



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

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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

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3 target species (Barca, Lindon, and Root-Bernstein 2016). Islands and remote islets of
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5 the Mediterranean, which are situated along the main migratory routes, are crucial
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7 stopover sites and are used by birds for resting and refuelling. On the other hand, the
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9 significant consumption of energy required for the migration and the lack of alternative
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11 migration pathways make birds quite vulnerable and an easy target for illegal poachers.
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13 For example, the problem of poaching is quite severe on islands such as Malta, Cyprus
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15 and Sardinia along with the Ionian Islands, and constitutes a big threat for the protection
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17 of avifauna biodiversity (Gavin, Solomon, and Blank 2010; St. John et al. 2010; Brochet
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19 et al. 2016), but also an issue with legal and ethical dimensions at local and international
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21 scale (Murgui 2014; BirdLife International 2015a; Veríssimo and Campbell 2015).
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24 The underlying causes of this illegal killing are largely related to the lack of
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26 awareness among public authorities and local communities. Local communities are
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28 unaware of the importance of migratory birds as a crucial part of European biodiversity
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30 and have limited access to knowledge about the relevant legislation and the detrimental
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32 effects of poaching in terms of its impact on avifauna. Law enforcement agencies are
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34 scarcely informed about the legal provisions of the Birds Directive 2009/147/EC and
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36 are unaware of the procedures that must be followed in order to address illegal killings
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38 of wild birds. Killing migratory birds during their pre-nuptial trip is illegal as is
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40 considered non-sustainable, given that it directly affects the breeding stock, which has
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42 already undergone a severe selection process during post-breeding migration and
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44 winter. Causing mass deaths in migratory birds with the highest fitness affects the
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46 recruitment process of populations and results in negative population trends. The use of
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48 traps and snares is also illegal as these methods are non-selective and cause the
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50 indiscriminate death of protected and huntable species alike. According to recent
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52 estimations, 11-36 million individual birds per annum are killed illegally in the
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3 Mediterranean region (Brochet et al. 2016). Although European legislation strictly
4 forbids the killing and trapping of birds during the migration period, this illegal activity
5 remains a matter of significant concern across Mediterranean regions, including the
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7 Ionian Islands (Murgui 2014; Arizaga and Laso 2015; Brochet et al. 2016; Barca,
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9 Lindon, and Root-Bernstein 2016; Raine, Gauci, and Barbara 2016; Jenkins,
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11 Mammides, and Keane 2017).

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16 In the Ionian region, poachers consider the spring illegal hunting of migratory
17 birds as a culturally valued form of human-nature interaction and they believe that it has
18 to be treated as part of their customs and a totally accepted activity with no significant
19 detrimental effects to fauna biodiversity. The usual methods that local poachers follow
20 are ‘camps’ and ‘hunting posts’ while the best poaching spots are rented out expensively
21 between the end of March and early April. The game species of high interest during the
22 spring migration is the Turtle Dove (*Streptopelia turtur*), a species that starts from
23 regions under the Sahara desert and migrates towards Northern Europe (Eraud et al.
24 2013). Ringing data indicate a regular passage of Turtle Doves through Greek islands
25 and islets between early April and late May and between early to late September
26 (Schogolev and Dimaki 1996; Dimaki and Alivizatos 2015). The mean number of
27 individual birds illegally killed/taken per year in Greece is about 704,000 individuals.
28 This illegal activity is most intense in the Ionian region where, according to estimates,
29 up to 100,000 birds are killed per year (Brochet et al. 2016).

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46 Numerous studies have shown that social surveys constitute an essential tool for
47 conservation strategies, not only for assessing people’s behaviour and understanding the
48 drivers of such behaviour (Nuno et al. 2013; St. John, Mai, and Pei 2015; Whytock et al.
49 2018) but also for evaluating and possibly improving awareness campaigns focused on
50 environmental issues (Staats, Wit, and Midden 1996; Taylor et al. 2007; Kemp et al.
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3 2017). When topics of significant conservation concern are illegal (e.g. poaching during
4 the spring migration of birds), inferences drawn from survey data should be interpreted
5 and used very carefully due to potential influences of non-response and social-
6 desirability bias (Nuno and St. John 2015). The current study obtained vital knowledge
7 on the meanings attached to the practice of poaching during the spring migration in the
8 Ionian Islands within the framework of the LIFE+ Information and Communication
9 project ‘Safe homes for the wild birds’ (LIFE11INF/IT/253). Such data and knowledge
10 is collected for the first time in Greece. The main objectives of the research were to:
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- 19 • assess people’s behaviour and understand its drivers regarding spring illegal
20 hunting of migratory birds;
- 21 • identify and record possible changes in the attitude and behaviour of selected
22 target groups after the public awareness campaign;
- 23 • evaluate the role of educating and informing the local communities in tackling
24 poaching.
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34 35 **Materials and methods**

36 37 *The LIFE11INF/IT/253 project*

38 39 *General information*

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42 The LIFE11 INF/IT/000253 “Safe haven for Wild Birds: changing attitudes towards
43 illegal killing in the North Mediterranean for European biodiversity” project started on
44 01/08/2012 and ended on 31/10/2015. The project was implemented by the Lega
45 Italiana Protezione Uccelli (LIPU), the Hellenic Ornithological Society (HOS), the
46 Sociedad Española de Ornitología (SEO/BirdLife) and J. Walter Thompson Italia S.p.A.
47 (JWT). The specific objectives of the project were to:
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- 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.

