**Supplementary Material**

Illegal killing and taking of birds in Europe outside the Mediterranean: assessing the scope and scale of a complex issue

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# **Table S1.** List of all bird species assessed indicating the mean estimated numbers of birds illegally killed (min-max), main reason, potential main type of illegality, and ratio of estimated no. of individual birds illegally killed to the global/European/EU27 population (min-max) for a) Northern and Central Europe and Caucasus, b) the whole of Europe (i.e. including European Mediterranean countries) and c) European Union (i.e. including 27 EU Member States, Croatia excluded, see text)

See excel worksheet

# **Table S2.** The 20 bird species with potentially the highest ratio between the estimated number of individuals killed/taken illegally per year in the 29 European countries and in the 19 EU Member States and the global/European/EU27 population size (ranked by global ratio, with ranks in square brackets for European/EU27 ratio). For European/EU27 analysis: only species with ≥10% of their global distribution within Europe are considered (see Methods). 2016 IUCN Red List category: NT = Near Threatened, VU = Vulnerable, EN = Endangered.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Species (IUCN Red List category)** | **Ratio of estimated no. of individual birds illegally killed/taken to the global population****(min – max)** | **Ratio of estimated no. of individual birds illegally killed/taken to the European population** **(min – max)** | **Ratio of estimated no. of individual birds illegally killed/taken in EU MS to the EU27 population** **(min – max)** | **Mean score for basis of****estimates** (1 = informedexpert opinion to3= extrapolated fromsystematic monitoring) | **Migratory status** | **Country with the largest estimated no. of individual birds illegally killed/year (EU MS)** |
| Red-crested Pochard *Netta rufina* (LC) | 0.12 (0.03–0.25) 1 | - | - | 1.3 | Migrant | Azerbaijan (Germany)  |
| Little Bustard *Tetrax tetrax* (NT) | 0.10(0.04–0.40) 2 | 0.11 (0.06–0.22) [3] 2 | - | 1.0 |  Migrant | Azerbaijan |
| Lesser White-fronted Goose *Anser erythropus* (VU) | 0.03(0.02–0.06) 3 | - | - | 1.2 |  Migrant | Azerbaijan |
| White-headed Duck *Oxyura leucocephala* (EN) | 0.03(0.01–0.07) 4 | 0.26 (0.06–0.72) [1] 4 | - | 1.1 |  Migrant | Azerbaijan |
| Eurasian Wigeon *Mareca penelope* (LC) | 0.03(0.01–0.05) 5 | 0.05 (0.01–0.09)[7] 5 | 0.004(0.002–0.01) [20] | 1.3 |  Migrant | Azerbaijan |
| Pygmy Cormorant *Microcarbo pygmaeus* (LC) | 0.02(0.01–0.07) 6 | - | - | 1.0 |  Migrant | Azerbaijan |
| Whooper Swan *Cygnus cygnus* (LC) | 0.02(0.001–0.03) 7 | 0.04 (0.002–0.08)[10] 7 | - | 1.0 |  Migrant | Azerbaijan |
| Common Pochard *Aythya ferina* (VU) | 0.02(0.004–0.03) 8 | 0.05 (0.01–0.10)[8] 8 | - | 1.2 |  Migrant | Azerbaijan |
| Pallid Harrier *Circus macrourus* (NT) | 0.01(0.005–0.03) 9 |  0.12 (0.03–0.46) [2] 9 | 0.21(0–2.67) [2] | 1.3 | Migrant | Georgia (Romania) |
| White-tailed Sea-eagle *Haliaeetus albicilla* (LC) | 0.01(0.002–0.04) | 0.02 (0.01–0.05) [15] | 0.01(0.002–0.02) [13] 21 | 1.7 |  Migrant | Germany (Germany) |
| Red Kite *Milvus milvus* (NT) | 0.01(0.003–0.03) 10 | - | - | 1.5 |  Migrant | Germany |
| Tufted Duck *Aythya fuligula* (LC) | 0.01(0.003–0.02) 11 | 0.02(0.004–0.04) [20] 11 | - | 1.2 |  Migrant | Azerbaijan |
| Levant Sparrowhawk *Accipiter brevipes* (LC) | 0.01 (0.003–0.03) 12 | - | - | 2.5 |  Migrant | Georgia |
| Common Coot *Fulica atra* (LC) | 0.01 (0.01–0.02) 13 | 0.03 (0.01–0.06)[14]13 | - | 1.2 |  Migrant | Azerbaijan |
| Greylag Goose *Anser anser* (LC) | 0.01(0.003–0.02) | - | - | 1.2 |  Migrant | Azerbaijan |
| Common Teal *Anas crecca* (LC) | 0.01(0.003–0.02) 14 | 0.04 (0.01–0.08) [11]14 | - | 1.2 |  Migrant | Azerbaijan |
| European Honey-buzzard*Pernis apivorus* (LC) | 0.01 (0.01–0.02) 15 | - | - | 1.5 |  Migrant | Georgia |
| Dalmatian Pelican *Pelecanus crispus* (VU) | 0.01 (0.002–0.02) 16 | - | - | 1.0 |  Migrant | Azerbaijan |
| Eastern Imperial Eagle *Aquila heliaca* (VU) | 0.01 (0.001–0.04) | - | 0.02(0.003–0.04) [9] | 1.3 |  Migrant | Hungary (Hungary) |
| Mute Swan *Cygnus olor* (LC) | 0.01(0.001–0.02) | - | - | 1.1 |  Migrant | Azerbaijan |
| Saker Falcon *Falco cherrug* (EN) | - |  0.08 (0.02–0.18) [4] | 0.01(0.001–0.02) [16] | 1.2 | Migrant | Azerbaijan (Hungary) |
| Gadwall *Mareca strepera* (LC) | - | 0.07 (0.03–0.14) [5] 17 | 0.02(0.01–0.04) [5] 17 | 1.2 | Migrant | Germany (Germany) |
| Northern Shoveler *Spatula clypeata* (LC) | - | 0.07 (0.02–0.14) [6]  | 0.02(0.01–0.04) [4] 22 | 1.2 | Migrant | Azerbaijan (Germany) |
| Brent Goose *Branta bernicla* (LC) | - | 0.05 (0.002–0.10) [9] | - | 1.3 | Migrant | Germany |
| Northern Pintail *Anas acuta* (LC) | - | 0.03 (0.01–0.06)[12] 18 | 0.02(0.01–0.04) [8] 18 | 1.3 | Migrant | Azerbaijan (Germany) |
| Marbled Teal *Marmaronetta angustirostris* (VU) | - | 0.03 (0.01–0.11) [13] 19 | - | 1.0 |  Migrant | Azerbaijan |
| Gyrfalcon *Falco rusticolus* (LC) | - | 0.02 (0.01–0.04) [16] | 0.01(0.003–0.02) [10] 23 | 1.0 |  Migrant | Iceland (Sweden) |
| Smew *Mergellus albellus* (LC) | - | 0.02 (0.01–0.05) [17] | 0.01(0.002–0.02) [14] | 1.3 |  Migrant | Germany (Germany) |
| Greater White-fronted Goose *Anser albifrons* (LC) | - | 0.02 (0.01–0.03) [18] | - | 1.2 |  Migrant | Azerbaijan |
| Caspian Gull*Larus cachinnans* (LC) | - | 0.02(0.01–0.03) [19] 20 | - | 1.2 | Migrant | Belarus |
| Little Stint*Calidris minuta* (LC) | - | - | 0.24(0–\*) [1] 24 | 1.0 | Migrant | (Latvia) |
| Bean Goose*Anser fabalis* (LC) | - | - | 0.11(0.05–0.25) [3] | 1.3 | Migrant | (Germany) |
| Garganey*Spatula querquedula* (LC) | - | - | 0.02(0.01–0.04) [6] | 1.3 | Migrant | (Germany) |
| Ruddy Shelduck*Tadorna ferruginea* (LC) | - | - | 0.02(0.01–0.04) [7] | 1.0 | Migrant | (Romania) |
| Red-throated Pipit*Anthus cervinus* (LC) | - | - | 0.01(0.0002–0.03) [11] 25 | 1.5 | Migrant | (Bulgaria) |
| Western Marsh-harrier*Circus aeruginosus* (LC) | - | - | 0.01(0.002–0.03) [12] | 1.3 | Migrant | (Hungary) |
| Barnacle Goose*Branta leucopsis* (LC) | - | - | 0.01(0.003–0.02) [15] 26 | 1.3 | Migrant | (Germany) |
| Hen Harrier*Circus cyaneus* (LC) | - | - | 0.01(0.001–0.02) [17] | 2.0 | Migrant | (United Kingdom) |
| Great Snipe*Gallinago media* (NT) | - | - | 0.01(0.002–0.01) [18] | 1.1 | Migrant | (Denmark) |
| Greater Spotted Eagle*Clanga clanga* (VU) | - | - | 0.005(0–0.01) [19] | 1.4 | Migrant | (Romania) |

