Status and Distribution of Waterbirds in a Natura 2000 Area: The Case of Gialova Lagoon, Messinia, Greece

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**Supplementary material**

**Table A1:** Table of observed birds in Gialova Lagoon (October 2016 – January 2019) according to BirdLife taxonomic basis (BirdLife, 2019), their conservation status in Europe (BirdLife International, 2015; Birds Directive 2009/147/EC, 2009) and Greece ((Legakis and Maragou, 2009; Handrinos et al., 2015; IUCN, 2020).), and Annex category in the Birds’ Directive (Birds Directive 2009/147/EC, 2009). Wetland species (waterbirds and wetland depended) are highlighted with bold. The maximum number of waterbirds’ individuals during the current (Max ’16-’19) and Kardakari, 2000 study.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Birds Category** | **Order** | **Family** | ***Scientific name*** | **Max ’16 -‘19** | **Max 2000** | **IUCN status (Eur/GR)** | **Birds' dir. (Annexes)** | |
| **Birds of prey** | Accipitriformes | Accipitridae | *Accipiter nisus* |  |  | LC/ NE | | I\* |
| Accipitriformes | Accipitridae | *Aquila pomarina* |  |  | LC/ **EN** | | I |
| Accipitriformes | Accipitridae | *Buteo buteo* |  |  | LC/ NE | |  |
| Accipitriformes | Accipitridae | *Circaetus gallicus* |  |  | LC/ **NT** | | I |
| **Accipitriformes** | **Accipitridae** | ***Circus aeruginosus*** |  |  | LC/ **VU** | | I |
| **Accipitriformes** | **Accipitridae** | ***Circus cyaneus*** |  |  | **ΝΤ**/ NE | | I |
| Accipitriformes | Accipitridae | *Hieraaetus pennatus* |  |  | LC/ **EN** | | I |
| **Accipitriformes** | **Padionidae** | ***Pandion haliaetus*** |  |  | LC/ LC | | I |
| Falconiformes | Falconidae | *Falco peregrinus* |  |  | LC/ LC | | I |
| Falconiformes | Falconidae | *Falco tinnunculus* |  |  | LC/ NE | |  |
| **Owls** | Strigiformes | Strigidae | *Athene noctua* |  |  | LC/ NE | |  |
| Strigiformes | Strigidae | *Bubo bubo* |  |  | LC/ LC | | I |
| Strigiformes | Tytonidae | *Tyto alba* |  |  | LC/ NE | |  |
| **Wildfowl** | **Anseriformes** | **Anatidae** | ***Anas acuta*** | 80 | 1490 | LC/ NE | | IIA, IIIB |
| **Anseriformes** | **Anatidae** | ***Anas crecca*** | 378 | 2500 | LC/ NE | | IIA, IIIB |
| **Anseriformes** | **Anatidae** | ***Anas platyrhynchos*** | 265 | 311 | LC/ NE | | IIA, IIIA |
| **Anseriformes** | **Anatidae** | ***Anser anser*** | 2 | 1 | LC/ **CR** | | IIA, IIIB |
| **Anseriformes** | **Anatidae** | ***Aythya ferina*** | 9 | 2220 | **VU**/ LC | | IIA, IIIB |
| **Anseriformes** | **Anatidae** | ***Aythya marila*** | 1 | 0 | **VU**/ NE | | IIB, IIIB |
| **Anseriformes** | **Anatidae** | ***Aythya nyroca*** | 12 | 26 | LC/ **VU** | | I |
| **Anseriformes** | **Anatidae** | ***Mareca penelope*** | 355 | 1200 | LC/ NE | | IIA, IIIB |
| **Anseriformes** | **Anatidae** | ***Mareca strepera*** | 21 | 65 | LC/ **VU** | | IIA |
| **Anseriformes** | **Anatidae** | ***Spatula clypeata*** | 160 | 780 | LC/ NE | | IIA, IIIB |
| **Anseriformes** | **Anatidae** | ***Spatula querquedula*** | 70 | 700 | LC/ **VU** | | IIA |
| **Anseriformes** | **Anatidae** | ***Tadorna tadorna*** | 9 | 43 | LC/ **VU** | |  |
| **Anseriformes** | **Anatidae** | ***Cygnus olor*** | 9 | 0 | LC/ LC | | IIB |
| **Rails & Crakes** | **Gruiformes** | **Rallidae** | ***Gallinula chloropus*** | 47 | 80 | LC/ NE | | IIB |
| **Gruiformes** | **Rallidae** | ***Fulica atra*** | 712 | 9000 | **NT**/ NE | | IIA, IIIB |
| **Gruiformes** | **Rallidae** | ***Rallus aquaticus*** | 8 | 50 | LC/ NE | | IIB |