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3 Locally, the campaign was implemented through actions that included
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5 informative events and public talks, a training seminar for volunteers, summer
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7 information kiosks and wide dissemination of communication materials. The local
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9 campaign engaged the Ionian population in understanding bird migration, the threats
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11 faced by migratory birds today, as well as the international dimension of the impacts of
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13 illegal killing. 177 local people actively participated in public events, while the
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15 campaign reached out to 428,058 foreign visitors and local residents. Moreover,
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17 although not foreseen in the project proposal, a local group was established in
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19 Zakynthos that committed to the diffusion of the campaign outputs, after completion of
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21 the project.
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24 The 'Leaving is Living' documentary was the highlight of the Greek campaign.
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26 The documentary explored the cultural roots of spring killing in Greece and gave a
27
28 'voice' to residents negatively affected by it and toured around seven national and
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30 international locations. The documentary also entered the prestigious 17th International
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32 Thessaloniki Documentary Festival competition, thus reaching an unexpectedly wide
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34 and varied audience of 648,118 people.
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37 Investing in the younger generation, HOS produced a state-of-the-art EE Kit,
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39 which creatively guides schoolchildren through the journey and perils of migration.
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41 School teachers were trained to implement the Kit's activities in their own school
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43 environment, thus ensuring ongoing implementation following the completion of the
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45 project. 7,371 children have been educated during the implementation of the project,
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47 while the artwork produced by pupils was showcased in a 2-week mobile exhibition that
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49 toured the Ionian Islands.
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52 Furthermore, an 'International Conference on Best Practices for Tackling Illegal
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54 Killing of Migratory Birds' was implemented, which placed Greece on the illegal
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3 killing hotspots ‘radar’ of national law enforcement authorities and international
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5 decision makers. The Conference produced a guidance document of Best Practices,
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7 which was circulated amongst the experts on illegal killing of the Bern Convention and
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9 the EU. In addition, the far-reaching dissemination of the campaign messages beyond
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11 the duration of this project was ensured through the installation of innovatively
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13 designed signboards on all project islands. It is believed that millions of residents and
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15 visitors to the Ionian Islands will receive these messages in the near future.
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19 ***Study area***

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21 The Ionian Islands are characterized by significant ecological and environmental value,
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23 which is confirmed by the designation of 19 NATURA 2000 Sites of Community
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25 Importance and Special Protection Areas according to Directives 92/43/EC and
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27 2009/147/EC respectively (Figure 1). This island complex hosts the National Marine
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29 Park of Zakynthos (NMPZ) and the National Park of Mountain Ainos in Kefalonia, as
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31 well as 11 Wildlife Refuges and 98 wetlands that cover a total area of 2.250 ha. The
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33 Ionian Islands lie along the eastern route of the European-African migration flyway.
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35 Consequently, remote islets such as the Strofades in the Ionian Sea constitute bottleneck
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37 sites of high importance for migratory birds every spring, and ensure their resting and
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39 refuelling (Karris et al. 2015).
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45 ***Data collection and analysis***

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47 A questionnaire-based survey was conducted in two phases, just before the launch
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49 (01/12/2012 to 10/04/2013) and the completion of the campaign (10/07/2015 to
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51 10/09/2015), to enable comparison of answers and data. The survey focused on
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53 Zakynthos, Corfu and Paxi as these islands are situated along a major bird migratory
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55 route and intense poaching takes place between the end of March and early May. Data
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3 were collected in collaboration with a number of public and private services in the
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5 Ionian Islands Region. The questionnaires (three versions according to each group of
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7 interest) were distributed to the main target groups of pupils, local hunters and residents
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9 claiming that they do not hunt. Prior to answering the questionnaire, the aim of the
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11 survey was fully explained to the respondents. The official agencies and organizations
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13 (TEI of Ionian Islands, Management Agency of the NMPZ, Environmental Education
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15 Center of Lithakia and HOS) coordinated the survey in order to gain the trust of the
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17 respondents and increase the completion rate (Levy and Lemeshow 2008; Crandall et al.
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19 2018).

22 Each version of the questionnaire consisted of different number of closed and
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24 open-ended questions (12-19 in total). They included questions addressed demographic
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26 and social data, e.g. gender, age, level of education, occupation, as well as specific
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28 questions about a) participation in EE programs, b) perceptions and knowledge that
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30 users might have about the value of the Ionian Islands for migratory birds and their
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32 conservation status, c) the need to preserve such values, d) spring poaching as a
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34 socioeconomic phenomenon and e) the risk which spring poaching and other ecological
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36 threats could pose for the conservation of migrating birds. The survey was applied on a
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38 stratified random basis and anonymity was guaranteed, in order to increase the
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40 willingness of respondents to participate in the survey. According to our sampling
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42 strategy, we tried also to distribute questionnaires to people with different profile (e.g.
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44 people living in urban and rural areas) so as to increase the reliability of our results.
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48 The structure and type of questions were the same for both phases so as to allow
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50 comparisons and evaluation of the effectiveness of the current LIFE Communication
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52 project, e.g. enhancement of knowledge relating to bird migration and detection of
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54 possible change of attitudes towards spring poaching. The data obtained from the survey
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3 were assigned to categories while the sum of the tested variables was normally
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5 distributed according to standard residual values. Statistical analysis was based on the
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7 Chi square test as an independent test for the collected data. The Monte Carlo
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9 simulation method was followed when necessary due to the limitations of the Chi
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11 square test, e.g. in some tested associations where more than 20% of the cells have an
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13 expected frequency count of less than 5%. When the Monte Carlo method was used for
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15 testing associations between different categorical variables, we set the confidence level
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17 and number of samples at 95% and 100,000 respectively. IBM SPSS statistics 20
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19 software was used for data analysis and only tests with $P < .05$ were considered
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21 significant. Mapping of the study area was implemented using ESRI's integrated GIS
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23 system ArcGIS v 10.1.
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28 ***Possible limitations***

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

52 ***Pupils***

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

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16 During the second phase of the survey, the percentage of pupils that had a
17 former EE experience (Table 1) was significantly higher than the corresponding
18 percentage of the first phase ($X^2=10.714$, $df=1$, $p<0.05$). In addition, the
19 percentage of pupils that were aware of the significance of the Ionian Islands for
20 migratory birds in 2015 (Table 2), was found to be significantly higher than in 2013 (X^2
21 $=4.184$, $df=1$, $p<0.05$).

