

The international dimension of illegal bird hunting in Lebanon

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Summary: Lebanon is situated on a critical migratory bottleneck along the African-Eurasian Flyway but illegal hunting is a serious conservation issue in the country, with an estimated two and a half million birds illegally killed every year. To examine the international dimension of this issue, an analysis was conducted on scientific bird rings found in Lebanon but fitted to birds in other countries. Ring recoveries came from a total of 28 countries with the five most frequent being Finland, Sweden, Germany, Israel and the Czech Republic. Considering only birds listed as 'shot' there were a total of 35 species with the five most frequent being Blackcap *Sylvia atricapilla*, Lesser Whitethroat *Curruca curruca*, White Stork *Ciconia ciconia*, Redwing *Turdus iliacus* and Common/Steppe Buzzard *Buteo b. buteo/vulpinus*. Significantly more storks were shot in the spring while raptors were predominantly shot during autumn migration. Ring recoveries of shot birds were found across the country but certain key poaching hotspots were identified including coastal areas, the north of Lebanon (particularly around Tripoli and Akkar), the vicinity of Beirut and the mountains to the east of Beirut including Mount-Lebanon. The results of this analysis highlight the international dimension of bird poaching in Lebanon and underline the need to tackle the issue through intensive and focused anti-poaching operations and education campaigns.

INTRODUCTION

Lebanon is situated on a critical migratory bottleneck along the African-Eurasian Flyway. Each year hundreds of thousands of migratory raptors, storks and other large soaring birds pass over the country on their way to and from Eurasian breeding grounds and African wintering grounds, along with millions of passerines and other species. Published records of bird migration over Lebanon highlight the international importance of the country to multiple species, particularly large soaring birds such as raptors (Nielsen & Christensen 1970, Khairallah 1991, Beale & Ramadan-Jaradi 2001, Cameron *et al* 2008, Meyburg *et al* 2020). Telemetry studies have also clearly demonstrated the country's importance to the Lesser Spotted Eagle *Clanga pomarina* (Meyburg *et al* 1995, Meyburg & Meyburg 2009, Meyburg *et al* 2020a, b) in particular, and it is estimated that almost the entire world population of this species migrates over the country twice a year (Meyburg *et al* 2020a). Furthermore, bird migration has been intensively studied in nearby Israel (the next point along the southerly migration route after Lebanon) and data collected in these areas have highlighted the particular importance of the route to large soaring species, including most of the world's population of Lesser Spotted Eagle and Levant Sparrowhawk *Accipiter brevipes* as well as internationally significant numbers of European Honey-buzzard *Pernis apivorus*, Black Kite *Milvus migrans*, White Stork *Ciconia ciconia*, Black Stork *Ciconia nigra* and Great White Pelican *Pelecanus onocrotalus* (Frumkin *et al* 1995, Shirihai 2002, Yosef *et al* 2003, Leshem & Yom-Tov 1996, 1998, Krumenacker 2013).

Unfortunately, Lebanon has also been ranked as one of the worst bird poaching hotspots on the Middle Eastern portion of this flyway (Brochet *et al* 2016), with bird poaching being identified as one of the primary conservation issues for birds in the country (El-Jisr 2011, Serhal & Khatib 2014). Recent estimates by BirdLife International suggest the number of birds illegally killed in Lebanon each year numbers approximately two and a half million (Brochet *et al* 2016), making it one of the worst countries for bird poaching on the African-Eurasian Flyway, along with Malta (Raine *et al.* 2016), Egypt and Cyprus (Magnin 1991, Eason *et al* 2016, Brochet *et al* 2016). Indeed in the BirdLife International analysis, Lebanon was one of the top three countries listed for the illegal killing of 55% of the 20 most illegally hunted bird species and the country also held a quarter of the top 20 locations

with the largest estimated number of individual birds killed illegally each year across the entire Mediterranean; namely Akkar, Fakiha, Roum-Aytouli, Dalboun and the Qaraoun area (Brochet *et al* 2016).

On paper, bird hunting in Lebanon has been heavily regulated in recent decades, although enforcement remains a major and defining issue. Between 1995 and 2016, the shooting of wild animals was officially banned. The lack of sanctions and controls, however, have led to a sharp increase in poaching, especially of migratory birds. This is coupled by the very large number of hunters in Lebanon, which is estimated at 300 000, of whom only 15 000 are licensed (GR-J pers obs) and the majority unlicensed (El-Jisr 2011). In 2004 a new hunting law (Law No. 580) came into effect through ratification in the parliament, which for the first time comprehensively regulated the shooting of birds and other wild animals. Under this law (which is still in place) there are now 12 huntable bird species (predominantly ducks, pigeons and thrushes) and all other species, including all birds of prey, storks and other migratory birds, are strictly protected. The first season for hunting, after more than twenty years of ban, took place in September 2017 and the official hunting season lasts from September to the end of January; spring hunting is forbidden.

