.

The Greek national campaign

Awareness raising campaigns require effective communication strategies to achieve the desired outcome. The 'Leaving is Living' national campaign was implemented via numerous communication tools, specially designed to reach Greek audiences in the Ionian Islands (Selvaggi, 2015). The campaign in Greece consisted of three developmental phases, which engaged the audiences in a growing level of involvement: newspapers, TV and radio, followed by engagement through social networks, and finally an open public statement of support to the Greek campaign (such as wearing of the campaign pin). The results were very positive; as 1,485,157 people were informed and/or engaged in the fight against spring shooting.

Locally, the campaign was implemented through actions that included informative events and public talks, a training seminar for volunteers, summer information kiosks and wide dissemination of communication materials. The local campaign engaged the Ionian population in understanding bird migration, the threats faced by migratory birds today, as well as the international dimension of the impacts of illegal killing. 177 local people actively participated in public events, while the campaign reached out to 428,058 foreign visitors and local residents. Moreover, although not foreseen in the project proposal, a local group was established in Zakynthos that committed to the diffusion of the campaign outputs, after completion of the project.

The 'Leaving is Living' documentary was the highlight of the Greek campaign. The documentary explored the cultural roots of spring killing in Greece and gave a 'voice' to residents negatively affected by it and toured around seven national and international locations. The documentary also entered the prestigious 17th International Thessaloniki Documentary Festival competition, thus reaching an unexpectedly wide and varied audience of 648,118 people.

Investing in the younger generation, HOS produced a state-of-the-art EE Kit, which creatively guides schoolchildren through the journey and perils of migration. School teachers were trained to implement the Kit's activities in their own school environment, thus ensuring ongoing implementation following the completion of the project. 7,371 children have been educated during the implementation of the project, while the artwork produced by pupils was showcased in a 2-week mobile exhibition that toured the Ionian Islands.

Furthermore, an 'International Conference on Best Practices for Tackling Illegal Killing of Migratory Birds' was implemented, which placed Greece on the illegal killing hotspots 'radar' of national law enforcement authorities and international decision makers. The Conference produced a guidance document of Best Practices, which was circulated amongst the experts on illegal killing of the Bern Convention and the EU. In addition, the far-reaching dissemination of the campaign messages beyond the duration of this project was ensured through the installation of innovatively designed signboards on all project islands. It is believed that millions of residents and visitors to the Ionian Islands will receive these messages in the near future.

Study area

The Ionian Islands are characterized by significant ecological and environmental value, which is confirmed by the designation of 19 NATURA 2000 Sites of Community Importance and Special Protection Areas according to Directives 92/43/EC and 2009/147/EC respectively (Figure 1). This island complex hosts the National Marine Park of Zakynthos (NMPZ) and the National Park of Mountain Ainos in Kefalonia, as well as 11 Wildlife Refuges and 98 wetlands that cover a total area of 2.250 ha. The Ionian Islands lie along the eastern route of the European-African migration flyway. Consequently, remote islets such as the Strofades in the Ionian Sea constitute bottleneck sites of high importance for migratory birds every spring, and ensure their resting and refuelling (Karris et al., 2015).

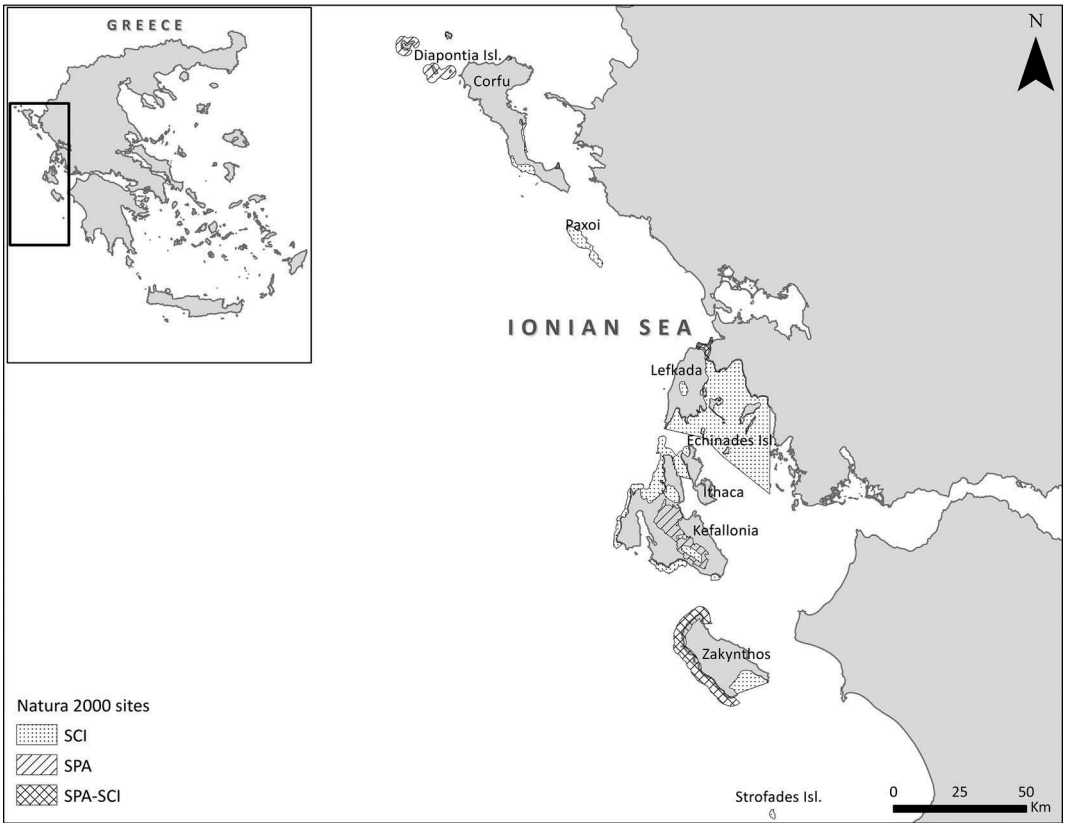

Figure 1. Study area where the questionnaire-based survey for the evaluation of the awareness campaign about illegal spring hunting in the Ionian Islands region took place. Locations of local NATURA 2000 sites are also shown.