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29 In 2015, the percentage of pupils who believed that hunting is an intensive
30 activity across the Ionian Islands (Table 3) was significantly higher than in 2013 (X^2
31 $=10.401$, $df=1$, $p<0.05$). Furthermore, in 2015, the percentage of pupils
32 who declared that hunting has effects on migratory birds crossing the Ionian Islands
33 (Table 4) was significantly higher than in 2013 ($X^2=4.572$, $df=1$, $p<0.05$).
34 More specifically, the majority (67%) of pupils for both sampling periods said that
35 hunting can negatively affect migratory birds. It is also worth mentioning that in 2015
36 the percentage of pupils who declared knowledge about the existence of a national
37 legislation framework for the control of hunting activity (Table 5) was higher than in
38 2013, but this was not statistically significant ($X^2 = 0.876$, $df = 1$, p -
39 $value=0.349$).

Local hunters

A total of 61 hunters responded to the survey 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. (Table 6). 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 (Table 6). However, differences in the relevant percentages were not statistically significant ($X^2 = 2.825$, $df = 2$, $p\text{-value} = 0.244$). 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. As it is shown in Table 7, hunters also noted that the bodies that they trust primarily as sources

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3 of up-to-date and valid information on the conservation status and protection of
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5 migratory birds are the Hunting Federations (20 inds; 35.7%), Forestry Services (15
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7 inds; 26.8%), and to a lesser extent the Institutions of Higher Education (8 inds; 14.3%),
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9 environmental Non-Governmental Organizations-eNGOs (7 inds; 12.5%) and the
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11 Ministry of Environment, Energy and Climate Change (6 inds; 10.7%). This preference
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13 remained stable between the two phases of our survey (X-squared = 0.954, df = 4, p-
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15 value = 0.917).

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18 In general, the majority of hunters (54 inds; 88.5%) noted that they have
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20 observed a significant decrease in the spring migration flow across the Ionian Islands
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22 during the last decades. According to hunters, the threats for the conservation of
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24 migratory birds listed in order of importance are: a) the use of insecticides-pesticides
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26 (13 inds; 21.3%); b) changes in land use and, as a consequence, habitat availability (11
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28 inds; 18.0%); c) poaching (11 inds; 18.0%); d) climate change (11 inds; 18.0%); e) the
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30 use of poisoned baits for controlling harmful species (10 inds; 16.4%); and f) other
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32 threats (5 inds; 8.2%) (Table 8). Based on the Monte Carlo simulation method, the
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34 opinion of hunters opinion as regards the main challenges for migratory have not
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36 changed significantly between the two survey phases (X-squared = 0.991, df = 5, p -
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38 value = 0.966). Additionally, during the first phase of the survey, the majority of
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40 hunters (23 inds; 62.2%) argued that hunting boosts the local economy (Table 9). The
41
42 second phase of the survey revealed that this opinion has changed significantly; only a
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44 minority of hunters (3 inds; 13.0%) had the same opinion about the economic benefits
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46 of poaching for the local community (X-squared = 13.935, df = 1, p-value <0.05) (Table
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48 9). It is also worthwhile mentioning that the participation of hunters at awareness events
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50 about spring poaching increased during the second phase of the survey (Table 10), but
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3 this trend was not significant according to the findings of the Monte Carlo method (X-
4 squared = 3.515, df = 1, p-value = 0.061).
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8 9 ***Residents (non-hunters)***

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11 The total of 119 residents responded to our survey, with both sexes being represented at
12 similar rates (44.5% and 55.5% for men and women respectively). All ages were
13 represented. The majority of respondents were categorised in the following age classes:
14 26-40 (60 inds; 50.4%), 41-55 (27 inds; 22.7%), 18-25 (25 inds; 21.0%) and > 55 (6
15 inds; 5.9%). The majority of residents who participated in the survey were higher
16 education graduates (72 inds; 60.5%), followed by secondary education (41 inds;
17 34.5%) and primary education (6 inds; 5.0%). As regards occupation, the respondents
18 were categorised into self-employed workers (34 inds; 28.8%), private sector employees
19 (31 inds; 26.3%) and public sector employees (22 inds; 18.6%).
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23 The majority of residents (103 inds; 86.6%) stated that they are aware of the importance
24 of the Ionian Islands region for bird migration, while the corresponding percentage in
25 the second phase of the survey appears to be higher than in the first phase (Table 11) but
26 not statistically significant (X-squared = 1.354, df = 1, p-value = 0.245). Unlike the
27 hunters, the majority of residents (74 inds; 62.2%) noted that their knowledge of the
28 status of migratory species is inadequate; this did not change in the second phase as it is
29 shown in Table 12 (X-squared = 0.095, df = 2, p-value = 0.953). Additionally, residents
30 also noted that the bodies that they trust primarily as sources of up-to-date and valid
31 information on the conservation status and protection of migratory birds are eNGOs (38
32 inds; 34.2%), Forestry Services (22 inds; 19.8%) and Institutions of Higher Education
33 (22 inds; 19.8%) and to a lesser extent the Ministry of Environment, Energy and
34 Climate Change (15 inds; 13.5%) and the Hunting Federations (14 inds; 12.6%) (Table
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3 13). This preference remained stable between the two phases of our survey (X-squared
4 = 1.835, df = 4, p-value = 0.766).

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7 As in the case of hunters, the majority of residents (81 inds; 68.1%) noted that
8 they have observed a significant decrease in the spring migration flow across the Ionian
9 Islands during the last decades. According to residents, the threats for the conservation
10 of migratory birds listed in order of importance are: a) poaching (27 inds; 22.7%), b)
11 changes in land use (21 inds; 17.6%), c) intensive use of insecticides and pesticides (21
12 inds; 17.6%), d) the use of poisoned baits (21 inds; 17.6%), e) climate change (20 inds;
13 16.8%) and f) other threats (9 inds; 7.6%) (Table 14). This opinion of residents as
14 regards the main challenges for migratory have not changed significantly between the
15 two survey phases (X-squared = 0.874, df = 5, p-value = 0.972). Additionally, during
16 the first phase of the survey, the majority of residents (40 inds; 87.0%) argued that
17 hunting does not support the local economy (Table 15). The second phase of the survey
18 revealed that this opinion which is in sharp contrast to the dominant respective response
19 of hunters at the same time, was enhanced but not significantly (X-squared = 0.443, df =
20 1, p-value = 0.506).

