**Supplementary Material**

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

Anne-Laure Brochet, Willem Van Den Bossche, VICTORIA R. JONES, Holmfridur Arnardottir, Dorin Damoc, Miroslav Demko, Gerald Driessens, Knud Flensted, Michael Gerber, Mamikon Ghasabyan, Dimitar Gradinarov, Janus Hansen, Marton Horvath, Marius Karlonas, Jarosław Krogulec, Tatiana Kuzmenko, Lars Lachman, Teemu Lehtiniemi, Patric Lorgé, Ulrik Lötberg, John Lusby, Gert Ottens, Jean-yves Paquet, Alexander Rukhaia, Matthias Schmidt, Paul Shimmings, Andris Stipnieks, Elchin Sultanov, ZdenĚk Vermouzek, Alexandre Vintchevski, Veljo Volke, Georg Willi, STUART H.M. BUTCHART

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# **Full Acknowledgement**

We record below our particular thanks to the following people and organisations, who have provided or revised national data on illegal killing and taking of birds included within this paper and/or who have supported national data contributors/compilers to work on this issue, asking for forgiveness from anyone whose name is inadvertently omitted or misspelled:

Armenia: Tsovinar Hovhannisyan and Levon Harutyunyan (Armenian Society for the Protection of Birds-ASPB); Artur Beglaryan (Senior inspector, Ministry of Nature Protection, State Environmental Inspectorate); Artak Sargsyan (Senior inspector, Sevan National Park); Vardges Hakobyan (taxidermist, Nature museum of Armenia); Shaqro Ghazaryan, Rudik Tatoyan, Vardges Karakhanyan (IBA caretakers); Eghya Zadoyan (CEO Armash fish farm), Vilen Minasyan (hunter).

Austria: Remo Probst (BirdLife Austria); Christian Pichler (WWF Austria); Richard Zink (University of Veterinary Medicine, Vienna); Hans Frey (EGS Haringsee).

Azerbaijan: Tahie Kerimov and Arzu Mammadov (Azerbaijan Ornithological Society-AOS); Michael Heiss.

Belarus: Irina Samusenko and Pavel Pinchuk (Scientific-Practical Center for Bioresources, National Academy of Sciences of Belarus); Vadzim Prakapchuk (hunter).

Belgium: Marita Arvela (Policy Officer EU); Jan Rodts and Nicolas Brackx (Vogelbescherming Vlaanderen); Mark Vandenmeerschaut (Agentschap voor Natuur en Bos-ANB).

Bulgaria: Stoycho Stoychev, Petar Iankov, Irina Kostadinova-Mateeva and Stoyan Nikolov (Bulgarian Society for the Protection of Birds-BSPB).

Czechia: Petr Lumpe (Czech Society for Ornithology-CSO); all contributors to the Free Wings database (database of illegal persecutions led by CSO); Libuse Vlasakova (Ministry of the Environment); Josef Chytil (Ornithological Station of Comenius Museum Přerov).

Denmark: Lasse Sehested Jensen (Ministry of Environment and Food of Denmark).

Estonia: Jaanus Elts (Estonian Ornithological Society-EOS); Piret Reinsalu (Environmental Inspectorate); Madis Leivits DVM (Estonian University of Life Sciences).

Faroe Islands: Johannis Danielsen and William Simonsen (Faroese Ornithological Society-FOS).

Finland: Tero Toivanen and Aki Arkiomaa (BirdLife Finland), Finnish ringing center.

Georgia: Aslan Bolkvadze, Natia Javakhishvili, Anna Sandor, Dennis de los Ríos, Anders Gray and Oliver Reville (SABUKO Society for Nature Conservation); Brecht Verhelst (BirdLife International); Zura Javakhisvili and Lexo Gavashelishvili (Ilia State University-ISU); Gareth Goldthorpe (Fauna & Flora International-FFI); Johannes Jansen, Wouter Mertens and Wouter Vansteelant (Batumi Raptor Count-BRC); Amiran Kodiashvili (Friends Association of Vashlovani Protected Areas-FAVPA); Local poachers; National Falconry Union of Georgia; Teona Karchava (Ministry of Environment and Natural Resources Protection of Georgia).

Germany: Committee Against Bird Slaughter-CABS; Armin Winter (Deutscher Jagdverband e.V.)

Hungary: Gergo Halmos, Karoly Nagy and Gábor Deák (Magyar Madártani és Természetvédelmi Egyesület-MME); András Schmidt and Gergő Gábor Nagy (Ministry of Agriculture).

Iceland: Anonymous members (Fuglavernd).

Ireland: Sinead Cummins (BirdWatch Ireland); Emma Higgs (Wildlife Crime); Allan Mee (Golden Eagle Trust); David Scallan (European Federation of Associations for Hunting and Conservation-FACE), Barry O’Donoghue (NPWS).

Latvia: Anonymous members (Latvian Ornithological Society-LOB); Aiva Bondare (State forestry service); Santa Kirsanova (Nature Conservation Agency); Mara Janaus (Institute of Biology, Laboratory of Ornithology).