| **Grebes** | **Podicipediformes** | **Podicipedidae** | ***Podiceps cristatus*** | 13 | 10 | LC/ NE | |  |
| **Podicipediformes** | **Podicipedidae** | ***Podiceps nigricollis*** | 21 | 50 | LC/ NE | |  |
| **Podicipediformes** | **Podicipedidae** | ***Tachybaptus ruficollis*** | 36 | 80 | LC/ NE | |  |
| **Waders** | **Charadriiformes** | **Charadriidae** | ***Charadrius alexandrinus*** | 43 | 50 | LC/ LC | | I |
| **Charadriiformes** | **Charadriidae** | ***Charadrius dubius*** | 38 | 65 | LC/ NE | |  |
| **Charadriiformes** | **Charadriidae** | ***Charadrius hiaticula*** | 31 | 0 | LC/ NE | |  |
| **Charadriiformes** | **Charadriidae** | ***Pluvialis apricaria*** | 38 | 35 | LC/ NE | | I, IIB, IIIB |
| **Charadriiformes** | **Charadriidae** | ***Pluvialis squatarola*** | 23 | 16 | LC/ NE | | IIB |
| **Charadriiformes** | **Charadriidae** | ***Vanellus spinosus*** | 1 | 1 | LC/ **VU** | | I |
| **Charadriiformes** | **Charadriidae** | ***Vanellus vanellus*** | 16 | 45 | **VU/ VU** | | IIB |
| **Charadriiformes** | **Recurvirostridae** | ***Himantopus himantopus*** | 80 | 0 | LC/ LC | | I |
| **Charadriiformes** | **Recurvirostridae** | ***Recurvirostra avosetta*** | 2 | 35 | LC/ **VU** | | I |
| **Charadriiformes** | **Scolopacidae** | ***Actitis hypoleucos*** | 9 | 50 | LC/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Calidris alba*** | 6 | 0 | LC/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Calidris alpina*** | 98 | 60 | LC/ NE | | I\* |
| **Charadriiformes** | **Scolopacidae** | ***Calidris ferruginea*** | 28 | 700 | **VU**/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Calidris minuta*** | 32 | 530 | LC/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Calidris pugnax*** | 93 | 1450 | LC/ NE | | I, IIB |
| **Charadriiformes** | **Scolopacidae** | ***Calidris temminckii*** | 7 | 2 | LC/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Gallinago gallinago*** | 40 | 340 | LC/ NE | | IIA, IIIB |
| **Charadriiformes** | **Scolopacidae** | ***Limosa limosa*** | 8 | 255 | **VU**/ NE | | IIB |
| **Charadriiformes** | **Scolopacidae** | ***Numenius arquata*** | 21 | 255 | **VU**/ LC | | IIB |
| **Charadriiformes** | **Scolopacidae** | ***Numenius phaeopus*** | 1 | 5 | LC/ NE | | IIB |
| **Charadriiformes** | **Scolopacidae** | ***Tringa erythropus*** | 4 | 80 | LC/ NE | | IIB |
| **Charadriiformes** | **Scolopacidae** | ***Tringa glareola*** | 9 | 1155 | LC/ LC | | I |
| **Charadriiformes** | **Scolopacidae** | ***Tringa nebularia*** | 3 | 110 | LC/ NE | | IIB |
| **Charadriiformes** | **Scolopacidae** | ***Tringa ochropus*** | 6 | 15 | LC/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Tringa stagnatilis*** | 11 | 100 | LC/ NE | |  |
| **Charadriiformes** | **Scolopacidae** | ***Tringa totanus*** | 35 | 300 | LC/ NE | | IIB |
| **Gulls, Terns & Cormorants** | **Charadriiformes** | **Laridae** | ***Larus genei*** | 3 | 20 | LC/ **VU** | | I |
| **Charadriiformes** | **Laridae** | ***Larus melanocephalus*** | 38 | 0 | LC/ **EN** | | I |
| **Charadriiformes** | **Laridae** | ***Larus michahellis*** | 77 | 0 | LC/ NE | |  |
| **Charadriiformes** | **Laridae** | ***Larus ridibundus*** | 35 | 400 | LC/ NE | | IIB |
| **Charadriiformes** | **Laridae** | ***Chlidonias hybrida*** | 1 | 39 | LC/ **EN** | | I |
| **Charadriiformes** | **Laridae** | ***Chlidonias leucopterus*** | 2 | 24 | LC/ NE | |  |
| **Charadriiformes** | **Laridae** | ***Hydroprogne caspia*** | 9 | 0 | LC/ NE | | I |