Data collection and analysis

A questionnaire-based survey was conducted in two phases, just before the launch (01/12/2012 to 10/04/2013) and the completion of the campaign (10/07/2015 to 10/09/2015), to enable comparison of answers and data. The survey focused on Zakynthos, Corfu and Paxi as these islands are situated along a major bird migratory route and intense poaching takes place between the end of March and early May. Data were collected in collaboration with a number of public and private services in the Ionian Islands Region. The questionnaires (three versions according to each group of interest) were distributed to the main target groups of pupils, local hunters and residents claiming that they do not hunt. Prior to answering the questionnaire, the aim of the survey was fully explained to the respondents. The official agencies and organizations (TEI of Ionian Islands, Management Agency of the NMPZ, Environmental Education Center of Lithakia, local public administration authorities of primary and secondary education and HOS via information kiosks and specific events) coordinated the survey in order to gain the trust of the respondents and increase the completion rate (Levy and Lemeshow, 2008; Crandall et al., 2018). Nevertheless, the response rates were not high for all target groups ranging from 30% and 60% for local hunters and residents respectively, up to 90% for pupils. On the other hand we didn't seek to force people trying to simply raise response rates since this outcome may not offer sufficient improvement of data quality (Lessler and Kalsbeek, 1992).

Each version of the questionnaire consisted of different number of closed and open-ended questions (Table 1). They included questions addressed demographic and social data, e.g. gender, age, level of education, occupation, as well as specific questions about a) participation in EE programs, b) hunting activity, c) perceptions and knowledge that users might have about the value of the Ionian Islands for migratory birds and their conservation status, d) the need to preserve such values, e) spring poaching as a socioeconomic phenomenon and f) the risk which spring poaching and other ecological threats could pose for the conservation of migrating birds. The survey was applied on a stratified random basis and anonymity was guaranteed, in order to increase the willingness of respondents to participate in the survey. According to our sampling strategy, the population was partitioned into three non-overlapping groups of interest (pupils, hunters and residents) and a sample was selected within each stratum. The target groups were

Table 1. Type of questions (general and specific) which were included into the three different questionnaires distributed to the target groups of the survey. (√) indicates the corresponded target group per question.

	Pupils	Local hunters	Residents
General questions			
Sex	√	√	√
Level of education	√	√	√
Age	√	√	√
Occupation		√	√
Specific questions			
Former EE experience	√		
Years of hunting activity		√	
Source of hunting motivation		√	
Hunting during spring migration		√	
Participation to hunting activities	√		
Participation to hunting activities during spring migration	√		
Significance of the Ionian Islands for migratory birds	√		√
Intensity of hunting activity across the Ionian Islands	√		
Effects of hunting activity on migratory birds crossing the Ionian Islands	√		
Knowledge of the existence of national hunting regulations	√		
Level of knowledge for the conservation status of migratory birds		√	√
Bodies for receiving valid information about migratory birds		√	√
Trend of the spring migration flow of birds across the Ionian Islands		√	√
Most significant threat for the conservation of migratory birds		√	√
Contribution of hunting activity to local economy in the Ionian Islands		√	√
Participation in awareness campaigns about spring poaching		√	

further stratified in the most convenient manner by using different criteria such as the island of survey, profile characteristics (e.g. sex, age, level of education), as well as area of residence (urban or rural) in order to increase the reliability of our results.

The questionnaires of our survey were designed and mainly piloted by pupils from schools of Zakynthos Island and students or employees of TEI of Ionian Islands so as to be sure that the respondents would understand the questions in the same way, and if necessary to proceed to revisions. The structure and type of questions were the same for both phases so as to allow comparisons and evaluation of the effectiveness of the current LIFE Communication project, e.g. enhancement of knowledge relating to bird migration and detection of possible change of attitudes towards spring poaching. The data obtained from the survey were assigned to categories while the sum of the tested variables was normally distributed according to standard residual values. Statistical analysis was based on the Chi square test as an independent test for the collected data. The Monte Carlo simulation method was followed when necessary due to the limitations of the Chi square test, e.g. in some tested associations where more than 20% of the cells have an expected frequency count of less than 5%. When the Monte Carlo method was used for testing associations between different categorical variables, we set the confidence level and number of samples at 95% and 100,000 respectively. IBM SPSS statistics 20 software was used for data analysis and only tests with $P < .05$ were considered significant. Mapping of the study area was implemented using ESRI's integrated GIS system ArcGIS v 10.1.

Possible limitations

Taking into consideration the total population of the three surveyed islands (145,130 individuals according to 2011 census data of National Statistical Service of Greece) our initial plan of survey included a total sample of 600 individuals per phase. Setting the level of accuracy up to 50%, this sample would correspond to confidence level and confidence interval of 95% and 4 respectively. Unfortunately, hunters as well as residents (non-hunters) showed a high rate of unwillingness to participate to the survey. As a consequence the total number of participants during both phases of survey was 381 which corresponded to a wider confidence interval (6.81–7.42) for the given confidence level and level of accuracy.