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 **Discussion**

39 *Pupils*

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42 The evaluation of the LIFE public awareness campaign shows that the project campaign
43 influenced the perceptions of pupils about the illegal killing of migratory birds. The
44 strong positive impact that formal or non-formal EE may have on student attitudes and
45 their subsequent behaviour as citizens, regarding environmental issues, has been shown
46 in a recent study carried out in Zakynthos by Martinis et al. (2018). It is evident that at
47 the time of completion of the campaign, pupils have significantly strengthened a) their
48 perception that hunting constitutes an intensive activity across the Ionian Islands, b)

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3 their view that poaching has negative impacts on migratory birds, c) their knowledge of
4 the importance of the Ionian Islands region for bird migration, and d) their participation
5 in EE programs. These results, combined with increased knowledge of the legislative
6 framework governing hunting, constitute a good omen as regards the achievement of a
7 long-term lasting responsible attitude of future generations towards spring poaching.
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13 According to Jenkins and Pell (2006), by strengthening participation in EE
14 activities, pupils will have access to further relevant information and this will encourage
15 them to take action for the protection and sustainable management of the natural
16 environment as a common good. Moreover, increased EE experience appears to have a
17 positive impact on the willingness of pupils to discuss environmental issues with their
18 parents and other adults in the community, as pointed out by other studies (Ballantyne,
19 Fien, and Packer 2001; Martinis et al. 2018). The implementation of specific EE
20 activities within the framework of the 'Leaving is Living' national campaign for
21 targeted parents may be fruitful to elaborate effectively this 'at home' education process
22 for spring illegal hunting.
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35 Additionally, the survey conducted among pupils revealed a marked difference
36 between their attitude and behaviour regarding spring poaching. Although the majority
37 of pupils argued that hunting activity can negatively affect migratory birds, 36% (82
38 inds) of the respondents who were all boys, declared that they have participated in
39 hunting activities. It is also interesting to note that a significant proportion of them (38
40 inds; 46.3%) mentioned that they have participated in poaching, which takes place
41 during the spring migration. Several relevant studies have pointed out that the
42 participation of boys in such activities embed means of transmitting masculine values
43 between generations (Bell, Hampshire, and Topalidou 2007; Jenkins, Mammides, and
44 Keane 2017). In our view, the willingness to answer such a sensitive question positively
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3 may be explained by the fact that pupils in general, perceive spring poaching as a local
4 tradition and an alternative recreational pursuit and not as an illegal activity.

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7 Consequently, we suggest that future EE programmes for pupils about spring illegal
8 hunting should focus on attitudes, as argued by Eilam and Trop (2012).
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11 12 13 ***Local hunters***

14
15 Illegal killing has deep social and cultural roots and its meanings constitute a
16 complicated and difficult task (Bell, Hampshire, and Topalidou 2007; Challender and
17 MacMillan 2014). According to Muth and Bowe (1998), in many societies poaching is
18 part of local culture and is linked to tradition, national heritage and other socio-cultural
19 factors. Poaching during the spring migration in the Ionian Islands and especially in
20 Zakynthos and Paxoi Islands constitutes such an example. In accordance with the
21 findings of relevant studies (Bell, Hampshire, and Topalidou 2007; Jenkins, Mammides,
22 and Keane 2017), it is motivated predominately by family and thus poaching cannot be
23 understood only as an individual action but has to be explained as a local social
24 phenomenon. Despite the fact that local hunters declared full knowledge of the national
25 legislation on hunting, 33% of them admitted to being involved in illegal shooting
26 activities during the spring months. These poachers insist on the right to shoot during
27 the spring migration by invoking a traditional value of this illegal activity and thus,
28 ignore the clear scientific evidence that shows a significant decreasing population trend
29 for the Turtle Dove during the last decades (BirdLife International 2015b). They also
30 argue that spring poaching is a less significant threat for migratory species such as
31 Turtle Dove even if they are aware of the dramatic decrease in spring migration flows
32 across the Ionian Islands compared to the relevant observations of the 1980s. This
33 perception may be explained by the fact that local illegal hunters do not consider the
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3 tradition of poaching as harmful for bird populations, as shown by Jenkins, Mammides,
4
5 and Keane (2017) in Cyprus.

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7 Illegal killing/trapping may offer additional sources of income for local
8
9 communities, thus encouraging poaching despite the general awareness of the illegality
10
11 of this activity and the respective consequences for wildlife (Fernandes-Ferreira et al.
12
13 2011; Nuno et al. 2013; Jenkins, Mammides, and Keane 2017). Our results also suggest
14
15 that economic profit from short-term rental of suitable hunting posts, accommodation
16
17 for foreign poachers and trade in equipment, including hunting dogs, constitute an
18
19 additional motivation for spring poaching. As mentioned by a poacher: 'For a couple of
20
21 old people it is of vital importance to rent private non-cultivated shrub land as spring
22
23 hunting posts to poachers. They can earn up to 10,000 € for just three weeks and this is
24
25 significant nowadays considering their low pensions.' Nevertheless, a significant change
26
27 in the views of the local hunting community as regards the positive effect of spring
28
29 poaching on the local economy was detected after the awareness campaign. Besides the
30
31 effectiveness of the awareness campaign regarding intensive wardening of protected
32
33 areas for birds in the Ionian islands, it is assumed that the enormous strength of the
34
35 tourism industry during the last 2-3 years and the lengthening of the tourism season to
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37 spring months, may drive this change in perceptions.
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41 Private consumption of illegally killed Turtle Doves in the Ionian Islands during
42
43 the spring migration was the main motivation in the past. This non-monetary motivation
44
45 was very strong in the past while the distribution of shot Turtle Doves to relatives and
46
47 friends was considered an opportunity to strengthen human relationships.