All of the authors of this paper can attest to the scale of the problem of illegal hunting occurring in Lebanon and have witnessed large scale illegal hunting incidents at key locations around the country. Examples of these include the nocturnal targeting (using spotlights and tape lures) of European Nightjar *Caprimulgus europaeus*, Eurasian Scops Owl *Otus scops*, Tawny Owl *Strix aluco*, Long-eared Owl *Asio otus*, Corn Crake *Crex crex* and many other species at Danniyeh in October 2019, the shooting of hundreds of raptors including European Honey Buzzards, Marsh Harriers *Circus aeruginosus*, Lesser Spotted Eagles, Levant Sparrowhawks, Eurasian Sparrowhawks *Accipiter nisus* and Short-toed Eagles *Circaetus gallicus* at Eghbe, Raachine and Chahtoul in the autumns of 2017 and 2018, and similar incidents of widespread persecution of raptors, storks and pelicans at locations such as Akkar, Hammana, Hermel and Qaa.

To examine the international dimension of bird poaching in Lebanon, this paper focuses on an analysis of scientific bird rings found in Lebanon but fitted to birds overseas, with a particular focus on birds confirmed as shot. Ring recoveries provide an excellent resource for assessing the origin countries of birds which are being illegally targeted along migratory routes (for example, see a similar analysis for Malta; Raine *et al* 2016). Furthermore, the results of such analyses provide useful information for conservation projects focused on protecting breeding populations of rare or endangered migratory bird species in Europe; if species from particular countries are being heavily persecuted in Lebanon then this may be having a serious impact on the overall success of conservation efforts in those countries.

METHODS

EURING (the European Union for Bird Ringing) administers a ringing database holding data collected from bird ringing programs across Europe to collaborate and co-ordinate ringing activities across the region. The entire EURING database was queried for ring recoveries from Lebanon. For all ring recoveries, data were available on the country of origin and ringing scheme for each ringed bird as well as the circumstances of the ring recovery itself (these are separated out into 91 individual causes, all given their own unique numeric code). Initially the database was assessed for birds that had been confirmed as shot. These included circumstances listed as '10, shot', '11, found shot', '16, shot because of ring' and '19, hunted'. However, other circumstances were more ambiguous, including '00, found', '01, bird found', '02, ring only found' and the grouping entitled '20, intentionally taken - Hunted,

trapped (including all captures by ringers), poisoned intentionally by man but not shot and not for reasons using codes 21 - 29.'

As an example, of the 77 ring recoveries of White Stork (one of the most frequently illegally shot large birds in Lebanon), 75.3% were confirmed shot. However, a further 15.6% were listed as 'found' and 3.9% as 'intentionally taken', with only two recoveries with a circumstance listed as definitively not shot (one each for violent weather and electrocution). It is therefore possible that up to 94.8% of recoveries of this species consisted of shot birds. Furthermore, as outlined above, illegal hunting is widespread throughout much of Lebanon with hunters targeting all bird species regardless of whether they are legally huntable or not. Therefore, as well as separating out only birds confirmed as shot, analyses were also undertaken on the entire database as a whole. Because the purpose of this analysis was to assess the international dimension of illegal bird hunting in Lebanon, this was considered appropriate considering the wider context of the analysis.

Heat maps were created for ring recoveries of shot birds, split into (i) all records, (ii) warblers, (iii) storks and (iv) raptors. These maps used only ring recoveries from birds confirmed as shot, and only those for locational data with an accuracy classification of 0-3 (i.e. from 0 - 'accurate to the given coordinates' to 3 - 'somewhere in a circle with radius 20km'). Heat maps were generated using the Kernel Density tool in ArcMap 10.7. A tally of shot birds by group at each unique geographic location was used as the "population" input field, and density was calculated using the Geodesic method, using the default search radius.