Results

Pupils

A total of 201 pupils participated in the survey (Table 2). Genders were almost equally represented (54.2% boys and 45.8% girls) during both phases of the survey. The questionnaires were completed by secondary education pupils mainly (175 inds; 87.0%) and to a lesser extent by primary education pupils (26 inds; 13.0%). The majority of the pupils were aged between 12–14 years old (134 inds; 66.7%) followed by the age classes of 15–18 (41 inds; 20.3%) and 6–11 (26 inds; 12.9% inds; 66.7%).

During the second phase of the survey, the percentage of pupils that had a former EE experience was significantly higher than the corresponding percentage of the first phase (X-squared = 10.714, df = 1, p-value <0.05). In addition, the percentage of pupils that were

Table 2. Number of participants corresponded to questionnaire-based survey per target group and sampling year.

		Pupils	Local hunters	Residents
Year	2013	118	38	51
	2015	83	23	68
Total		201	61	119

aware of the significance of the Ionian Islands for migratory birds in 2015, was found to be significantly higher than in 2013 (X-squared = 4.184, df = 1, p-value <0.05).

In 2015, the percentage of pupils who believed that hunting is an intensive activity across the Ionian Islands was significantly higher than in 2013 (X-squared = 10.401, df = 1, p-value <0.05). Furthermore, in 2015, the percentage of pupils who declared that hunting has effects on migratory birds crossing the Ionian Islands was significantly higher than in 2013 (X-squared = 4.572, df = 1, p-value <0.05). More specifically, the majority (67%) of pupils for both sampling periods said that hunting can negatively affect migratory birds. It is also worth mentioning that in 2015 the percentage of pupils who declared knowledge about the existence of a national legislation framework for the control of hunting activity was higher than in 2013, but this was not statistically significant (X-squared = 0.876, df = 1, p-value = 0.349).

Local hunters

A total of 61 hunters responded to the survey (Table 2) and all but one of the participants were males. All ages were represented whereas the majority of hunters belonged to the 26–40 years old age class (26 inds; 42.6%), followed by the age classes of 41–55 (19 inds; 31.1%), >55 (12 inds; 19.7%) and 18–25 (4 inds; 6.6%). The majority of the hunters who participated in the survey were secondary (37 inds; 60.7%) and primary level graduates (13 inds; 23.0%) while only few them were tertiary/higher education graduates (11 inds; 18.0%). The professions reported by hunters cover a wide range; from self-employed workers (26 inds; 42.6%) to public (12 inds; 19.7%) and private sector (11 inds; 18.0%) employees. The majority of surveyed hunters have been engaged in hunting for more than 10 years (45 inds; 73.8%) while the same proportion declared that family was the main source of their hunting motivation.

During both phases of the survey, the majority (48 inds; 78.7%) of the hunters argued that they have adequate to very good knowledge of the conservation status of migratory birds, including population trends, threats etc. Nevertheless, the percentage of hunters who answered that they had very good knowledge of the conservation status of migratory birds in 2015 was lower than in 2013, while the respective figure for inadequate knowledge was higher in 2015 compared to 2013. However, differences in the relevant percentages were not statistically significant (X-squared = 2.825, df = 2, p-value = 0.244). It is quite important to mention that, although a small number of hunters (13 inds; 21.3%) declared inadequate knowledge of the conservation status of migratory birds, a higher number (20 inds; 32.8%) of corresponded hunters admitted that they continue to hunt in April and May, which is a prohibited activity according to European and national legislation. Hunters also noted that the bodies that they trust primarily as sources of up-to-date and valid information on the conservation status and protection of migratory birds are the Hunting Federations (20 inds; 35.7%), Forestry Services (15 inds; 26.8%), and to a lesser extent the Institutions of Higher Education (8 inds; 14.3%), environmental Non-Governmental Organizations-eNGOs (7 inds; 12.5%) and the Ministry of Environment, Energy and Climate Change (6 inds; 10.7%). This preference remained stable between the two phases of our survey (X-squared = 0.954, df = 4, p-value = 0.917).

In general, the majority of hunters (54 inds; 88.5%) noted that they have observed a significant decrease in the spring migration flow across the Ionian Islands during the last decades. According to hunters, the threats for the conservation of migratory birds listed in order of importance are: a) the use of insecticides-pesticides (13 inds; 21.3%); b) changes in land use and, as a consequence, habitat availability (11 inds; 18.0%); c) poaching (11 inds; 18.0%); d) climate change (11 inds; 18.0%); e) the use of poisoned baits for controlling harmful species (10 inds; 16.4%); and f) other threats (5 inds; 8.2%). Based on the Monte Carlo simulation method, the opinion of hunters opinion as regards the main challenges for migratory have not changed significantly between the two survey phases (X-squared = 0.991, df = 5, p-value = 0.966). Additionally, during the first phase of the survey, the majority of hunters (23 inds; 62.2%) argued that hunting boosts the local

economy. The second phase of the survey revealed that this opinion has changed significantly; only a minority of hunters (3 inds; 13.0%) had the same opinion about the economic benefits of poaching for the local community (X-squared = 13.935, df = 1, p-value <0.05). It is also worthwhile mentioning that the participation of hunters at awareness events about spring poaching increased during the second phase of the survey, but this trend was not significant according to the findings of the Monte Carlo method (X-squared = 3.515, df = 1, p-value = 0.061).