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50 Currently, however, our findings show that this motivation is weak and that poachers
51
52 are more interested in the trophy and in shooting high numbers. For example, a hunter
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54 in Zakynthos noted that 'Nowadays, spring poaching is an expensive sport and is
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3 mainly used as a tool to express an individual's or a family's economic and social status
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5 in relation to others, so poachers are trying to compete with each other by spending a lot
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7 of money to buy the most effective, or sometimes even crude and unfair hunting
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9 equipment, and to rent the best hunting posts in order to kill greater numbers of birds.
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11 Then you can be proud of your performance as a hunter and you can gain reputation
12
13 among friends and colleagues who share the passion for the game.' This behaviour of
14
15 poachers is quite worrying and besides enforcement of anti-poaching measures it is of
16
17 vital importance for the hunting community to enhance compliance with the relevant
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19 legislation amongst their members, as suggested for Malta (Verissimo and Campbell
20
21 2015).
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24 According to our results, hunters trust the Hunting Federations mainly as regards
25
26 updated and valid information about the conservation status and protection of migratory
27
28 birds, and to a lesser extent eNGOs. This fact reveals the ongoing conflict between the
29
30 hunting and poaching community and conservationists, and has been recorded in other
31
32 Mediterranean countries suffering from illegal killing /trapping of migratory birds
33
34 (Campbell and Verissimo 2014; Barca, Lindon, and Root-Bernstein 2016, Jenkins,
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36 Mammides, and Keane 2017). On the other hand, the enthusiastic involvement of
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38 hunters in public debates that have taken place under the LIFE programme for spring
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40 poaching and their increased participation in relevant awareness events coordinated by
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42 an eNGO (HOS), is assessed as a positive change of attitude.
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48 ***Residents (non-hunters)***

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50 Irrespective of their level of education, local inhabitants are quite aware of the
51
52 ecological significance of the Ionian Islands for birds migrating between European
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54 breeding sites and African wintering areas. Despite the fact that the spring migration of
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3 avifauna constitutes an ecological symbol for the local community, deeper knowledge
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5 of this phenomenon is required. For instance, only a minority of residents (14 inds;
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7 11.8%) declared very good knowledge of the status of migratory species even though an
8
9 extensive relevant awareness raising campaign was implemented targeting them. On the
10
11 other hand, after the completion of our survey, the respondents showed general
12
13 willingness to receive more information about the conservation status (e.g. distribution
14
15 patterns, population trends, threats) of migratory avifauna. We assumed that this lack of
16
17 deeper knowledge may be attributed to the high rate of regional uncontrolled poaching
18
19 activities during spring (e.g. the case of Zakynthos Island), which practically deters
20
21 other recreational pursuits such as hiking, bird watching, biking and horseback riding.
22
23 Consequently, the discouragement to perform alternative wild nature expeditions in
24
25 important areas of natural heritage during spring migration flow could not promote any
26
27 need for further knowledge on relevant environmental issues (Ormsby 2008; Martinis et
28
29 al. 2018).
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33 In contrast with hunters, local non-hunters trust mainly eNGOs and in a lesser
34
35 extent other Bodies for receiving update information about the conservation status and
36
37 protection of migratory birds. According to Blood (2005), this can be attributed to the
38
39 internal organisation, diversity, brand building and internationalism that NGOs have
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41 developed after the Second World War. As a result, eNGOs obtained specific
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43 capabilities with which they have achieved greater public influence, awareness and trust
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45 by competing more effectively or even displacing traditional political and national
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47 institutions. In addition, residents and more specifically these of higher education,
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49 valued scientific knowledge as a prerequisite for conservation management and it seems
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51 that they don't trust Hunting Federations for receiving relevant information regarding
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53 migratory birds. Perhaps this is due to the fact that hunting associations in Europe with
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3 some recent exceptions are still lack proper and valid information about the
4
5 environment (Barca, Lindon, and Root-Bernstein 2016).
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7 Contrary to what hunters responded, poaching was identified by residents as the
8
9 main threat for the conservation of migratory birds like Turtle Dove. This assertion
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11 suggests that spring illegal hunting should not be interpreted as a public symbol for the
12
13 Ionian Islands and that poaching doesn't represent normal behaviour for the whole local
14
15 community. Additionally, they also believe that profit gained from poaching is based
16
17 only on short-term rental of private hunting posts called 'posta' and this is not actually
18
19 beneficial for the economy but rather detrimental for the local tourism industry as it also
20
21 indicated for illegal bushmeat hunting in Botswana (Rogan et al. 2017). Moreover,
22
23 international tourists visiting Zakynthos Island are aware of the local natural heritage
24
25 and show a growing interest in green tourism development in some areas of the NMPZ
26
27 (Kokkali and Edwards 2011). Consequently, it is quite possible that intensive poaching
28
29 in the Ionian Islands may harm the local socio-cultural profile by taking into
30
31 consideration that thousands of foreign tourists who have complete different ecological
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33 perceptions for conservation crimes, visit the Ionian Islands during spring.
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37 It is worth mentioning that, compared to pupils, residents as well as hunters
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39 remained quite stable in their general view about poaching throughout the entire
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41 awareness campaign. Our results suggest that human beings become less susceptible to
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43 influence as they grow and that their views regarding environmental issues are difficult
44
45 to change significantly. Indeed, trying to change the attitude of a targeted adult audience
46
47 through awareness campaigns is a difficult task as observed for other environmental
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49 (Eilam and Trop 2012) as well as for political and health issues (Glenn 1980; Alwin,
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51 Cohen, and Newcomb 1991).
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Conclusions

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. On the other hand, the public survey was identified as a valuable tool for adapting the communication and education tools of the "Leaving is Living" campaign 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