1 This result is largely driven by an estimate of 15,000-100,000 individuals illegally killed/taken per year in Azerbaijan (95% of the total mean estimate for the 29 European countries) and by an estimate of 1,000-2,000 individuals illegally killed/taken per year in Germany (95% of the total mean estimate for 19 EU MS)

2 This result is largely driven by an estimate of 20,000-40,000 individuals illegally killed/taken per year in Azerbaijan (100% of the total mean estimate)

3 This result is largely driven by an estimate of 500-1,500 individuals illegally killed/taken per year in Azerbaijan (97% of the total mean estimate)

4 This result is largely driven by an estimate of 100-500 individuals illegally killed/taken per year in Azerbaijan (92% of the total mean estimate)

5 This result is largely driven by an estimate of 20,000-120,000 individuals illegally killed/taken per year in Azerbaijan (89% of the total mean estimate)

6 This result is largely driven by an estimate of 1,000-2,500 individuals illegally killed/taken per year in Azerbaijan (82% of the total mean estimate)

7 This result is largely driven by an estimate of 50-5,000 individuals illegally killed/taken per year in Azerbaijan (79% of the total mean estimate)

8 This result is largely driven by an estimate of 5,000-50,000 individuals illegally killed/taken per year in Azerbaijan (82% of the total mean estimate)

9 This result is largely driven by an estimate of 100-400 individuals illegally killed/taken per year in Georgia (96% of the total mean estimate)

10 This result is largely driven by an estimate of 170-1,700 individuals illegally killed/taken per year in Germany (82%% of the total mean estimate)

11 This result is largely driven by an estimate of 5,000-50,000 individuals illegally killed/taken per year in Azerbaijan (80% of the total mean estimate)

12 This result is largely driven by an estimate of 80-350 individuals illegally killed/taken per year in Georgia (79% of the total mean estimate)

13 This result is largely driven by an estimate of 50,000-150,000 individuals illegally killed/taken per year in Azerbaijan (94% of the total mean estimate)

14 This result is largely driven by an estimate of 15,000-100,000 individuals illegally killed/taken per year in Azerbaijan (91% of the total mean estimate)