| **Charadriiformes** | **Laridae** | ***Sterna hirundo*** | 2 | 0 | LC/ LC | | I |
| **Charadriiformes** | **Laridae** | ***Thalasseus sandvicensis*** | 10 | 15 | LC/ **VU** | | I |
| **Suliformes** | **Phalacrocoracidae** | ***Phalacrocorax carbo*** | 739 | 1000 | LC/ NE | |  |
| **Herons, Ibises and Flamingos** | **Pelecaniformes** | **Ardeidae** | ***Ardea alba*** | 83 | 360 | LC/ **VU** | | I |
| **Pelecaniformes** | **Ardeidae** | ***Ardea cinerea*** | 37 | 478 | LC/ NE | |  |
| **Pelecaniformes** | **Ardeidae** | ***Ardea purpurea*** | 4 | 79 | LC/ **EN** | | I |
| **Pelecaniformes** | **Ardeidae** | ***Ardeola ralloides*** | 3 | 45 | LC/ **VU** | | I |
| **Pelecaniformes** | **Ardeidae** | ***Botaurus stellaris*** | 2 | 10 | LC/ **EN** | | I |
| **Pelecaniformes** | **Ardeidae** | ***Egretta garzetta*** | 54 | 200 | LC/ LC | | I |
| **Pelecaniformes** | **Ardeidae** | ***Ixobrychus minutus*** | 1 | 0 | LC/ LC | | I |
| **Pelecaniformes** | **Ardeidae** | ***Nycticorax nycticorax*** | 20 | 0 | LC/ **NT** | | I |
| **Pelecaniformes** | **Threskiornithidae** | ***Plegadis falcinellus*** | 11 | 380 | LC/ **CR** | | I |
| **Pelecaniformes** | **Threskiornithidae** | ***Platalea leucorodia*** | 2 | 10 | LC/ **VU** | | I |
| **Phoenicopteriformes** | **Phoenicopteridae** | ***Phoenicopterus roseus*** | 439 | 72 | LC/ LC | | I |
| **Wablers** | **Passeriformes** | **Acrocephalidae** | ***Acrocephalus arundinaceus*** |  |  | LC/ NE | |  |
| **Passeriformes** | **Acrocephalidae** | ***Acrocephalus melanopogon*** |  |  | LC/ **VU** | | Ι |
| **Passeriformes** | **Acrocephalidae** | ***Acrocephalus scirpaceus*** |  |  | LC/ NE | |  |
| **Passeriformes** | **Acrocephalidae** | ***Acrocephalus schoenobaenus*** |  |  | LC/ NE | |  |
| Passeriformes | Acrocephalidae | *Iduna pallida* |  |  | LC/ NE | |  |
| **Passeriformes** | **Cettiidae** | ***Cettia cetti*** |  |  | LC/ NE | |  |
| **Passeriformes** | **Scotocercidae** | ***Cisticola juncidis*** |  |  | LC/ NE | |  |
| Passeriformes | Sylvidae | *Sylvia atricapilla* |  |  | LC/ NE | |  |
| Passeriformes | Sylvidae | *Sylvia cantillans* |  |  | LC/ NE | |  |
| Passeriformes | Sylvidae | *Sylvia melanocephala* |  |  | LC/ NE | | Ι |
| Passeriformes | Phylloscopidae | *Phylloscopus collybita* |  |  | LC/ NE | |  |
| Passeriformes | Phylloscopidae | *Phylloscopus trochilus* |  |  | LC/ NE | |  |
| **Crows** | Passeriformes | Corvidae | *Corvus corax* |  |  | LC/ NE | |  |
| Passeriformes | Corvidae | *Corvus corone* |  |  | LC/ NE | | IIB |
| Passeriformes | Corvidae | *Corvus monedula* |  |  | LC/ NE | | IIB |
| Passeriformes | Corvidae | *Garrulus glandarius* |  |  | LC/ NE | | IIB |
| Passeriformes | Corvidae | *Pica pica* |  |  | LC/ NE | | IIB |
| **Cranes** | **Gruiformes** | **Gruidae** | ***Grus grus*** |  |  | LC/ DD | | I |
| **Swifts, Swallows & Martins** | Caprimulgiformes | Apodidae | *Apus apus* |  |  | LC/ NE | |  |
| Caprimulgiformes | Apodidae | *Tachymarptis melba* |  |  | LC/ NE | |  |
| Passeriformes | Hirundinidae | *Delichon urbicum* |  |  | LC/ NE | |  |
| Passeriformes | Hirundinidae | *Cecropis (Hirundo) daurica* |  |  | LC/ NE | |  |
| Passeriformes | Hirundinidae | *Ptyonoprogne rupestris* |  |  | LC/ NE | |  |
| Passeriformes | Hirundinidae | *Hirundo rustica* |  |  | LC/ NE | |  |
| **Passeriformes** | **Hirundinidae** | ***Riparia riparia*** |  |  | LC/ NE | |  |
| **Bee-eaters** | Passeriformes | Meropidae | *Merops apiaster* |  |  | LC/ NE | |  |
| Bucerotiformes | Upupidae | *Upupa epops* |  |  | LC/ NE | |  |