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2
3 example the effective protection of Strofades, which constitute a significant stopover
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5 site and a breeding area for migratory passerines and seabirds (Schogolev and Dimaki
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7 1996; Karris et al. 2017). Moreover, they argued that intense wardening coupled with
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9 public awareness campaigns about spring illegal hunting have to be encouraged and
10
11 enhanced in future, so as to fight against poaching.
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14 Crandall et al. (2018) argue that socio-ecological research is becoming more
15
16 widely used to achieve conservation objectives, especially on inhabited islands. Even if
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18 the current study was based on data through distributed questionnaires and the
19
20 respective results have to be considered with caution, we concluded that an urgent need
21
22 to assess the magnitude of poaching as a socio-economic and environmental issue in the
23
24 Ionian Islands is needed. Furthermore, assessment of the significance of this threat for
25
26 the conservation of migratory avifauna species constitutes a prerequisite for proposing
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28 and planning effective conservation actions to reduce the negative impact on bird
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30 populations and their habitats.
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36
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38
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41 *changing attitudes towards illegal killing in North Mediterranean for European biodiversity*'
42
43 project (2012-2015).
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47 **Disclosure statement**

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49 All authors declare that they have no competing interests.
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References

- Alwin, D. F., R. L. Cohen, and T. M. Newcomb. 1991. *Political Attitudes over the Lifespan: The Bennington Women After Fifty Years*. University of Wisconsin Press: Madison, WI, USA.
- 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.
- 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.
- 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.
- 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.
- 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*. Office for Official Publications of the European communities, Luxembourg.
- Blood, R. 2005. "Should NGOs be viewed as "political corporations"?" *Journal of Communication Management* 9 (2): 120–133.
- 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

- 1
2
3 scale of illegal killing and taking of birds in the Mediterranean.” *Bird Conservation*
4
5 *International* 26 (1): 1–28.
6
7 Campbell, B., and D. Verissimo. 2014. “Bye, bye, cacopardo! Revisiting factionalism
8
9 through the hunting scene in Malta.” *Journal of Mediterranean Studies* 23 (2): 203–
10
11 223.
12
13 Challender, D. W. S., and D. C. MacMillan. 2014. “Poaching is more than an
14
15 enforcement problem.” *Conservation Letters* 7 (5): 484–494.
16
17 Crandall, S. G., J. L. Ohayon, L. A. de Wit, J. E. Hammond, K. L. Melanson, M. M.
18
19 Moritsch, R. Davenport et al. 2018. “Best practices: social research methods to
20
21 inform biological conservation.” *Australasian Journal of Environmental*
22
23 *Management* 25 (1): 6–23.
24
25 Dimaki, M., and H. Alivizatos. 2015. “Ringing studies of the turtle dove *Streptopelia*
26
27 *turtur* (Aves: Columbidae) during passage through Antikythera Island,
28
29 southwestern Greece.” *Journal of Natural History* 49 (5-8): 419–427.
30
31 Eilam, E., and T. Trop. 2012. “Environmental Attitudes and Environmental Behavior-
32
33 Which Is the Horse and Which Is the Cart?” *Sustainability* 4 (9): 2210–2246.
34
35 Eraud, C., M. Rivière, H. Lormée, J. W. Fox, J.-J. Ducamp, and J.-M. Boutin. 2013.
36
37 “Migration routes and staging areas of trans-Saharan Turtle Doves appraised from
38
39 light-level geolocators.” *PLoS ONE* 8 (3): e59396.
40
41 doi:10.1371/journal.pone.0059396.
42
43
44
45 Fernandes-Ferreira, H., S. V. Mendonça, C. Albano, F. S. Ferreira, R. R. N. Alves.
46
47 2011. “Hunting, use and conservation of birds in Northeast Brazil.” *Biodiversity*
48
49 *Conservation* 21 (1): 221–244.
50
51 Gavin, M. C., J. Solomon, and S. G. Blank. 2010. “Measuring and monitoring illegal
52
53 use of natural resources.” *Conservation Biology* 24 (1): 89–100.
54
55
56
57
58
59

- 1
2
3 Glenn, J. 1980. "Freud's Advice to Han's Father: The First Supervisory Sessions." In
4
5 *Freud and His Patients*, edited by M. Kanzer, and J. Glenn, 121–143. Jason
6
7 Aronson: New York, NY, USA.
8
- 9 Hahn, S., S. Bauer, and F. Liechti. 2009. "The Natural Link between Europe and Africa:
10
11 2.1 Billion Birds on Migration." *Oikos* 118 (4): 624–626.
12
- 13 Jenkins, H. M., C. Mammides, and A. Keane. 2017. "Exploring differences in
14
15 stakeholders' perceptions of illegal bird trapping in Cyprus." *Journal of*
16
17 *Ethnobiology and Ethnomedicine* 13: 67. doi:10.1186/s13002-017-0194-3.
18
19
- 20 Jenkins, E. W., and R. G. Pell. 2006. "Me and the environmental challenges: A survey
21
22 of English secondary school students' attitudes towards the environment."
23
24 *International Journal of Science Education* 28 (7): 765–780.
25
- 26 Karris, G., C. Barboutis, D. Chatzidakis, S. Xirouchakis, Y. Vardanis, A. Evangelidis,
27
28 C. Dimitriadis, and T. Fransson. 2015. "Arriving to Europe extremely lean - spring
29
30 migration of some passerines at three small Greek islands." Poster presented at the
31
32 10th Conference of the European Ornithologist's Union, Badajoz, Spain, August 24-
33
34 28.
35
36
- 37 Karris, G., S. Xirouchakis, C. Grivas, M.-D. Voulgaris, S. Sfenthourakis, and S. Giokas.
38
39 2017. "Estimating the population size of Scopoli's Shearwaters (*Calonectris*
40
41 *diomedea*) frequenting the Strofades islands (Ionian Sea, western Greece) by raft
42
43 counts and surveys of breeding pairs." *North-Western Journal of Zoology* 13 (1):
44
45 101–108.
46
47
- 48 Kemp, C., C. J. van Riper, L. Boufajreldin, W. Stewart, J. Scheunemann, and R. J. G.
49
50 van den Born. 2017. "Connecting human-nature relationships to environmental
51
52 behaviors that minimize the spread of aquatic invasive species." *Biological*
53
54 *Invasions* 19 (7): 2059–2074.
55
56
57
58
59