15 This result is largely driven by an estimate of 3,000-7,000 individuals illegally killed/taken per year in Georgia (89% of the total mean estimate)

16 This result is largely driven by an estimate of 20-200 individuals illegally killed/taken per year in Azerbaijan (88%% of the total mean estimate)

17 This result is largely driven by an estimate of 11,000-22,000 individuals illegally killed/taken per year in Germany (75% of the total mean estimate for the 29 European countries and 90% of the total mean estimate for 19 EU MS)

18 This result is largely driven by an estimate of 5,000-30,000 individuals illegally killed/taken per year in Azerbaijan (79% of the total mean estimate for the 29 European countries) and by an estimate of 2,000-4,000 individuals illegally killed/taken per year in Germany (90% of the total mean estimate for 19 EU MS)

19 This result is largely driven by an estimate of 20-100 individuals illegally killed/taken per year in Azerbaijan (89% of the total mean estimate)

20 This result is largely driven by an estimate of 3,000-4,500 individuals illegally killed/taken per year in Belarus (95% of the total mean estimate)

21 This result is largely driven by an estimate of 80-800 individuals illegally killed/taken per year in Germany (76% of the total mean estimate for 19 EU MS)

22 This result is largely driven by an estimate of 8,000-16,000 individuals illegally killed/taken per year in Germany (88% of the total mean estimate for 19 EU MS)

23 This result is largely driven by an estimate of 10-40 individuals illegally killed/taken per year in Sweden (100% of the total mean estimate for 19 EU MS)

24 This result is largely driven by an estimate of 0-20 individuals illegally killed/taken per year in Latvia (100% of the total mean estimate for 19 EU MS)

25 This result is largely driven by an estimate of 10-600 individuals illegally killed/taken per year in Bulgaria (100% of the total mean estimate for 19 EU MS)

26 This result is largely driven by an estimate of 2,000-4,000 individuals illegally killed/taken per year in Germany (77% of the total mean estimate for 19 EU MS)

\* Maximum estimate is unknown as EU27 minimum population estimate sets to 0

# **Table S3.** Estimated numbers of individual raptors illegally killed/taken per year in each assessed country in Northern and Central Europe and the Caucasus.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Country (\*EU member state)** | **No. of species regularly occurring** | **% of species known or likely to be illegally killed/taken (values in parentheses include species killed/taken in insignificant numbers)** | **Mean estimated no. of individual birds illegally killed/taken per year (min – max)** | **Mean score for basis of estimates** (1 = informed expert opinion to 3 = extrapolated from systematic monitoring) | **Mean estimated trend over the last 10 years in illegal killing/taking** |
| **Armenia** | 42 | 31% (64%) | 700 (400–900) | 1.0 | Unknown |
| Austria\* | 37 | 35% (92%) | 1,000 (200–1,800) | 1.0 | Unknown |
| Azerbaijan | 42 | 31% (74%) | 900 (300–1,600) | 1.0 | 0.3 |
| Belarus | 34 | 35% (47%) | 2,800 (1,800–3,800) | 1.0 | 0.0 |
| Belgium\* | 22 | 32% (82%) | 500 (200–800) | 2.0 | Unknown  |
| Bulgaria\* | 45 | 29% (93%) | 1,200 (600–1,800) | 1.5 | Unknown  |
| Czechia\* | 35 | 26% (63%) | 1,400 (300–2,500) | 1.0 | +0.3 |
| Denmark\* | 25 | 16% (48%) | 400 (100–700) | 1.0 | -2.0 |
| Estonia\* | 30 | 0% (27%) | 30 (0–50) | Unknown | Unknown |
| Faroe Islands | 5 | 0% (20%) | 5 (0–10) | Unknown | Unknown |
| Finland\* | 30 | 7% (20%)  | 200 (100–400) | 1.0 | 0.0 |
| Georgia | 41 | 51% (71%) | 12,400 (5,800–19,000) | 2.1 | Unknown |
| Germany\* | 31 | 45% (68%) | 6,500 (1,200–11,700) | 2.0 | -0.9 |
| Hungary\* | 35 | 23% (66%) | 2,100 (700–3,600) | 1.5 | -0.5 |
| Iceland | 5 | 20% (40%) | 90 (50–100) | 1.0 | Unknown |
| Ireland\* | 16 | 25% (69%) | 500 (60–900) | 2.0 | +0.7 |
| Latvia\* | 31 | 3% (39%) | 100 (20–200) | 1.0 | -2.0 |
| Liechtenstein | 21 | Birds killed/taken in trivial numbers |
| Lithuania\* | 31 | 0% (23%) | 100 (20–200) | Unknown | Unknown |
| Luxembourg\* | 22 | Birds killed/taken in trivial numbers |
| Netherlands\* | 23 | 30% (83%) | 1,900 (700–3,100) | 1.9 | Unknown |
| Norway | 25 | 8% (88%) | 300 (100–500) | 1.0 | Unknown |
| Poland\* | 34 | 12% (44%) | 400 (40–700) | 1.8 | 0.0 |
| Romania\* | 38 | 61% (95%) | 4,300 (1,100–7,500) | 1.0 | Unknown |
| Slovakia\* | 36 | 25% (69%) | 800 (400–1,300) | 1.0 | Unknown  |
| Sweden\* | 31 | 23% (81%) | 700 (400–1,000) | 1.0 | Unknown  |
| Switzerland | 29 | Birds killed/taken in trivial numbers |
| Ukraine | 42 | 31% (76%) | 900 (200–1,600) | 1.0 | Unknown |
| United Kingdom\* | 22 | 45% (86%) | 1,400 (200–2,900) | 2.0 | Unknown |
| **NC Europe and Caucasus**  | **52** | **79% (98%)** | **41,800 (15,100–68,500)** | **1.4** | **Unknown** |