RESULTS

A total of 570 ring recoveries from Lebanon were found in the EURING database, with ring recoveries spanning the period between 1918 and 2018. The majority of ring recoveries (63.9%) came from 1960-1989, with ring recoveries becoming less common from 2000 onwards (18.4% of all records). The most common cause of ring recovery was 'shot' (60.3%), followed by 'found' (17.0%) and 'intentionally taken' (16.6%).

Ring recoveries came from a total of 28 countries (Figure 1), representing 25 European countries, along with Russia, Turkey and Israel. The five most common countries in the database were Finland (19.8%), Sweden (19.3%), Germany (15.4%), Israel (8.1%) and the Czech Republic (5.5%). Together, these five countries made up 68.1% of all recoveries.

In total, 54 species were found in the EURING database, with the five most frequent species being Blackcap *Sylvia atricapilla* ($n = 150$), Lesser Whitethroat *Curruca curruca* ($n = 103$), White Stork ($n = 77$), Moustached Warbler *Acrocephalus melanopogon* ($n = 33$) and Lesser Black-backed Gull *Larus fuscus* ($n = 23$). Data were also considered in terms of broad avian groupings. The three most common groupings in this analysis (in terms of total number of ring recoveries) were warblers (58.1%), storks (14.0%) and raptors (7.1%). These groupings were then considered in more detail.

Ring recoveries for storks consisted of 77 White Storks and two Black Storks. White Stork recoveries came from 10 countries, with the majority from Germany (68.8%), Poland (10.4%) and Denmark (7.8%). The two Black Stork recoveries came from Czech Republic and Poland.

For warblers, 13 species in the database originated from 22 countries. The three most frequent warbler species were Blackcap ($n = 150$), Lesser Whitethroat ($n = 103$) and Moustached Warbler ($n = 33$). The top five countries for warblers were Sweden (25.5%), Finland (16.0%), Israel (12.6%), the United Kingdom (7.7%) and Germany (7.4%). Together these five countries made up 69.2% of all warbler recoveries.

For raptors, there were ring recoveries of nine species from 11 countries. The most common ring recoveries for this grouping were Common/Steppe Buzzard, European

Honey-buzzard and Lesser Spotted Eagle. All Common/Steppe Buzzards came from Finland (86.7%) and Sweden (13.3%). European Honey-buzzards came from five countries, with the top two being Finland (44.4%) and Sweden (22.2%). Lesser Spotted Eagles originated from five countries, with the top two being Poland (32.5%) and Germany (25.0%). Combined, the majority of raptors came from Finland (52.5%), Poland (10.0%) and Sweden (10.0%).

Considering only birds listed as ‘shot’ ($n = 334$), there was a total of 35 species (Table 1) with the five most frequent species being Blackcap (103), Lesser Whitethroat (62), White Stork (57), Redwing *Turdus iliacus* (17) and Common/Steppe Buzzard (12). Together, these five species made up 44.2% of all individual recoveries. Ring recoveries for shot birds were considered by month for the three main groups (warblers, storks and raptors), with clear differences being apparent within groups for the timing of when birds were shot. For storks, significantly more birds were shot during spring migration ($\chi^2 = 25.76$, $df = 3$, $P < 0.0001$), with 71.2% of records coming from Mar-May (Figure 2). Conversely, for raptors, significantly more birds were shot during autumn migration ($\chi^2 = 87.25$, $df = 3$, $P < 0.0001$), with 69.0% of records coming from Sept-Nov (Figure 2). Lastly for warblers, ring recoveries of shot birds came from all months, with two distinct peaks – in spring (45.7% in Apr-May) and autumn (25.3% in Sept-Oct) ($\chi^2 = 126.1$, $df = 3$, $P < 0.0001$). Across all ring recoveries, 35.8% were recovered during the official hunting season (Sept-Jan) and 64.2% during the closed season (Feb-Aug).

Heat maps were created for all ring recoveries of shot birds, split into (i) all records, (ii) warblers, (iii) storks and (iv) raptors. Ring recoveries of shot birds were found across the country (Figure 3). For storks, the majority of records came from the north of Lebanon around Tripoli and Akkar, as well as the vicinity of Beirut and the mountains to the east of