- 1
2
3 Kokkali, A., and J. Edwards. 2011. "An assessment of the demand for and supply of
4
5 tourism experiences in the National Marine Park of Zakynthos (NMPZ)." In
6
7 *Proceedings of the International Conference on Tourism (ICOT 2011) Tourism in*
8
9 *an Era of Uncertainty*, edited by K. Andriotis, A. Theocharous, and F. Kotsi, 356–
10
11 370. International Association for Tourism Policy.
12
- 13
14 Levy, P. S., and S. Lemeshow. 2008. *Sampling of Populations: Methods and*
15
16 *Applications (4th ed.)*. J. Wiley & Sons, Inc. Hoboken, NJ, USA.
17
- 18
19 Martinis, A., K. Kabassi, C. Dimitriadou, and G. Karris. 2018. "Pupils' environmental
20
21 awareness of natural protected areas: The case of Zakynthos Island." *Applied*
22
23 *Environmental Education & Communication* 17 (2): 106–123.
24
- 25
26 Murgui, E. 2014. "When governments support poaching: a review of the illegal trapping
27
28 of thrushes *Turdus* spp. in the parany of Comunidad Valenciana, Spain." *Bird*
29
30 *Conservation International* 24 (2): 127–137.
31
- 32
33 Muth, R. M., and Jr. J. F. Bowe. 1998. "Illegal harvest of renewable natural resources in
34
35 North America: Toward a typology of the motivations for poaching." *Society &*
36
37 *Natural Resources* 11 (1): 9–24.
38
- 39
40 Nuno, A., and F. A. V. St. John. 2015. "How to ask sensitive questions in conservation:
41
42 A review of specialized questioning techniques." *Biological Conservation* 189: 5–
43
44 15.
45
- 46
47 Nuno, A., M. Bunnefeld, L. C. Naiman, and E. J. Milner-Gulland. 2013. "A Novel
48
49 Approach to Assessing the Prevalence and drivers of illegal bushmeat hunting in
50
51 the Serengeti." *Conservation Biology* 27 (6): 1355–1365.
52
- 53
54 Ormsby, A. 2008. "Development of environmental education programs for protected
55
56 areas in Madagascar." *Applied Environmental Education & Communication* 6 (3–
57
58 4): 223–232.
59

- 1
2
3 Raine, A. F., M. Gauci, and N. Barbara. 2016. "Illegal bird hunting in the Maltese
4
5 Islands: an international perspective." *Oryx* 50 (4): 597–605.
6
7 Rogan, M. S., P. A. Lindsey, C. J. Tambling, K. A. Golabek, M. J. Chase, K. Collins, J.
8
9 W. McNutt. 2017. "Illegal bushmeat hunters compete with predators and threaten
10
11 wild herbivore populations in a global tourism hotspot." *Biological Conservation*
12
13 210: 233–242.
14
15 Schogolev, I., and M. Dimaki. 1996. "Bird migration in the spring at Strophades Islands
16
17 (Ionian Sea, Greece)." *The Ring* 18 (1-2): 89–96.
18
19 Selvaggi, D. 2015. *Safe haven for Wild Birds: A safe haven for wild birds: changing*
20
21 *attitudes towards illegal killing in North Mediterranean for European biodiversity.*
22
23 Final report of the EU LIFE project number LIFE11 INF/IT/000253, LIPU Lega
24
25 Italiana Protezione Uccelli Onlus.
26
27
28 St. John, F. A. V., G. Edwards-Jones, J. M. Gibbons, and J. P. G. Jones. 2010. "Testing
29
30 novel methods for assessing rule breaking in conservation." *Biological*
31
32 *Conservation* 143 (4): 1025–1030.
33
34
35 St. John, F. A.V., C.-H. Mai, and K. J.-C. Pei. 2015. "Evaluating deterrents of illegal
36
37 behaviour in conservation: Carnivore killing in rural Taiwan" *Biological*
38
39 *Conservation* 189: 86–94
40
41
42 Staats, H. J., A. P. Wit, and C. Y. H. Midden. 1996. "Communicating the Greenhouse
43
44 Effect to the Public: Evaluation of a Mass Media Campaign from a Social Dilemma
45
46 Perspective." *Journal of Environmental Management* 46 (2): 189–203.
47
48 Taylor, A., R. Curnow, T. Fletcher, and J. Lewis. 2007. "Education campaigns to reduce
49
50 stormwater pollution in commercial areas: Do they work?" *Journal of*
51
52 *Environmental Management* 84 (3): 323–335.
53
54
55
56
57
58
59

1
2
3 Veríssimo, D., and B. Campbell. 2015. "Understanding stakeholder conflict between
4
5 conservation and hunting in Malta." *Biological Conservation* 191: 812–818.
6

7
8 Whytock, R. C., B. J. Morgan, T. Awa II, Z. Bekokon, E. A. Abwe, R. Buij, M. Virani,
9
10 J. A. Vickery, and N. Bunnefeld. 2018. "Quantifying the scale and
11
12 socioeconomic drivers of bird hunting in Central African forest communities."
13
14 *Biological Conservation* 218: 18–25.
15
16
17
18
19
20
21
22
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24
25
26
27
28
29
30
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Table 1. Former Environmental Education (EE) experience of pupils declared during the two phases of the survey.

		Former participation of pupils in EE activities		Total
		Yes	No	
Year	2013	56 (47.9%)	61 (52.1%)	117 (100%)
	2015	59 (71.1%)	24 (28.9%)	83 (100%)
Total		115	85	200

Table 2. Knowledge of pupils regarding the importance of the Ionian Islands as a migration corridor for birds during the two phases of the survey.

		Knowledge of the importance of the Ionian region for bird migration		Total
		Yes	No	
Year	2013	60 (51.3%)	57 (48.7%)	117 (100%)
	2015	54 (65.9%)	28 (34.1%)	82 (100%)
Total		114	85	199

Table 3. Declaration of pupils about the level of hunting pressure across the Ionian Islands during the two phases of the survey.