# **Table S4.** Worst locations for illegal killing and taking of birds identified in Northern and Central Europe and the Caucasus (ordered in decreasing mean estimated number individual birds illegally killed/year).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Country** | **Location name** | **Administrative region** | **Latitude** | **Longitude** | **Mean estimated no. individual birds illegally killed/year** | **Min estimated no. individual birds illegally killed/year** | **Max estimated no. individual birds illegally killed/year** | **Protected area(s) overlapping or contained in the location and potentially within which illegal killing is occurring** | **IBA(s) overlapping location overlapping or contained in the location and potentially within which illegal killing is occurring** |
| Azerbaijan | Greater and Lesser Gizilagach Bays | Lenkoran district | 39.0555 | 48.9446 | 222,735 | 71,756 | 373,714 | Gizilagach State nature Reserve and Gizilagach State Nature Sanctuary | [AZ048 - Gizilagach State Reserve](http://www.birdlife.org/datazone/sitefactsheet.php?id=143) |
| Azerbaijan | Mahmudchala Lake (inside part) | Bilasuvar, Salyan and Jalilabad districts | 39.3754 | 48.7370 | 38,607 | 12,438 | 64,777 |  | [AZ045 - Lake Mahmudchala](http://www.birdlife.org/datazone/sitefactsheet.php?id=171) [AZ047 - Lake Ich-chala (Novogolovka chala)](http://www.birdlife.org/datazone/sitefactsheet.php?id=184)  |
| Azerbaijan | Kura River Delta | Neftechala district | 39.3534 | 49.3745 | 23,758 | 7,654 | 39,863 |  | [AZ046 - Kura Delta](http://www.birdlife.org/datazone/sitefactsheet.php?id=168) |
| Azerbaijan | Aggyol Lake  | Agjabedi district | 39.9986 | 47.6642 | 23,758 | 7,654 | 39,863 | Aggol National Park | [AZ030 - Aggyol National Park](http://www.birdlife.org/datazone/sitefactsheet.php?id=142) |
| Azerbaijan | The factory of deep water platforms | Great Baku, Sahil district | 40.2377 | 49.6348 | 23,758 | 7,654 | 39,863 |  | [AZ053 - Sahil settlement - "Shelf" factory](http://www.birdlife.org/datazone/sitefactsheet.php?id=18769) |
| Azerbaijan | Sarisu Lake  | Imishli, Sabirabad districts | 40.0480 | 48.1724 | 17,819 | 5,740 | 29,897 |  | [AZ032 - Lake Sarisu](http://www.birdlife.org/datazone/sitefactsheet.php?id=178) |
| Germany | Niedersachsen | Niedersachsen | 52.7561 | 9.3931 | 17,497 | 9,360 | 25,633 |  |  |
| Azerbaijan | Yashma island | Absheron district | 40.7825 | 49.5551 | 14,849 | 4,784 | 24,914 |  | [AZ033 - Yashma island](http://www.birdlife.org/datazone/sitefactsheet.php?id=187) |
| Azerbaijan | Alat bay | Great Baku, Sahil district | 39.9640 | 49.4237 | 14,849 | 4,784 | 24,914 |  | [AZ040 - Glynanniy island](http://www.birdlife.org/datazone/sitefactsheet.php?id=161), overlapping of all water water surface around (about 2000-5000 ha) |
| Germany | Schleswig-Holstein | Schleswig-Holstein | 54.4700 | 9.5139 | 12,498 | 6,686 | 18,309 |  |  |
| Germany | Mecklenburg-Vorpommern | Mecklenburg-Vorpommern | 53.6167 | 12.7000 | 12,498 | 6,686 | 18,309 |  |  |
| Germany | Nordrhein-Westfalen | Nordrhein-Westfalen | 51.4667 | 7.5500 | 12,498 | 6,686 | 18,309 |  |  |
| Bulgaria | Black Sea coast  | Dobrich, Varna, Burgas districts | 43.1882 | 27.4306 | 12,617 | 3,882 | 21,353 |  | [BG049 - Shabla Lake Complex](http://datazone.birdlife.org/site/factsheet/shabla-lake-complex-iba-bulgaria)[BG050 - Durankulak Lake](http://datazone.birdlife.org/site/factsheet/durankulak-lake-iba-bulgaria)[BG051 – Kaliakra](http://datazone.birdlife.org/site/factsheet/kaliakra-iba-bulgaria)[BG036 - Atanasovsko Lake](http://datazone.birdlife.org/site/factsheet/atanasovsko-lake-iba-bulgaria) [BG034 - Mandra-Poda complex](http://datazone.birdlife.org/site/factsheet/mandra-poda-complex-iba-bulgaria)[BG035 - Burgasko Lake](http://datazone.birdlife.org/site/factsheet/burgasko-lake-iba-bulgaria)[BG037 - Pomorie Lake](http://datazone.birdlife.org/site/factsheet/pomorie-lake-iba-bulgaria)  |
| Azerbaijan | Jandari Lake  | Agstafa district, on Georgian border | 41.4167 | 45.2269 | 8,909 | 2,870 | 14,949 |  |  |
| Azerbaijan | Boz-Gobu Lake  | Sabirabad, Imishli districts | 40.0460 | 47.8847 | 8,909 | 2,870 | 14,949 |  | [AZ031 - Lake Boz-Koba](http://www.birdlife.org/datazone/sitefactsheet.php?id=156) |
| Germany | Brandenburg | Brandenburg | 52.3619 | 13.0081 | 7,499 | 4,012 | 10,986 |  |  |
| Netherlands | Friesland Province | Friesland Province | 53.1333 | 5.8167 | 7,238 | 808 | 13,668 |  |  |
| Armenia | Metsamor River System | Armavir district | 40.0996 | 44.1902 | 6,151 | 3,647 | 8,656 |  | [AM012 - Metsamor](http://datazone.birdlife.org/site/factsheet/19762) |
| Georgia | Chorokhi river mouth and surrounding area | Autonomos Republic of Adjara | 41.5953 | 41.5775 | 5,490 | 2,066 | 8,915 |  | [GE032 - Chorokhi Delta](http://datazone.birdlife.org/site/factsheet/chorokhi-delta-iba-georgia) |