| **Kingfishers** | **Coraciiformes** | **Alcedinidae** | ***Alcedo atthis*** |  |  | **VU**/ DD | | I |
| **Pigeons & Doves** | Columbiformes | Columbidae | *Columba livia* |  |  | LC/ NE | | IIA |
| Columbiformes | Columbidae | *Streptopelia decaocto* |  |  | LC/ NE | | IIB |
| Columbiformes | Columbidae | *Streptopelia turtur* |  |  | **VU**/ NE | | IIB |
| **Finches** | Passeriformes | Fringillidae | *Carduelis carduelis* |  |  | LC/ NE | |  |
| Passeriformes | Fringillidae | *Chloris chloris* |  |  | LC/ NE | |  |
| Passeriformes | Fringillidae | *Fringilla coelebs* |  |  | LC/ NE | | I\* |
| Passeriformes | Fringillidae | *Linaria cannabina* |  |  | LC/ NE | |  |
| Passeriformes | Fringillidae | *Serinus serinus* |  |  | LC/ NE | |  |
| **Buntings** | Passeriformes | Emberizidae | *Emberiza cirlus* |  |  | LC/ NE | |  |
| Passeriformes | Emberizidae | *Emberiza calandra* |  |  | LC/ NE | |  |
| Passeriformes | Emberizidae | *Emberiza citrinella* |  |  | LC/ NE | |  |
| **Passeriformes** | **Emberizidae** | ***Emberiza schoeniclus*** |  |  | LC/ NE | |  |
| **Sparrows** | Passeriformes | Passeridae | *Passer domesticus* |  |  | LC/ NE | |  |
| Passeriformes | Passeridae | *Passer hispaniolensis* |  |  | LC/ NE | |  |
| **Starlings** | Passeriformes | Sturnidae | *Sturnus vulgaris* |  |  | LC/ NE | | ΙΙΒ |
| **Shrikes** | Passeriformes | Laniidae | *Lanius minor* |  |  | LC/ **NT** | | I |
| Passeriformes | Laniidae | *Lanius senator* |  |  | LC/ NE | |  |
| **Tits** | Passeriformes | Paridae | *Parus major* |  |  | LC/ NE | |  |
| Passeriformes | Paridae | *Cyanistes caeruleus* |  |  | LC/ NE | |  |
| **Passeriformes** | **Remizidae** | ***Remiz pendulinus*** |  |  | LC/ NE | |  |
| **Passeriformes** | **Panuridae** | ***Panurus biarmicus*** |  |  | LC/ NE | |  |
| **Flycatchers** | Passeriformes | Muscicapidae | *Muscicapa striata* |  |  | LC/ NE | |  |
| **Thrushes & Chats** | Passeriformes | Muscicapidae | *Erithacus rubecula* |  |  | LC/ NE | |  |
| Passeriformes | Muscicapidae | *Phoenicurus ochruros* |  |  | LC/ NE | |  |
| Passeriformes | Muscicapidae | *Saxicola rubetra* |  |  | LC/ NE | |  |
| Passeriformes | Muscicapidae | *Saxicola rubicola* |  |  | LC/ NE | |  |
| Passeriformes | Turdidae | *Turdus merula* |  |  | LC/ NE | | ΙΙΒ |
| Passeriformes | Turdidae | *Turdus philomelos* |  |  | LC/ NE | | ΙΙΒ |
| **Pipits & Wagtails** | Passeriformes | Motacillidae | *Anthus campestris* |  |  | LC/ NE | | I |
| Passeriformes | Motacillidae | *Anthus cervinus* |  |  | LC/ NE | |  |
| Passeriformes | Motacillidae | *Anthus pratensis* |  |  | **NT**/ NE | |  |
| Passeriformes | Motacillidae | *Anthus spinoletta* |  |  | LC/ NE | |  |
| Passeriformes | Motacillidae | *Anthus trivialis* |  |  | LC/ NE | |  |
| Passeriformes | Motacillidae | *Motacilla alba* |  |  | LC/ NE | |  |
| Passeriformes | Motacillidae | *Motacilla cinerea* |  |  | LC/ NE | |  |
| Passeriformes | Motacillidae | *Motacilla flava* |  |  | LC/ NE | |  |
| **Wrens** | Passeriformes | Troglodydae | *Troglodytes troglodytes* |  |  | LC/ NE | | Ι\* |
| **Wheatears** | Passeriformes | Muscicapidae | *Oenanthe hispanica* |  |  | LC/ NE | |  |
| Passeriformes | Muscicapidae | *Oenanthe oenanthe* |  |  | LC/ NE | |  |
| **Gamebirds** | Passeriformes | Phasianidae | *Coturnix coturnix* |  |  | LC/ NE | |  |
| **Larks** | Passeriformes | Alaudidae | *Alauda arvensis* |  |  | LC/ **NT** | | ΙΙΒ |
| Passeriformes | Alaudidae | *Galerida cristata* |  |  |  | |  |