		Level of hunting pressure across the Ionian Islands		Total
		Intense	Non-intense	
Year	2013	19 (16.2%)	98 (83.8%)	117 (100%)
	2015	30 (36.1%)	53 (63.9%)	83 (100%)
Total		49	151	200

Table 4. Declaration of pupils about the existence of possible effects of hunting activity on migratory birds crossing the Ionian Islands during the two phases of the survey.

		Effects of hunting activity on migratory birds		Total
		Yes	No	
Year	2013	87 (74.4%)	30 (25.6%)	117(100%)
	2015	72 (86.7%)	11 (13.3%)	83 (100%)
Total		159	41	200

Table 5. Declaration of pupils about the knowledge of the existence of national legislation for the control of hunting activity during the two phases of the survey.

		Knowledge of the existence of national hunting legislation		Total
		Yes	No	
Year	2013	45 (39.1%)	70 (60.9%)	115 (100%)
	2015	38 (45.8%)	45 (54.2%)	83 (100%)
Total		83	115	198

Table 6. Declaration of hunters about the level of knowledge for the conservation status of the migratory bird species during the two phases of the survey.

		Level of knowledge for the conservation status of migratory birds			Total
		Very good	Adequate	Inadequate	
Year	2013	19 (50.0%)	13 (34.2%)	6 (15.8%)	38 (100%)
	2015	7 (30.4%)	9 (39.1%)	7 (30.4%)	23 (100%)
Total		26	22	13	61

Table 7. Declaration of hunters about the bodies that mainly trust to receive up-to-date and valid information regarding the conservation status and protection of migratory birds during the two phases of the survey.

		Information body					Total
		Hunting Federations	Forestry Services	Environmental NGOs	Institutions of Higher Education	Ministry of Environment	
Year	2013	12 (36.4%)	9 (27.3%)	3 (9.1%)	5 (15.1%)	4 (12.1%)	33 (100%)
	2015	8 (34.8%)	6 (26.1%)	4 (17.4%)	3 (13.0%)	2 (8.7%)	23 (100%)
Total		20	15	7	8	6	56

Table 8. The threats for the conservation of migratory birds listed in order of importance according to hunters in the Ionian Islands region during the two phases of the survey.

	The most important threat for the conservation of migratory birds							Total
	Land Use Change	Insecticides Pesticides	Poaching	Climate change	Poisonous baits	Other		
Year	2013	6 (15.8%)	8 (21.1%)	7 (18.4%)	7 (18.4%)	6 (15.8%)	4 (10.5%)	38 (100%)
	2015	5 (21.7%)	5 (21.7%)	4 (17.4%)	4 (17.4%)	4 (17.4%)	1 (4.4%)	23 (100%)
Total		11	13	11	11	10	5	61

Table 9. The contribution of hunting activity to the local economy in the Ionian Islands region according to hunters opinion during the two phases of the survey.

		Strengthening of local economy by hunting activity		Total
		No	Yes	
Year	2013	14 (37.8%)	23 (62.2%)	37 (100%)
	2015	20 (87.0%)	3 (13.0%)	23 (100%)
Total		34	26	60

Table 10. Hunters' participation in awareness campaigns about spring poaching in the Ionian Islands during the two phases of the survey.

		Participation in awareness campaigns		Total
		Yes	No	
Year	2013	2 (5.6%)	34 (94.4%)	36 (100%)
	2015	5 (21.7%)	18 (78.3%)	23 (100%)
Total		7	52	59

Table 11. Knowledge of residents regarding the importance of the Ionian Islands as a migration corridor for birds during the two phases of the survey.

		Knowledge of the importance of the Ionian region for bird migration		Total
		Yes	No	
Year	2013	42 (82.4%)	9 (17.6%)	51 (100%)
	2015	61 (89.7%)	7 (10.3%)	68 (100%)
Total		103	16	119

Table 12. Declaration of residents about the level of knowledge for the conservation status of the migratory bird species during the two phases of the survey.

		Level of knowledge for the conservation status of migratory birds			Total
		Very good	Adequate	Inadequate	
Year	2013	6 (11.8%)	14 (27.5%)	31 (60.7%)	51 (100%)
	2015	8 (11.8%)	17 (25.0%)	43 (63.2%)	68 (100%)
Total		14	31	74	119

Table 13. Declaration of residents about the bodies that mainly trust to receive up-to-date and valid information regarding the conservation status and protection of migratory birds during the two phases of the survey.

		Information Bodies					Total
		Hunting Federations	Forestry Services	Environmental NGOs	Institutions of Higher Education	Ministry of Environment	
Year	2013	7 (15.2%)	8 (17.4%)	17 (37.0%)	7 (15.2%)	7 (15.2%)	46 (100%)
	2015	7 (10.8%)	14 (21.5%)	21 (32.3%)	15 (23.1%)	8 (12.3%)	65 (100%)
Total		14	22	38	22	15	111

Table 14. The threats for the conservation of migratory birds listed in order of importance according to residents in the Ionian Islands region during the two phases of the survey.

		The most important threat for the conservation of migratory birds						Total
		Land Use Change	Insecticides Pesticides	Poaching	Climate change	Poisonous baits	Other	
Year	2013	9 (17.6%)	9 (17.6%)	11 (21.6%)	9 (17.6%)	8 (15.8%)	5 (9.8%)	51 (100%)
	2015	12 (17.6%)	12 (17.6%)	16 (23.6%)	11 (16.2%)	13 (19.1%)	4 (5.9%)	68 (100%)
Total		21	21	27	20	21	9	119

Table 15. Contribution of hunting activity to the local economy of the Ionian Islands region according to the opinion of residents during the two phases of the survey.

	Strengthening of local economy through hunting activity			Total
	Yes	No		
Year	2013	40 (87.0%)	6 (13.0%)	46 (100%)
	2015	60 (90.9%)	6 (9.1%)	66 (100%)
Total		100	12	112

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