| Armenia | Vayk | Vayoc Dzor district | 39.7034 | 45.4385 | 5,126 | 3,039 | 7,213 | Gnishik Community Managed Protected Area, Herher State Sanctuary | [AM014 - Noravank](http://datazone.birdlife.org/site/factsheet/19764) [AM015 - Jermook](http://datazone.birdlife.org/site/factsheet/19757) |
| Armenia | Armash fish-farm | Ararat district | 39.7649 | 44.7626 | 4,511 | 2,674 | 6,348 |  | [AM004 - Armash fish-farm](http://datazone.birdlife.org/site/factsheet/3137) |
| Ukraine | Dnipro | Dnipro region | 48.4500 | 34.9833 | 3,299 | 485 | 6,113 |  |  |
| Armenia | Ashotskh  | Shirak district | 41.0325 | 43.8221 | 3,076 | 1,823 | 4,328 | Arpi Lake National Park | [AM001 - Lake Arpi](http://datazone.birdlife.org/site/factsheet/3136)[AM006 – Amasia](http://datazone.birdlife.org/site/factsheet/19751) |
| Armenia | Baghramyan  | Armavir district | 40.1567 | 43.8266 | 3,076 | 1,823 | 4,328 |  | [AM011 - Sardarapat](http://datazone.birdlife.org/site/factsheet/19766) |
| Armenia | Lchashen | Gegharkuniq district | 40.4918 | 44.8849 | 3,076 | 1,823 | 4,328 |  |  |
| Ukraine | Kyiv | Kyiv region | 50.4547 | 30.5238 | 2,749 | 404 | 5,095 | Holosiyivskiy National Nature Park |
| Georgia | Alazani Valley | Kakheti Region | 41.8333 | 45.8167 | 2,516 | 947 | 4,086 | Vashlovani National Park and Chachuna National Reserves | [GE025 - Alazani Valley](http://datazone.birdlife.org/site/factsheet/alazani-valley-iba-georgia) |
| Armenia | Sevan Lake  | Gegharkuniq district | 40.3309 | 45.3364 | 2,461 | 1,459 | 3,462 | Sevan Lake National Park | [AM005 - Lake Sevan](http://datazone.birdlife.org/site/factsheet/3618) |
| Belarus | Minsk | Minsk | 53.9000 | 27.5667 | 1,951 | 1,071 | 2,830 |  |  |
| Armenia | Urts mountains | Ararat district | 39.8284 | 44.9365 | 1,845 | 1,094 | 2,597 |  |  |
| Georgia | Svaneti | Upper Svaneti Region | 43.0000 | 42.8333 | 1,830 | 689 | 2,972 | Svaneti National Park  | [GE0012 - Svaneti](http://datazone.birdlife.org/site/factsheet/svaneti-iba-georgia) |
| Hungary | BÁCS-KISKUN county | BÁCS-KISKUN county | 46.5671 | 19.3783 | 1,753 | 293 | 3,214 |  |  |
| Hungary | HAJDÚ-BIHAR county | HAJDÚ-BIHAR county | 47.4696 | 21.4575 | 1,753 | 293 | 3,214 |  |  |
| Netherlands | Zeeland Province | Zeeland Province | 51.5667 | 3.7500 | 1,645 | 184 | 3,106 |  |  |
| Netherlands | Noord-Brabant Province | Noord-Brabant Province | 51.6667 | 5.0000 | 1,645 | 184 | 3,106 |  |  |
| Germany | Harz Mountains | Lower Saxony, Saxony-Anhalt, and Thuringia | 51.7500 | 10.6333 | 1,500 | 802 | 2,197 |  |  |
| Armenia | Horom | Shirak district | 40.6662 | 43.8389 | 1,435 | 851 | 2,020 |  |  |
| Ukraine | Zaporizhzhia | Zaporizhzhia region | 47.8229 | 35.1903 | 1,375 | 202 | 2,547 |  |  |
| Estonia | Kihnu Island and surrounding islets | Pärnu County | 58.1235 | 23.9823 | 1,265 | 331 | 2,198 | Pärnu lahe SPA (EE0040346) | [EE059 - Parnu Bay (NEW)](http://www.birdlife.org/datazone/sitefactsheet.php?id=18564) |
| Armenia | Stepanavan  | Lori district | 41.0974 | 44.2907 | 1,230 | 729 | 1,731 |  | [AM007 - Tashir](http://datazone.birdlife.org/site/factsheet/19767)  |
| Hungary | JÁSZ-NAGYKUN-SZOLNOK county | JÁSZ-NAGYKUN-SZOLNOK county | 47.2618 | 20.4202 | 1,052 | 176 | 1,928 |  |  |
| Hungary | PEST county | PEST county | 47.411 | 19.3592 | 1,052 | 176 | 1,928 |  |  |
| Hungary | SOMOGY county | SOMOGY county | 46.4451 | 17.6074 | 1,052 | 176 | 1,928 |  |  |
| Hungary | SZABOLCS-SZATMÁR-BEREG county | SZABOLCS-SZATMÁR-BEREG county | 47.9927 | 22.0808 | 1,052 | 176 | 1,928 |  |  |
| Hungary | TOLNA county | TOLNA county | 46.5074 | 18.5381 | 1,052 | 176 | 1,928 |  |  |
| Hungary | VESZPRÉM county | VESZPRÉM county | 47.1332 | 17.6518 | 1,052 | 176 | 1,928 |  |  |
| Belarus | Homel | Homel  | 52.4345 | 30.9754 | 975 | 536 | 1,415 |  |  |
| Austria | Lower Austria | Lower Austria | 48.1200 | 15.7800 | 877 | 151 | 1,603 |  | [AT010 - March/Thaya riverine forest](http://datazone.birdlife.org/site/factsheet/march-thaya-riverine-forest-iba-austria)[AT012 - Feuchte Ebene and Rauchwarther Platte](http://datazone.birdlife.org/site/factsheet/feuchte-ebene-and-rauchwarther-platte-iba-austria)[AT016 - Western Weinviertel](http://datazone.birdlife.org/site/factsheet/western-weinviertel-iba-austria)[AT017 - Central Marchfeld](http://datazone.birdlife.org/site/factsheet/central-marchfeld-iba-austria)[AT018 - Riverine forests in the Tullnerfeld](file:///C%3A%5Ctemp%5CIKB%5CRiverine%20forests%20in%20the%20Tullnerfeld)[AT019 - Lösslandschaft and Wagram east of Krems](http://datazone.birdlife.org/site/factsheet/l%C3%B6sslandschaft-and-wagram-east-of-krems-iba-austria)[AT022 - Southern Waldviertel](http://datazone.birdlife.org/site/factsheet/southern-waldviertel-iba-austria)[AT026 - Fish-ponds in the Waldviertel](http://datazone.birdlife.org/site/factsheet/fish-ponds-in-the-waldviertel-iba-austria)[AT027 - Western Waldviertel](http://datazone.birdlife.org/site/factsheet/western-waldviertel-iba-austria) |