**References**

BirdLife International (2015). European Red List of Birds. Luxembourg: Publications Office of the European Union Available at <https://ec.europa.eu/environment/nature/conservation/species/redlist/downloads/European_birds.pdf> (accessed 10 September, 2019).

BirdLife International (2019). BirdLife Taxonomic Basis. Available online at: <http://datazone.birdlife.org/species/taxonomy> (accessed 27 September, 2019).

Birds Directive 2009/147/EC, (2009). The European Union Birds Directive. Available online at: <https://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:32009L0147> (accessed 2 November, 2020).

Handrinos, G., Kazantzidis, S., Alivizatos, C., Akriotis, T., and Portolou, D. (2015). International Waterbird Census in Greece (1968 – 2006). Analysis of the Populations of Wildfowl (Anseriformes) and the Coot (Fulica atra). Athens: Hellenic Ornithological Society – Hellenic Bird Ringing Centre.

IUCN (2020). The IUCN Red List of Threatened Species. Available online at: <https://www.iucnredlist.org/> (accessed 2 November, 2020).

Kardakari, N. (2000). The Birds of Gialova Lagoon: A Report on the Avifauna of the Important Bird Area: Divari Pilou Lagoon (Gialova). Athens: Hellenic Ornithological Society. (Available only in Greek).

Legakis, A., and Maragou, P. (2009). The Red Book of Endangered Species in Greece (in Greek). Athens: Hellenic Zoological Society, 1–528. (Available in Greek).