Lithuania: Liutauras Raudonikis (Lithuanian Ornithological Society-LOD); Julius Morkūnas (Klaipėda University); Džiugas Anuškevičius (Ministry of Environment).

Netherlands: Gert Ottens, Jip Louwe Kooijmans and Gerald Derksen (Society for the Protection of Birds-VBN); Central Veterinary Institute-CVI); Dierenbescherming; Wim Knol (Royal Dutch Huning Association); Wilmar Remmelts (Ministerie van Economische Zaken).

Norway : Oddvar Heggøy and anonymous local contacts (BirdLife Norway); Øystein R. Størkersen (Norwegian Environment Agency).

Poland: Monika Lesz (Ministry of Environment).

Romania: Fantana Ciprian, Dani Dragan, Sebastian Bugariu and Emil Todorov (Romanian Ornithological Society-SOR); Daroczi Szilard (Milvus Group).

Slovakia: J. Gúgh, J. Ridzon and A. Chudý (SOS/BirdLife Slovakia); D. Karaska and M. Macek (State Nature Conservation of the Slovak republic-SNC); Zuzana Guziová (Raptor Protection of Slovakia-RPS).

Sweden: Thomas Birkö, Claes Kyrk, Kenneth Bengtsson, Måns Hjernquist, Peter Nilsson, Lars Gezelius, Tommy Larsson, Mats Axbrink, Lars Harnemo, Tommy Järås and Rolf Larsson (BirdLife Sweden); Peter Hellström (Museum of Natural History Stockholm).

Ukraine: Oleg Dudkin, Olga Yaremchenko, Vasyl Ilchuk, (Ukrainian Society for the Protection of Birds-USPB); Yuriy Kuzmenko (Shmalhausen Institute of Zoology of National Academy of Science of Ukraine); Rostyslav Zhuravchak (Rivnensky Nature Reserve); Yuriy Strus (State Museum of Natural History of National Academy of Science of Ukraine); Andriy Sagaidak (Mizhrichynskiy Regional Landscape Park); Andriy Miskov (Desniansko-Starohutskiy National Nature Park); Olexandr Fedun (Shevchenka National Pedagogical University of Chernihiv); Olexandr Bronskov (Meotyda National Nature Park); Andriy Kyiko (Regional Nature Center of Lviv).

United Kingdom: Neil Douglas, Helen Mason and Staffan Roos (Royal Society for the Protection of Birds-RSPB); Matt Ellis (British Association for Shooting and Conservation-BASC); Simon Mackown (Department for Environment, Food and Rural Affairs-DEFRA); Andy Musgrove (British Trust for Ornithology-BTO); Paul Shimmings (BirdLife Norway); David Stroud (Joint Nature Conservation Committee-JNCC).

International: Marita Arvela (European Commission); Iva Obretenova (Bern Convention); Borja Heredia, Fernando Spina and Marco Barbieri (Convention on Migratory Species-CMS); Sergey Dereliev and Saulius Svazas (African-Eurasian Migratory Waterbird Agreement-AEWA); Nick Williams, Jenny Renell and Des Thompson (Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia-Raptors MOU); Alex Ngari and Olivier Biber (African-Eurasian Migratory Landbirds Action Plan-AEMLAP); David Scallan (European Federation of Associations for Hunting and Conservation-FACE); Marguerite Tarzia (BirdLife International).

# **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 = informed  expert opinion to  3= extrapolated from  systematic 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)

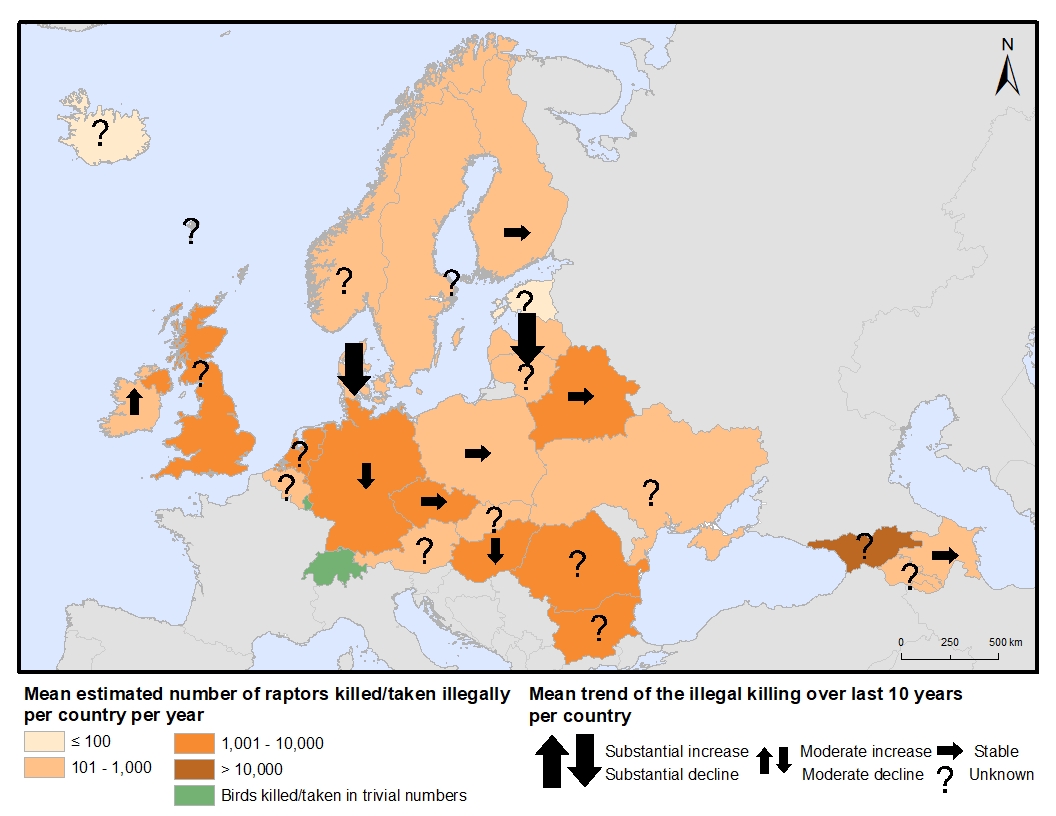
\* Maximum estimate is unknown as EU27 minimum population estimate sets to 0