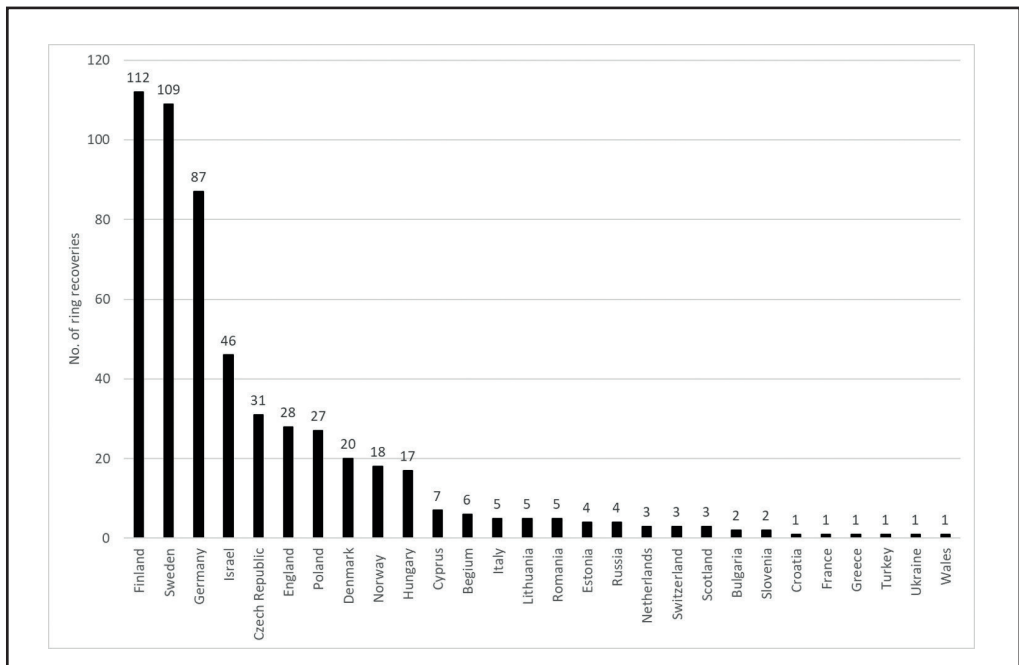


Figure 1. Ring recoveries of all birds ringed overseas and found in Lebanon.

Beirut including Mount-Lebanon (Figure 4). For raptors, the majority of records came from

the vicinity of Beirut and the mountains to the east of Beirut including Mount-Lebanon, followed by several hotspots in the north around Tripoli and Akkar (Figure 5). For warblers, the pattern was more widely distributed although points were clearly clustered along the coast, with a hotspot in the Beirut area and the mountains to the east of Beirut around Zable (Figure 6).

Table 1. All ring recoveries the EURING database of birds ringed overseas and listed as shot in Lebanon.

Common Name	Scientific Name	Count
Blackcap	<i>Sylvia atricapilla</i>	103
Lesser Whitethroat	<i>Curruca curruca</i>	61
White Stork	<i>Ciconia ciconia</i>	57
Redwing	<i>Turdus iliacus</i>	17
Common/Steppe Buzzard	<i>Buteo buteo vulpinus</i>	12
Willow Warbler	<i>Phylloscopus trochilus</i>	10
Lesser Black-backed Gull	<i>Larus fuscus</i>	8
European Honey-buzzard	<i>Pernis apivorus</i>	7
Red-backed Shrike	<i>Lanius collurio</i>	7
White Wagtail	<i>Motacilla alba</i>	7
Lesser Spotted Eagle	<i>Clanga pomarina</i>	6
Common Whitethroat	<i>Curruca communis</i>	4
Thrush Nightingale	<i>Luscinia luscinia</i>	4
Barn Swallow	<i>Hirundo rustica</i>	3
Barred Warbler	<i>Sylvia nisoria</i>	3
Black Stork	<i>Ciconia nigra</i>	2
Black-headed Gull	<i>Larus ridibundus</i>	2
Common Chiffchaff	<i>Phylloscopus collybita</i>	2
Eurasian Siskin	<i>Carduelis spinus</i>	2
Spotted Flycatcher	<i>Muscicapa striata</i>	2
Black Kite	<i>Milvus migrans</i>	1
Black Redstart	<i>Phoenicurus ochruros</i>	1
Common Kestrel	<i>Falco tinnunculus</i>	1
Common Tern	<i>Sterna hirundo</i>	1
Corn Crake	<i>Crex crex</i>	1
Eurasian Hobby	<i>Falco subbuteo</i>	1
Eurasian Reed Warbler	<i>Acrocephalus scirpaceus</i>	1
European Robin	<i>Erithacus rubecula</i>	1
Garden Warbler	<i>Sylvia borin</i>	1
Herring Gull	<i>Larus argentatus</i>	1
Marsh Warbler	<i>Acrocephalus palustris</i>	1
Osprey	<i>Pandion haliaetus</i>	1
Sand Martin	<i>Riparia riparia</i>	1
Wryneck	<i>Jynx torquilla</i>	1