Residents (non-hunters)

The total of 119 residents responded to our survey (Table 2), with both sexes being represented at similar rates (44.5% and 55.5% for men and women respectively). All ages were represented. The majority of respondents were categorised in the following age classes: 26–40 (60 inds; 50.4%), 41–55 (27 inds; 22.7%), 18–25 (25 inds; 21.0%) and >55 (6 inds; 5.9%). The majority of residents who participated in the survey were higher education graduates (72 inds; 60.5%), followed by secondary education (41 inds; 34.5%) and primary education (6 inds; 5.0%). As regards occupation, the respondents were categorised into self-employed workers (34 inds; 28.8%), private sector employees (31 inds; 26.3%) and public sector employees (22 inds; 18.6%).

The majority of residents (103 inds; 86.6%) stated that they are aware of the importance of the Ionian Islands region for bird migration, while the corresponding percentage in the second phase of the survey appears to be higher than in the first phase but not statistically significant (X-squared = 1.354, df = 1, p-value = 0.245). Unlike the hunters, the majority of residents (74 inds; 62.2%) noted that their knowledge of the status of migratory species is inadequate; this did not change in the second phase (X-squared = 0.095, df = 2, p-value = 0.953). Additionally, residents also noted that the bodies that they trust primarily as sources of up-to-date and valid information on the conservation status and protection of migratory birds are eNGOs (38 inds; 34.2%), Forestry Services (22 inds; 19.8%) and Institutions of Higher Education (22 inds; 19.8%) and to a lesser extent the Ministry of Environment, Energy and Climate Change (15 inds; 13.5%) and the Hunting Federations (14 inds; 12.6%). This preference remained stable between the two phases of our survey (X-squared = 1.835, df = 4, p-value = 0.766).

As in the case of hunters, the majority of residents (81 inds; 68.1%) noted that they have observed a significant decrease in the spring migration flow across the Ionian Islands during the last decades. According to residents, the threats for the conservation of migratory birds listed in order of importance are: a) poaching (27 inds; 22.7%), b) changes in land use (21 inds; 17.6%), c) intensive use of insecticides and pesticides (21 inds; 17.6%), d) the use of poisoned baits (21 inds; 17.6%), e) climate change (20 inds; 16.8%) and f) other threats (9 inds; 7.6%). This opinion of residents as regards the main challenges for migratory birds has not changed significantly between the two survey phases (X-squared = 0.874, df = 5, p-value = 0.972). Additionally, during the first phase of the survey, the majority of residents (40 inds; 87.0%) argued that hunting does not support the local economy. The second phase of the survey revealed that this opinion which is in sharp contrast to the dominant respective response of hunters at the same time, was enhanced but not significantly (X-squared = 0.443, df = 1, p-value = 0.506).

Discussion

Pupils

The evaluation of the LIFE public awareness campaign shows that the project campaign influenced the perceptions of pupils about the illegal killing of migratory birds. The strong positive impact that formal or non-formal EE may have on student attitudes and their subsequent behaviour as citizens, regarding environmental issues, has been shown in a recent study carried out in Zakynthos by Martinis et al. (2018). It is evident that at the time of completion of the

campaign, pupils have significantly strengthened a) their perception that hunting constitutes an intensive activity across the Ionian Islands, b) their view that poaching has negative impacts on migratory birds, c) their knowledge of the importance of the Ionian Islands region for bird migration, and d) their participation in EE programs. These results, combined with increased knowledge of the legislative framework governing hunting, constitute a good omen as regards the achievement of a long-term lasting responsible attitude of future generations towards spring poaching.

According to Jenkins and Pell (2006), by strengthening participation in EE activities, pupils will have access to further relevant information and this will encourage them to take action for the protection and sustainable management of the natural environment as a common good. Moreover, increased EE experience appears to have a positive impact on the willingness of pupils to discuss environmental issues with their parents and other adults in the community, as pointed out by other studies (Ballantyne, Fien, and Packer, 2001; Martinis et al., 2018). The implementation of specific EE activities within the framework of the 'Leaving is Living' national campaign for targeted parents may be fruitful to elaborate effectively this 'at home' education process for spring illegal hunting.

Additionally, the survey conducted among pupils revealed a marked difference between their attitude and behaviour regarding spring poaching. Although the majority of pupils argued that hunting activity can negatively affect migratory birds, 36% (82 inds) of the respondents who were all boys, declared that they have participated in hunting activities. It is also interesting to note that a significant proportion of them (38 inds; 46.3%) mentioned that they have participated in poaching, which takes place during the spring migration. Several relevant studies have pointed out that the participation of boys in such activities embed means of transmitting masculine values between generations (Bell, Hampshire, and Topalidou, 2007; Jenkins, Mammides, and Keane, 2017). In our view, the willingness to answer such a sensitive question positively may be explained by the fact that pupils in general, perceive spring poaching as a local tradition and an alternative recreational pursuit and not as an illegal activity. Consequently, we suggest that future EE programmes for pupils about spring illegal hunting should focus on attitudes, as argued by Eilam and Trop (2012).

Local hunters

Illegal killing has deep social and cultural roots and its meanings constitute a complicated and difficult task (Bell, Hampshire, and Topalidou, 2007; Challender and MacMillan, 2014). According to Muth and Bowe (1998), in many societies poaching is part of local culture and is linked to tradition, national heritage and other socio-cultural factors. Poaching during the spring migration in the Ionian Islands and especially in Zakynthos and Paxoi Islands constitutes such an example. In accordance with the findings of relevant studies (Bell, Hampshire, and Topalidou, 2007; Jenkins, Mammides, and Keane, 2017), it is motivated predominately by family and thus poaching cannot be understood only as an individual action but has to be explained as a local social phenomenon. Despite the fact that local hunters declared full knowledge of the national legislation on hunting, 33% of them admitted to being involved in illegal shooting activities during the spring months. These poachers insist on the right to shoot during the spring migration by invoking a traditional value of this illegal activity and thus, ignore the clear scientific evidence that shows a significant decreasing population trend for the Turtle Dove during the last decades (Birdlife International, 2015b). They also argue that spring poaching is a less significant threat for migratory species such as Turtle Dove even if they are aware of the dramatic decrease in spring migration flows across the Ionian Islands compared to the relevant observations of the 1980s. This perception may be explained by the fact that local illegal hunters do not consider the tradition of poaching as harmful for bird populations, as shown by Jenkins, Mammides, and Keane (2017) in Cyprus.