| Hungary | GYŐR-MOSON-SOPRON county | GYŐR-MOSON-SOPRON county | 47.6502 | 17.2637 | 842 | 140 | 1,543 |  |  |
| Bulgaria | Thracian Valley near Pazardzik and Plovdiv | Plovdiv district | 42.0951 | 24.3736 | 753 | 232 | 1,275 |  | [BG057 - Besaparski Hills](http://datazone.birdlife.org/site/factsheet/18979) |
| Georgia | Lagodekhi | Kakheti Region | 41.8167 | 46.2667 | 686 | 258 | 1,114 | Lagodekhi | [GE024 - Lagodekhi](http://datazone.birdlife.org/site/factsheet/lagodekhi-iba-georgia) |
| Ireland | Wicklow | Wicklow | 53 | -6.4167 | 632 | 11 | 1,252 |  |  |
| Norway | Finnmark (whole county) | Finnmark | 69.9144 | 25.2814 | 596 | 155 | 1,036 | A large number of nature reserves, bird sanctuaries and other protected sites are found in Finnmark county. | [NO010 - Gjesværstappen](http://datazone.birdlife.org/site/factsheet/gjesv%C3%A6rstappan-iba-norway) [NO009 - Sværholtklubben](http://datazone.birdlife.org/site/factsheet/sv%C3%A6rholtklubben-iba-norway)[(No current code) Lille Porsangen](http://datazone.birdlife.org/site/factsheet/lille-porsangen-iba-norway) [(No current code) Slettnes](http://datazone.birdlife.org/site/factsheet/slettnes-iba-norway)[NO008 - Omgangsstauran](http://datazone.birdlife.org/site/factsheet/omgangsstauran-iba-norway)[NO007 - Tanamunningen](http://datazone.birdlife.org/site/factsheet/tanamunningen-iba-norway) [NO006 - Kongsøy IBA](http://datazone.birdlife.org/site/factsheet/kongs%C3%B8y-iba-norway)[(No current code) Båtsfjord](http://datazone.birdlife.org/site/factsheet/b%C3%A5tsfjord-iba-norway)[NO005 -Syltefjordstauran](http://datazone.birdlife.org/site/factsheet/syltefjordstauran-iba-norway)[(No current code) Persfjorden](http://datazone.birdlife.org/site/factsheet/persfjorden-iba-norway)[(No current code) Varanger Peninsula](http://datazone.birdlife.org/site/factsheet/varanger-peninsula-iba-norway) [(No current code) Varangerfjord](http://datazone.birdlife.org/site/factsheet/varangerfjord-%28including-horn%C3%B8ya-and-rein%C3%B8ya%29-iba-norway)[(No current code) Sirbma fields](http://datazone.birdlife.org/site/factsheet/sirbma-fields-iba-norway) [NO002 - Neiden & Munkefjord](http://datazone.birdlife.org/site/factsheet/neiden-%26-munkefjord-iba-norway)[NO001 - Øvre Pasvik](http://datazone.birdlife.org/site/factsheet/%C3%B8vre-pasvik-iba-norway) [NO012 - Inner Porsangerfjord](http://datazone.birdlife.org/site/factsheet/inner-porsangerfjord-iba-norway)[(No current code) Iesjavri](http://datazone.birdlife.org/site/factsheet/ie%C5%A1j%C3%A1vri-iba-norway) [(No current code) Altaelvmunningen](http://datazone.birdlife.org/site/factsheet/altaelvmunningen-iba-norway) [NO013 -Alta-Kautokeino watercourse](http://datazone.birdlife.org/site/factsheet/alta-kautokeino-watercourse-iba-norway)[(No current code) Øvre Anarjohka](http://datazone.birdlife.org/site/factsheet/%C3%B8vre-an%C3%A1rjohka-iba-norway) |
| Norway | Jæren area | Rogaland | 58.7085 | 5.7259 | 596 | 155 | 1,036 | There are a large number of nature reserves within the Jæren area | [NO044 - Jæren](http://datazone.birdlife.org/site/factsheet/j%C3%A6ren-iba-norway) |
| Austria | Burgenland | Burgenland | 47.9700 | 17.0000 | 584 | 101 | 1,068 |  | [AT001 - Austrian part of Hanság](http://datazone.birdlife.org/site/factsheet/austrian-part-of-hans%C3%A1g-iba-austria)[AT002 - Parndorfer Platte and Heideboden](http://datazone.birdlife.org/site/factsheet/parndorfer-platte-and-heideboden-iba-austria)[AT003 - Southern Seewinkel and Zitzmannsdorfer Wiesen](http://datazone.birdlife.org/site/factsheet/southern-seewinkel-and-zitzmannsdorfer-wiesen-iba-austria)[AT004 - Neusiedler See](http://datazone.birdlife.org/site/factsheet/neusiedler-see-iba-austria)[AT006 - North-eastern Leithagebirge](http://datazone.birdlife.org/site/factsheet/north-eastern-leithagebirge-iba-austria)[AT007 - Surroundings of Mattersburg](http://datazone.birdlife.org/site/factsheet/surroundings-of-mattersburg-iba-austria) |
| Ireland | Dublin | Dublin | 53.4167 | -6.2500 | 474 | 8 | 939 |  |  |
| Georgia | Batumi bottleneck. Westernmost section of the Meskheti range.  | Autonomos Republic of Adjara | 41.7333 | 41.8000 | 458 | 172 | 743 | Mtirala National Park  | [GE014 - Batumi](http://datazone.birdlife.org/site/factsheet/18588) |
| Georgia | Kolkheti Lowland | Samegrelo Region | 42.1667 | 41.8333 | 458 | 172 | 743 | Kolkheti National Park | [GE004 - Kolkheti](http://datazone.birdlife.org/site/factsheet/kolkheti-iba-georgia) |
| Belarus | Prypiacki National Park and its game estates | Zytkavichy, Lelchycy, Petrykau districts | 52.9620 | 28.0275 | 436 | 239 | 632 | National park | [BY036 - Prypiackija baloty](http://datazone.birdlife.org/site/factsheet/prypiackija-baloty-iba-belarus) |