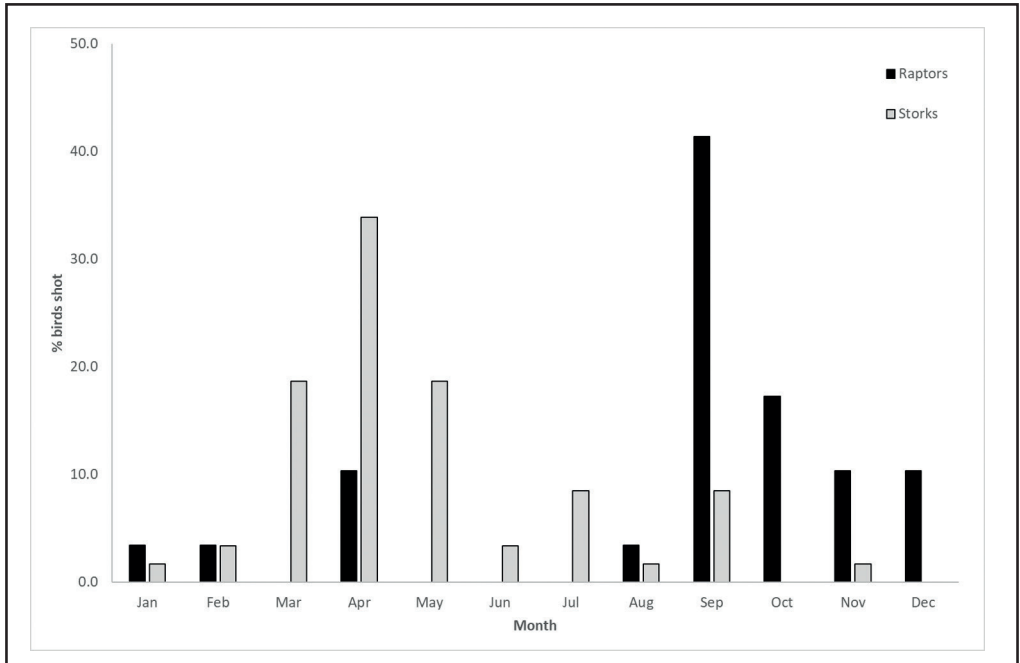


Figure 2. Ring recoveries of all storks and raptors ringed overseas and found in Lebanon, by month.

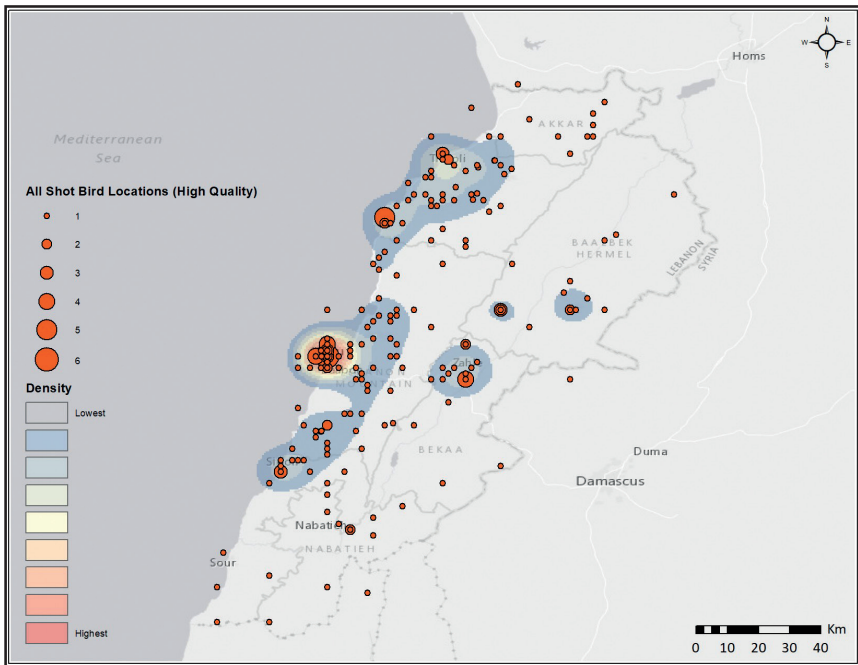


Figure 3. The location of all shot birds found in the EURING database with a locational quality of 3 (within a 20-km radius) or less.