Illegal killing/trapping may offer additional sources of income for local communities, thus encouraging poaching despite the general awareness of the illegality of this activity and the respective consequences for wildlife (Fernandes-Ferreira et al., 2011; Nuno et al., 2013; Jenkins, Mammides, and Keane, 2017). Our results also suggest that economic profit from short-term rental of suitable hunting posts, accommodation for foreign poachers and trade in equipment, including hunting dogs, constitute an additional motivation for spring poaching. As mentioned by a poacher: 'For a couple of old people it is of vital importance to rent private non-cultivated shrub land as spring hunting posts to poachers. They can earn up to 10,000 € for just three weeks and this is significant nowadays considering their low pensions.' Nevertheless, a significant change in the views of the local hunting community as regards the positive effect of spring poaching on the local economy was detected after the awareness campaign. Besides the effectiveness of the awareness campaign regarding intensive wardening of protected areas for birds in the Ionian islands, it is assumed that the enormous strength of the tourism industry during the last 2–3 years and the lengthening of the tourism season to spring months, may drive this change in perceptions.

Private consumption of illegally killed Turtle Doves in the Ionian Islands during the spring migration was the main motivation in the past. This non-monetary motivation was very strong in the past while the distribution of shot Turtle Doves to relatives and friends was considered an opportunity to strengthen human relationships. Currently, however, our findings show that this motivation is weak and that poachers are more interested in the trophy and in shooting high numbers. For example, a hunter in Zakynthos noted that 'Nowadays, spring poaching is an expensive sport and is mainly used as a tool to express an individual's or a family's economic and social status in relation to others, so poachers are trying to compete with each other by spending a lot of money to buy the most effective, or sometimes even crude and unfair hunting equipment, and to rent the best hunting posts in order to kill greater numbers of birds. Then you can be proud of your performance as a hunter and you can gain reputation among friends and colleagues who share the passion for the game.' This behaviour of poachers is quite worrying and besides enforcement of anti-poaching measures it is of vital importance for the hunting community to enhance compliance with the relevant legislation amongst their members, as suggested for Malta (Veríssimo and Campbell, 2015).

According to our results, hunters trust the Hunting Federations mainly as regards updated and valid information about the conservation status and protection of migratory birds, and to a lesser extent eNGOs. This fact reveals the ongoing conflict between the hunting and poaching community and conservationists, and has been recorded in other Mediterranean countries suffering from illegal killing/trapping of migratory birds (Campbell and Veríssimo, 2014; Barca, Lindon, and Root-Bernstein, 2016, Jenkins, Mammides, and Keane, 2017). On the other hand, the enthusiastic involvement of hunters in public debates that have taken place under the LIFE programme for spring poaching and their increased participation in relevant awareness events coordinated by an eNGO (HOS), is assessed as a positive change of attitude.

Residents (non-hunters)

Irrespective of their level of education, local inhabitants are quite aware of the ecological significance of the Ionian Islands for birds migrating between European breeding sites and African wintering areas. Despite the fact that the spring migration of avifauna constitutes an ecological symbol for the local community, deeper knowledge of this phenomenon is required. For instance, only a minority of residents (14 inds; 11.8%) declared very good knowledge of the status of migratory species even though an extensive relevant awareness raising campaign was implemented targeting them. On the other hand, after the completion of our survey, the respondents showed general willingness to receive more information about the conservation status (e.g. distribution patterns, population trends, threats) of migratory avifauna. We assumed that this lack of deeper knowledge may be attributed to the high rate of regional uncontrolled

poaching activities during spring (e.g. the case of Zakynthos Island), which practically deters other recreational pursuits such as hiking, bird watching, biking and horseback riding. Consequently, the discouragement to perform alternative wild nature expeditions in important areas of natural heritage during spring migration flow could not promote any need for further knowledge on relevant environmental issues (Ormsby, 2008; Martinis et al., 2018).

In contrast with hunters, local non-hunters trust mainly eNGOs and in a lesser extent other Bodies for receiving update information about the conservation status and protection of migratory birds. According to Blood (2005), this can be attributed to the internal organisation, diversity, brand building and internationalism that NGOs have developed after the Second World War. As a result, eNGOs obtained specific capabilities with which they have achieved greater public influence, awareness and trust by competing more effectively or even displacing traditional political and national institutions. In addition, residents and more specifically those of higher education, valued scientific knowledge as a prerequisite for conservation management and it seems that they don't trust Hunting Federations for receiving relevant information regarding migratory birds. Perhaps this is due to the fact that hunting associations in Europe with some recent exceptions are still lack proper and valid information about the environment (Barca, Lindon, and Root-Bernstein, 2016).

Contrary to what hunters responded, poaching was identified by residents as the main threat for the conservation of migratory birds like Turtle Dove. This assertion suggests that spring illegal hunting should not be interpreted as a public symbol for the Ionian Islands and that poaching doesn't represent normal behaviour for the whole local community. Additionally, they also believe that profit gained from poaching is based only on short-term rental of private hunting posts called 'posta' and this is not actually beneficial for the economy but rather detrimental for the local tourism industry as it also indicated for illegal bushmeat hunting in Botswana (Rogan et al., 2017). Moreover, international tourists visiting Zakynthos Island are aware of the local natural heritage and show a growing interest in green tourism development in some areas of the NMPZ (Kokkali and Edwards, 2011). Consequently, it is quite possible that intensive poaching in the Ionian Islands may harm the local socio-cultural profile by taking into consideration that thousands of foreign tourists who have complete different ecological perceptions for conservation crimes, visit the Ionian Islands during spring.