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

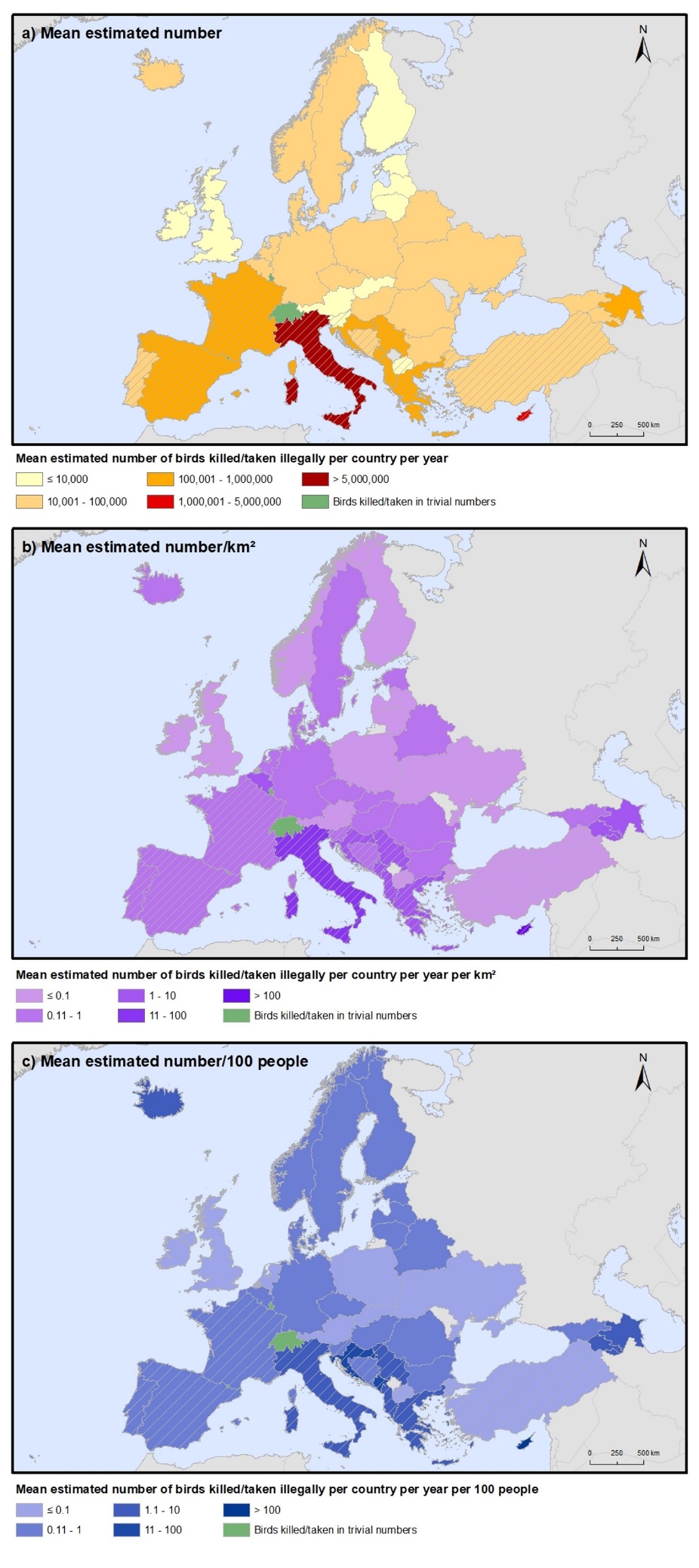
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Country (\*EU member state)** | **No. of species regularly occurring** | **% of species known or likely to be illegally killed/taken (values in parentheses include species killed/taken in insignificant numbers)** | **Mean estimated no. of 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:\temp\IKB\Riverine%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-(including-horn%C3%B8ya-and-rein%C3%B8ya)-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-&-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-&-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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