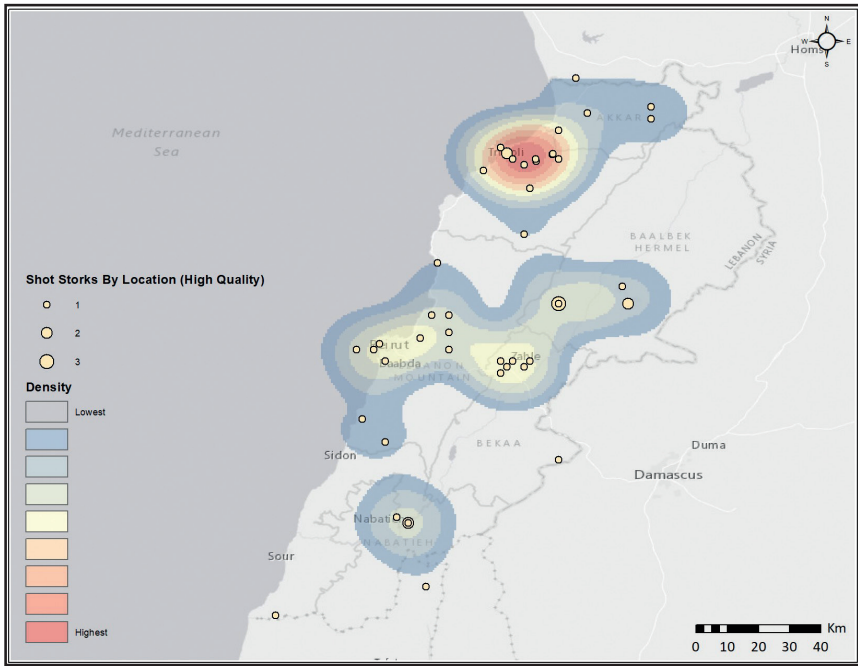


Figure 4. Heat map of all ring recoveries for storks ringed overseas and shot illegally in Lebanon.

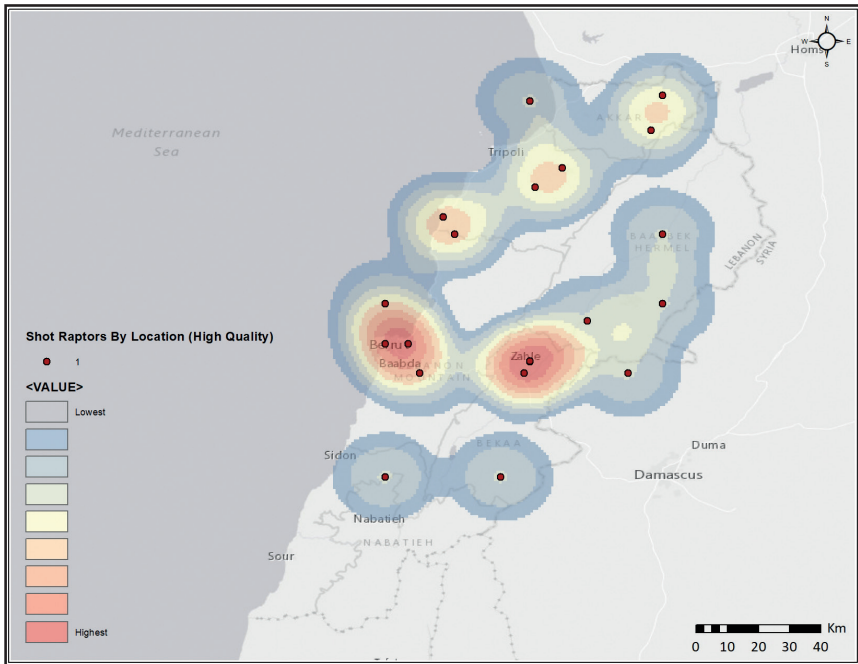


Figure 5. Heat map of all ring recoveries for raptors (all species combined) ringed overseas and shot illegally in Lebanon.