It is worth mentioning that, compared to pupils, residents as well as hunters remained quite stable in their general view about poaching throughout the entire awareness campaign. Our results suggest that human beings become less susceptible to influence as they grow and that their views regarding environmental issues are difficult to change significantly. Indeed, trying to change the attitude of a targeted adult audience through awareness campaigns is a difficult task as observed for other environmental (Eilam and Trop, 2012) as well as for political and health issues (Glenn, 1980; Alwin, Cohen, and Newcomb, 1991).

Conclusions and implications for future research and teaching practice

The current study carried out an opinion survey in order to assess changes in attitudes and as regards the illegal killing of migratory birds in the Ionian Islands, using data collected before and after the 'Leaving is Living' campaign. These were collected through a questionnaire-based survey, which was conducted in collaboration with a number of public and private services in the Ionian Islands Region. The two-phase sampling survey took place in three Ionian Islands, in 2013 and 2015, and provided significant findings.

The main results of the study show that the local community in general perceives spring illegal killing as part of the normal social and cultural life of the Ionian Islands. This is also believed by male pupils. The respondents are also aware of the dramatic reduction in spring migration flows across the Ionian Islands, while the understanding of the roots for this decline varies between hunters and non-hunters. Regarding the evaluation of the public awareness campaign, differences in the level of effectiveness among selected target groups were identified. Contrary to adults (hunters and

residents), pupils were found to be more susceptible to changing their attitudes on poaching as a significant threat for the conservation of migratory birds. Nevertheless, we found that pupils perceive spring poaching as a local tradition and an alternative recreational pursuit and not as an illegal activity. For that reason we suggest that future EE programmes about illegal taking of wildlife, targeting pupils in hotspots of 'traditional' poaching, should focus on changing attitudes. It is also evident from the responses of the different target groups involved in the current study, that the issue of poaching is complex including socioeconomic drivers. As a consequence, raising awareness of pupils should be taking into account the need for a wider awareness effort targeting the entire community. In such cases, public surveys may act as a valuable tool for adapting the communication and education tools of awareness campaigns to local attitudes and awareness gaps, by taking into consideration the level of awareness among target groups.

In a relevant survey carried out during the same period, the wardens of local authorities of the Ionian Islands argued that illegal hunting during the spring migration is a common phenomenon (HOS unpubl. data). They also pointed out the need for more severe and coordinated patrolling missions in the study area, giving as a brilliant example the effective protection of Strofades, which constitute a significant stopover site and a breeding area for migratory passerines and seabirds (Schogolev and Dimaki, 1996; Karris et al., 2017). Moreover, they argued that intense wardening coupled with public awareness campaigns about spring illegal hunting have to be encouraged and enhanced in future, so as to fight against poaching.

Crandall et al. (2018) argue that socio-ecological research is becoming more widely used to achieve conservation objectives, especially on inhabited islands. Even if the current study was based on data through distributed questionnaires and the respective results have to be considered with caution, we concluded that an urgent need to assess the magnitude of poaching as a socio-economic and environmental issue in the Ionian Islands is needed. Furthermore, assessment of the significance of this threat for the conservation of migratory avifauna species constitutes a prerequisite for proposing and planning effective conservation actions to reduce the negative impact on bird populations and their habitats.

Acknowledgments

We would like to thank Myrto Aktypi-Vlachogianni, Zoi Pindoulakou and Alexandra Ntouzevic for their involvement in the distribution of questionnaires and the collection of the respective raw data in Zakynthos, Paxoi and Corfu Islands. We are very grateful to the Environmental Education Center of Lithakia and the Management Agency of the National Marine Park of Zakynthos for helping us to distribute the questionnaires to specific target groups e.g. pupils and hunters. We also thank Athina Kokkali for preparation of the map.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the European Commission's LIFE 'Environmental Governance & Information' financial instrument under the LIFE11 INF/IT/000253 '*Safe haven for Wild Birds: changing attitudes towards illegal killing in North Mediterranean for European biodiversity*' project (2012–2015).

Data availability statement

The data supporting the results or analyses presented in the paper can be found in the Department of Environment, Ionian University (contact person: Georgios Karris)

ORCID

Georgios Karris http://orcid.org/0000-0001-5264-8026

References

Alwin, D. F., R. L. Cohen, and T. M. Newcomb. 1991. *Political Attitudes over the Lifespan: The Bennington Women after Fifty Years*. Madison, WI, USA: University of Wisconsin Press.

Arizaga, J., and M. Laso. 2015. "A Quantification of Illegal Hunting of Birds in Gipuzkoa (North of Spain)." *European Journal of Wildlife Research* 61 (5): 795–799. doi:10.1007/s10344-015-0940-6.

Ballantyne, R., J. Fien, and J. Packer. 2001. "School Environmental Education Programme Impacts upon Student and Family Learning: A Case Study Analysis." *Environmental Education Research* 7 (1): 23–37. doi:10.1080/13504620124123.

Barca, B., A. Lindon, and M. Root-Bernstein. 2016. "Environmentalism in the Crosshairs: Perspectives on Migratory Bird Hunting and Poaching Conflicts in Italy." *Global Ecology and Conservation* 6: 189–207. doi:10.1016/j.gecco.2016.03.001.