| Belarus | Sialiec Fishfarm | Biaroza district | 52.6500 | 24.8667 | 436 | 239 | 632 |  | [BY011 - Sialiec](http://datazone.birdlife.org/site/factsheet/sialiec-iba-belarus) |
| Belarus | Bielaje Fishfarm | Zytkavichy district | 52.2827 | 27.6512 | 436 | 239 | 632 |  | [BY019 - Bielaje fish farm](http://datazone.birdlife.org/site/factsheet/bielaje-fish-farm-iba-belarus) |
| Belarus | Paliessie fishfarm | Zytkavichy district | 52.2965 | 26.2887 | 436 | 239 | 632 |  | [BY015 - Paliessie fish farm](http://datazone.birdlife.org/site/factsheet/paliessie-fish-farm-iba-belarus) |
| Belarus | Cyrvonaya slabada Fishfarm | Kopyl and Kleck districts | 52.8399 | 27.0409 | 436 | 239 | 632 |  |  |
| Belarus | Laktysy Fishfarm | Hancevichy and Kleck districts | 52.8043 | 26.7645 | 436 | 239 | 632 |  |  |
| Belarus | Dnepra-Buhski Fishfarm | Drahichyn district | 52.1082 | 24.9617 | 436 | 239 | 632 |  |  |
| Slovakia | South West Slovakia  | District: Galanta, Senec, Trnava  | 48.2259 | 17.6167 | 427 | 141 | 712 | SPA Uľanska Mokraď, SPA Špačinsko nižnianske polia  | [(No current code) Pusté Úľany - Zeleneč](http://datazone.birdlife.org/site/factsheet/puste-ulany-zelenec-iba-slovakia) [(No current code) Spačince - Nižná](http://datazone.birdlife.org/site/factsheet/spacince--nizna-iba-slovakia) |
| Norway | Engerdal municipality | Hedmark | 61.9205 | 11.9530 | 298 | 77 | 518 | Several nature reserves and one national park lie within Engerdal municipality. |  |
| Norway | Helgeland area | Nordland | 66.0098 | 12.2712 | 298 | 77 | 518 | There are a large number of nature reserves within the Helgeland area | [(No current code) Tenna & Herøy](http://datazone.birdlife.org/site/factsheet/tenna-%26-her%C3%B8y-iba-norway)[NO030 - Vegaøyan](http://datazone.birdlife.org/site/factsheet/vega-archipelago-iba-norway)  |
| Estonia | Prangli Island | Harju County | 59.6264 | 25.0144 | 253 | 66 | 440 | Prangli SCI (EE0010126) |  |
| Ireland | Limerick | Limerick | 52.5000 | -8.7500 | 237 | 4 | 469 |  |  |
| Ireland | Tipperary | Tipperary | 52.6667 | -7.8333 | 237 | 4 | 469 |  |  |
| Ireland | Waterford | Waterford | 52.2500 | -7.5000 | 237 | 4 | 469 |  |  |
| Bulgaria | Sofia region  | Sofia district  | 42.8082 | 23.1383 | 188 | 58 | 319 |  | [BG001 - Rayanovtsi](http://datazone.birdlife.org/site/factsheet/rayanovtsi-iba-bulgaria)[BG004 - Dolni Bogrov-Kazichene](http://datazone.birdlife.org/site/factsheet/dolni-bogrov-kazichene-iba-bulgaria)  |
| Bulgaria | Sakar mountain | Haskovo and Yambol districts  | 42.0774 | 26.4422 | 188 | 58 | 319 |  | [BG021 - Sakar](http://datazone.birdlife.org/site/factsheet/sakar-iba-bulgaria) |
| Latvia | Lake Babīte | Babite district | 56.9137 | 23.7128 | 136 | 48 | 223 | Babīte lake | [LV022 - Babite lake](http://www.birdlife.org/datazone/sitefactsheet.php?id=305) |
| Latvia | Mērsrags beach | Mersrags district | 57.3567 | 23.1341 | 136 | 48 | 223 | Lake Engure Nature park | [LV020 - Engure lake](http://www.birdlife.org/datazone/sitefactsheet.php?id=307) |
| Latvia | Lake Liepāja | Liepaja, Noca district, Grobina district | 56.4560 | 21.0575 | 136 | 48 | 223 | Liepaja lake | [LV004 - Liepaja lake](http://www.birdlife.org/datazone/sitefactsheet.php?id=310) |
| Latvia | Lake Lubāns | Rezekne district, Madona district. | 56.7624 | 26.8772 | 136 | 48 | 223 | Lubans wetlands | [LV052 - Lubans and fish-ponds](http://www.birdlife.org/datazone/sitefactsheet.php?id=318) |
| Ireland | Clare | Clare | 52.833 | -9.0000 | 79 | 1 | 156 |  |  |
| Ireland | Offaly | Offaly | 53.25 | -7.5000 | 79 | 1 | 156 |  |  |
| United Kingdom | Angus Glens | Glenogil, Angus | 56.8000 | -2.9000 | Unknown | Unknown | Unknown |  |  |
| United Kingdom | South Lanarkshire | Lanarkshire | 55.5000 | -3.7000 | Unknown | Unknown | Unknown |  | [UK100 - Muirkirk and North Lowther Uplands](http://datazone.birdlife.org/site/factsheet/muirkirk-and-north-lowther-uplands-iba-united-kingdom) |
| United Kingdom | Scottish Borders | Midlothian | 55.8000 | -2.9000 | Unknown | Unknown | Unknown |  | [UK 205 - Moorfoot Hills](http://datazone.birdlife.org/site/factsheet/moorfoot-hills-iba-united-kingdom)[UK153 - Gladhouse Reservoir](http://datazone.birdlife.org/site/factsheet/gladhouse-reservoir-iba-united-kingdom)  |
| United Kingdom | Peak District | Derbyshire, South Yorkshire | 53.4000 | -1.8000 | Unknown | Unknown | Unknown | Peak District National Park | [South Pennine and Peak District Moors - UK062](http://datazone.birdlife.org/site/factsheet/south-pennine-and-peak-district-moors-iba-united-kingdom) |
| United Kingdom | Aberfeldy | Perthshire, Perth and Kinross | 56.7000 | -3.9000 | Unknown | Unknown | Unknown |  |  |