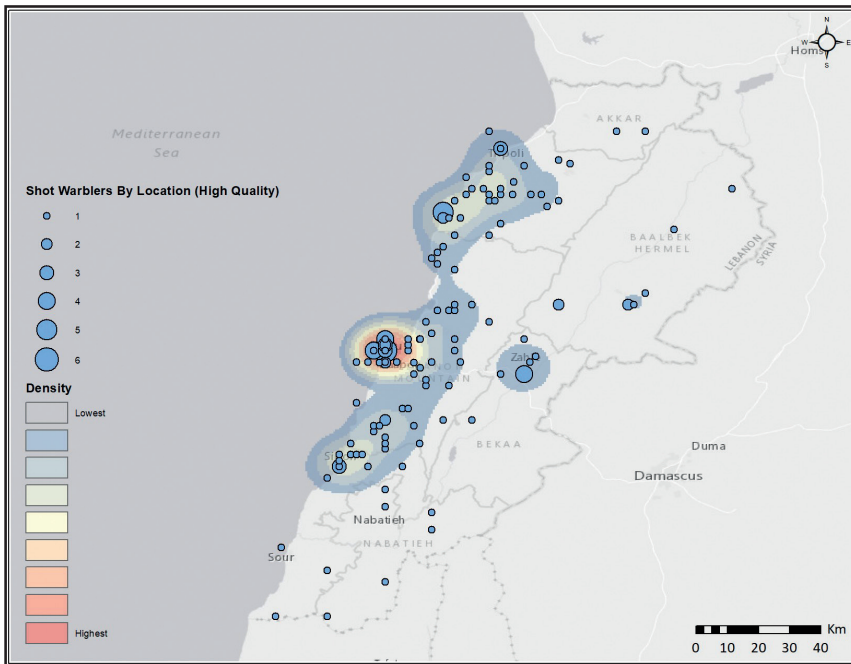


Figure 6. Heat map of all ring recoveries for warblers (all species combined) ringed overseas and shot legally or illegally (depending on the species) in Lebanon.

DISCUSSION

The results of this analysis clearly demonstrate the international dimension of bird poaching in Lebanon, particularly when coupled with the estimates of two and a half million birds killed illegally in the country annually (Brochet *et al* 2016). This highlights the serious implications that poaching in Lebanon could be having on bird species breeding in Eurasia and following the African-Eurasian Flyway. For some species, such as White Stork and Lesser Spotted Eagle, birds originate from a few key countries only. The fact that large numbers of these species are being shot over Lebanon every year will almost certainly be having a significant impact on conservation efforts for these species in Europe. This is compounded by the fact that birds of prey and storks are often rare or declining species, have small numbers of young and take several years to reach sexual maturity (during which time they will have to undertake two trips a year over hotspots of illegal hunting such as Lebanon). This makes the impact of illegal hunting even more severe for these species and the effects of illegal persecution of raptors to the sustainability of breeding populations are well documented (*e.g.* Etheridge *et al* 1997, Sim *et al* 2001, Watson & Whitfield 2002, Salvador & Ibanez 2006).

The analysis of ring recoveries also highlighted some key areas where raptors, storks and warblers are being heavily persecuted. These are areas where the Lebanese authorities should consider targeting anti-poaching operations, particularly as several of these areas (such as Akkar) were also highlighted as being in the top 20 illegal hunting locations in the whole of the Mediterranean by Brochet *et al* (2016). Furthermore, as expected, poaching of these groups of birds was concentrated during key migration periods with storks being targeted heavily during the spring migration and raptors during the autumn migration.

Hotspots in the central and northern regions were particularly evident, while warbler shooting appears to be more widespread but is particularly prevalent in coastal areas. It is not clear whether the hotspots for bird poaching around Beirut is to some degree over-emphasized because injured birds are often brought to wildlife rehabilitation centers in the city (and thus potentially could have their location reported as being there) but certainly there are regular reports of illegal hunting activity around the city and suburbs so perhaps this pattern is accurate. Likewise, it is possible that hunters shooting birds away from coastal cities such as Beirut and Tripoli may not report rings due to a lack of awareness of ringing studies, or a heightened fear of fines, with the result that these areas could be under-represented in the analysis.

While there were 35 bird species of birds confirmed as shot, some were almost certainly under-represented in the analysis despite being heavily targeted by Lebanese hunters. Most of the available data relate to bird species or groups that are ringed systematically or are focal conservation species in Europe (e.g. Lesser Spotted Eagle, White Stork). The proportion of the overall population of these species that are ringed will thus be higher than other species. It therefore follows that just because other species were not present in the analysis (e.g. European Nightjar, Common Quail *Coturnix coturnix* and European Bee-eater *Merops apiaster*) it does not necessarily mean that they are not heavily hunted in Lebanon. In fact, field operations by CABS and local partner organisations (SPNL, ABCL and MESH) have clearly indicated that these species are in fact severely persecuted in the country; the shooting of bee-eaters in particular is a common pastime by the majority of hunters who also use electronic bird lures to bring flocks of this species into shooting range (AFR, AH, GMA, LS pers obs).