Bell, S., K. Hampshire, and S. Topalidou. 2007. "The Political Culture of Poaching: A Case Study from Northern Greece." *Biodiversity and Conservation* 16 (2): 399–418. doi:10.1007/s10531-005-3371-y.

Birdlife International. 2015a. *Assessing the Scope and Scale of Illegal Killing and Taking of Birds in the Mediterranean, and Establishing a Basis for Systematic Monitoring*. Cambridge, UK: BirdLife International.

Birdlife International. 2015b. *European Red List of Birds*. Luxembourg: Office for Official Publications of the European communities.

Blood, R. 2005. "Should NGOs Be Viewed as 'Political Corporations'?" *Journal of Communication Management* 9 (2): 120–133. doi:10.1108/13632540510621353.

Brochet, A.-L., W. van Den Bossche, S. Jbour, P. K. Ndang'ang'a, V. R. Jones, W. A. L. I. Abdou, A. R. Al-Hmoud, et al. 2016. "Preliminary Assessment of the Scope and Scale of Illegal Killing and Taking of Birds in the Mediterranean." *Bird Conservation International* 26 (1): 1–28. DOI:10.1017/S0959270915000416.

Campbell, B., and D. Veríssimo. 2014. "Bye, Bye, Cacopardo! Revisiting Factionalism through the Hunting Scene in Malta." *Journal of Mediterranean Studies* 23 (2): 203–223.

Challender, D. W. S., and D. C. MacMillan. 2014. "Poaching Is More than an Enforcement Problem." *Conservation Letters* 7 (5): 484–494. doi:10.1111/conl.12082.

Crandall, S. G., J. L. Ohayon, L. A. de Wit, J. E. Hammond, K. L. Melanson, M. M. Moritsch, R. Davenport, et al. 2018. "Best Practices: Social Research Methods to Inform Biological Conservation." *Australasian Journal of Environmental Management* 25 (1): 6–23. DOI:10.1080/14486563.2017.1420499.

Dimaki, M., and H. Alivizatos. 2015. "Ringing Studies of the Turtle Dove Streptopelia Turtur (Aves: Columbidae) during Passage through Antikythera Island, Southwestern Greece." *Journal of Natural History* 49 (5–8): 419–427. doi:10.1080/00222933.2013.830790.

Eilam, E., and T. Trop. 2012. "Environmental Attitudes and Environmental Behavior-Which Is the Horse and Which Is the Cart?" *Sustainability* 4 (9): 2210–2246. doi:10.3390/su4092210.

Eraud, C., M. Rivière, H. Lormée, J. W. Fox, -J.-J. Ducamp, and J.-M. Boutin. 2013. "Migration Routes and Staging Areas of trans-Saharan Turtle Doves Appraised from Light-Level Geolocators." *PloS one* 8 (3): e59396. doi:10.1371/journal.pone.0059396.

Fernandes-Ferreira, H., S. V. Mendonça, C. Albano, F. S. Ferreira, and R. R. N. Alves. 2011. "Hunting, Use and Conservation of Birds in Northeast Brazil." *Biodiversity Conservation* 21 (1): 221–244. doi:10.1007/s10531-011-0179-9.

Gavin, M. C., J. Solomon, and S. G. Blank. 2010. "Measuring and Monitoring Illegal Use of Natural Resources." *Conservation Biology* 24 (1): 89–100. doi:10.1111/cbi.2010.24.issue-1.

Glenn, J. 1980. "Freud's Advice to Han's Father: The First Supervisory Sessions." In *Freud and His Patients*, edited by M. Kanzer and J. Glenn, 121–143. New York, USA: Jason Aronson.

Hahn, S., S. Bauer, and F. Liechti. 2009. "The Natural Link between Europe and Africa: 2.1 Billion Birds on Migration." *Oikos* 118 (4): 624–626. doi:10.1111/j.1600-0706.2008.17309.x.

Jenkins, E. W., and R. G. Pell. 2006. "Me and the Environmental Challenges: A Survey of English Secondary School Students' Attitudes Towards the Environment." *International Journal of Science Education* 28 (7): 765–780. doi:10.1080/09500690500498336.

Jenkins, H. M., C. Mammides, and A. Keane. 2017. "Exploring Differences in Stakeholders' Perceptions of Illegal Bird Trapping in Cyprus." *Journal of Ethnobiology and Ethnomedicine* 13: 67. doi:10.1186/s13002-017-0194-3.

St. John, F. A. V., C.-H. Mai, and K. J.-C. Pei. 2015. "Evaluating Deterrents of Illegal Behaviour in Conservation: Carnivore Killing in Rural Taiwan." *Biological Conservation* 189: 86–94. doi:10.1016/j.biocon.2014.08.019.

Karris, G., C. Barboutis, D. Chatzidakis, S. Xirouchakis, Y. Vardanis, A. Evangelidis, C. Dimitriadis, and T. Fransson. 2015. "Arriving to Europe Extremely Lean - Spring Migration of Some Passerines at Three Small