# **Figure S1.** Spatial pattern of illegal killing/taking of raptors in Northern and Central Europe and Caucasus in terms of the mean estimated number of individual birds illegally killed/taken per year per country and the mean estimated trend in illegal killing/taking over the last 10 years. Mean estimated trends (as listed in Table 1 and Table S3) were categorised as: substantial decline (mean <-1.5), moderate decline (-1.5 to -0.5), stable (-0.4 to +0.4), moderate increase (+0.5 to +1.5) or substantial increase (>+1.5).



# **Figure S2.** Spatial pattern of illegal killing/taking of birds in Europe in terms of the mean estimated number of individual birds illegally killed/taken per year per country a) in absolute values, b) per km² and c) per 100 people (hatched country: data from Brochet et al. 2016).

# **Note on lead shot issue**

Review purpose and assumption

Please note that in this study, estimates of illegal killing and taking of birds did not include illegal use of lead shot, except where this was accompanied by other forms of illegality. This was owing to a lack of comparable information between countries/territories on the scale of this issue and complexities of how lead shot use is regulated at the state and province level. This issue has been examined in more depth in the UK and is further explored below.

The authors recognise, however, that there are additional mortality and morbidity impacts which result from lead shot use, which have been well documented (e.g. Clark and Scheuhammer 2003, Helander *et al.* 2009, Berny *et al.* 2015, Madry *et al.* 2015, Green and Pain 2016, Wiemeyer *et al.* 2017) but are not accounted for in this study.

UK example

Cromie *et al.* (2015) using questionnaire surveys of hunters showed that as well as being illegal, the use of lead shot despite the ban in place is quite clearly deliberate. Lead gunshot use for duck shooting has been illegal in England since 1999 yet hunters are choosing to use lead gunshot for duck shooting rather than comply with the law, with more than 80% of sampled ducks found to be illegally shot with lead. This means that hundreds of thousands of ducks could potentially be classed as illegally killed (hunting bag statistics in the UK: 1 million ducks shot in 2012/2013 hunting season; PACEC 2014). The UK is the only European country/territory for which we were able to find such data on rate of non-compliance with a lead ban.

Recommendations

Use of lead shot as illegal ammunition should be more intensively monitored in all countries/territories so that comparable data can be included in any future assessments of illegal killing and taking of birds.

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