Similarly, the ringing database will also under-represent the number of ringed birds actually being shot, and probably the number of countries of origin, for several reasons. First, there is a disparity in the level of ringing activity in various countries in Europe, with ringing schemes and large numbers of bird ringers well established in some countries and not in others. Second, there is presumably a low likelihood of hunters or members of the public reporting ring recoveries, simply due to a lack of knowledge of scientific bird ringing programs. A good example of this is the presence of the Barn Swallow *Hirundo rustica* in this analysis. This species is the target of many European ringing schemes and large numbers of birds are ringed annually at roost sites, meaning that there is a relatively high proportion of individuals of this species with rings. Field operations have noted that Barn Swallows are shot in Lebanon in extremely large numbers throughout the migration period (AFR, AH, GMA, LS pers obs), yet only three ring recoveries were present in the database. It therefore seems likely that many ring recoveries are simply not being reported and the rings thrown away or kept as 'trophies'.

Third, the large reduction in ring reporting in the EURING database for Lebanon in more recent decades suggests that hunters are becoming less inclined to report ringed birds. Ring recoveries were particularly prevalent in the database between 1960 and 1989, with far fewer reports from 2000 onwards. This certainly does not relate to a decrease in hunting activity; if anything, bird poaching in the country has increased greatly in recent years. It seems probable that this is related more to the changes in hunting laws. Because hunters are now aware that their actions are illegal, they are presumably far less likely to report ring recoveries, particularly if the species is clearly a protected species (i.e. raptors and storks). This pattern was also found in the analysis of ring records for birds shot in Malta, with ringing records tapering off in more recent years after hunting laws began to slowly be enforced and fines increased for hunting infractions (Raine *et al* 2016).

Lebanon is an important bottleneck on the African-Eurasian Flyway. Internationally significant numbers of many species of raptor and other large soaring birds funnel over

the country each year, where they fly low over well-known areas in the country and roost overnight in others. These birds are extremely vulnerable to illegal hunting in the country. Evidence collected by CABS, SPNL, ABCL and MESHCL clearly show that illegal hunting in Lebanon is a serious issue in the country, with millions of birds being shot every year in spring and autumn. As this analysis has shown, these birds originate from countries across Europe and the heavy persecution of these species in Lebanon could negatively impact conservation efforts in countries where the birds are originating from. These include conservation efforts in countries such as Germany, Sweden, Finland, the Czech Republic and the United Kingdom, where efforts focus on protecting breeding birds and enhancing breeding habitat. The fact that birds from these countries are then funneling over Lebanon and being shot in huge numbers is therefore a significant international issue of conservation concern, particularly when considered in the wider context and scale of illegal hunting across the entire flyway from Europe (Brochet *et al* 2019a) to the Mediterranean and Mediterranean Middle East (Brochet *et al* 2016) and the Arabian Peninsula (Brochet *et al* 2019b). Controlling illegal hunting in Lebanon should be considered a conservation priority not only for the Lebanese authorities but for European countries as well, who could provide funding and expertise to help assist in these efforts through both enforcement and education initiatives. If illegal hunting continues in Lebanon at its current unrestrained level, the impact of these actions on this important migratory bottleneck could well cause localised extinction for certain key species breeding across Europe.

ACKNOWLEDGEMENTS

We would like to thank all of our Lebanese partners who work extremely hard in very difficult conditions to tackle the issue of bird poaching in Lebanon and who also undertake focused education campaigns to highlight the importance of Lebanon to international bird migration, in particular: Adonis el-Khatib, Julie Lebnann, Fouad Itani, Claudine Aoun Roukoz, Shirine Bou Raffoul, Maroun Bou Raffoul, Gabi Nader and Samer A. Azar. We would also like to thank all of the CABS staff and volunteers who have assisted in CABS operations - not only Lebanon but also all of the other countries where the organisation tackles illegal hunting and trapping issues. For Lebanon operations, we would particularly like to thank Tolga Temuge, Fillippo Bamberghi, Alexander Heyd, the CMS-Secretariat and the staff at Lebanese Wildlife. This research received no specific grant from any funding agency, or commercial or not-for-profit sectors.

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