Greek Islands." Poster presented at the 10th Conference of the European Ornithologist's Union, Badajoz, Spain, August 24–28.
Karris, G., S. Xirouchakis, C. Grivas, M.-D. Voulgaris, S. Sfenthourakis, and S. Giokas. 2017. "Estimating the Population Size of Scopoli's Shearwaters (*Calonectris Diomedea*) Frequenting the Strofades Islands (Ionian Sea, Western Greece) by Raft Counts and Surveys of Breeding Pairs." *North-Western Journal of Zoology* 13 (1): 101–108.
Kemp, C., C. J. van Riper, L. Boufajreldin, W. Stewart, J. Scheunemann, and R. J. G. van Den Born. 2017. "Connecting Human-Nature Relationships to Environmental Behaviors that Minimize the Spread of Aquatic Invasive Species." *Biological Invasions* 19 (7): 2059–2074. doi:10.1007/s10530-017-1418-0.
Kokkali, A., and J. Edwards. 2011. "An Assessment of the Demand for and Supply of Tourism Experiences in the National Marine Park of Zakynthos (NMPZ)." Proceedings of the International Conference on Tourism (ICOT 2011) Tourism in an Era of Uncertainty, edited by K. Andriotis, A. Theocharous, and F. Kotsi, 356–370. Rhodes, Greece: International Association for Tourism Policy.
Lessler, J. T., and W. D. Kalsbeek. 1992. *Nonsampling Error in Surveys*. NY, USA: J. Wiley & Sons.
Levy, P. S., and S. Lemeshow. 2008. *Sampling of Populations: Methods and Applications*. 4th ed. Hoboken, NJ, USA: J. Wiley & Sons, .
Martinis, A., K. Kabassi, C. Dimitriadou, and G. Karris. 2018. "Pupils' Environmental Awareness of Natural Protected Areas: The Case of Zakynthos Island." *Applied Environmental Education & Communication* 17 (2): 106–123. doi:10.1080/1533015X.2017.1366883.
Murgui, E. 2014. "When Governments Support Poaching: A Review of the Illegal Trapping of Thrushes *Turdus* Spp. In the Parany of Comunidad Valenciana, Spain." *Bird Conservation International* 24 (2): 127–137. doi:10.1017/S095927091300052X.
Muth, R. M., and J. F. Bowe Jr. 1998. "Illegal Harvest of Renewable Natural Resources in North America: Toward a Typology of the Motivations for Poaching." *Society & Natural Resources* 11 (1): 9–24. doi:10.1080/08941929809381058.
Nuno, A., M. Bunnefeld, L. C. Naiman, and E. J. Milner-Gullard. 2013. "A Novel Approach to Assessing the Prevalence and Drivers of Illegal Bushmeat Hunting in the Serengeti." *Conservation Biology* 27 (6): 1355–1365. doi:10.1111/cobi.12064.
Nuno, A., and F. A. V. S. John. 2015. "How to Ask Sensitive Questions in Conservation: A Review of Specialized Questioning Techniques." *Biological Conservation* 189: 5–15. doi:10.1016/j.biocon.2014.09.047.
Ormsby, A. 2008. "Development of Environmental Education Programs for Protected Areas in Madagascar." *Applied Environmental Education & Communication* 6 (3–4): 223–232. doi:10.1080/15330150801944515.
Raine, A. F., M. Gauci, and N. Barbara. 2016. "Illegal Bird Hunting in the Maltese Islands: An International Perspective." *Oryx* 50 (4): 597–605. doi:10.1017/S0030605315000447.
Rogan, M. S., P. A. Lindsey, C. J. Tambling, K. A. Golabek, M. J. Chase, K. Collins, and J. W. McNutt. 2017. "Illegal Bushmeat Hunters Compete with Predators and Threaten Wild Herbivore Populations in a Global Tourism Hotspot." *Biological Conservation* 210: 233–242. doi:10.1016/j.biocon.2017.04.020.
Schogolev, I., and M. Dimaki. 1996. "Bird Migration in the Spring at Strophades Islands (Ionian Sea, Greece)." *The Ring* 18 (1–2): 89–96.
Selvaggi, D. 2015. *Safe Haven for Wild Birds: A Safe Haven for Wild Birds: Changing Attitudes Towards Illegal Killing in North Mediterranean for European Biodiversity*. Final report of the EU LIFE project number LIFE11 INF/IT/000253, LIPU Lega Italiana Protezione Uccelli Onlus.
St. John, F. A. V., G. Edwards-Jones, J. M. Gibbons, and J. P. G. Jones. 2010. "Testing Novel Methods for Assessing Rule Breaking in Conservation." *Biological Conservation* 143 (4): 1025–1030. doi:10.1016/j.biocon.2010.01.018.
Staats, H. J., A. P. Wit, and C. Y. H. Midden. 1996. "Communicating the Greenhouse Effect to the Public: Evaluation of a Mass Media Campaign from a Social Dilemma Perspective." *Journal of Environmental Management* 46 (2): 189–203. doi:10.1006/jema.1996.0015.
Taylor, A., R. Curnow, T. Fletcher, and J. Lewis. 2007. "Education Campaigns to Reduce Stormwater Pollution in Commercial Areas: Do They Work?" *Journal of Environmental Management* 84 (3): 323–335. doi:10.1016/j.jenvman.2006.06.002.
Veríssimo, D., and B. Campbell. 2015. "Understanding Stakeholder Conflict between Conservation and Hunting in Malta." *Biological Conservation* 191: 812–818. doi:10.1016/j.biocon.2015.07.018.
Vickery, J. A., S. R. Ewing, K. W. Smith, D. J. Pain, F. Bairlein, J. Skorpilova, and R. D. Gregory. 2014. "The Decline of Afro-Palaearctic Migrants and an Assessment of Potential Causes." *Ibis* 156: 1–22. doi:10.1111/ibi.12118.
Whytock, R. C., B. J. Morgan, T. Awa II, Z. Bekokon, E. A. Abwe, R. Buij, M. Virani, J. A. Vickery, and N. Bunnefeld. 2018. "Quantifying the Scale and Socioeconomic Drivers of Bird Hunting in Central African Forest Communities." *Biological Conservation* 218: 18–25. doi:10.1016/j.biocon.2017.11.034.