



Global Species Risk

dr Michał Skakuj





BIRDS AND AVIATION





Aerodromes become more and more attractive to various wildlife species)



Only some 30 species are hazardous to aviation

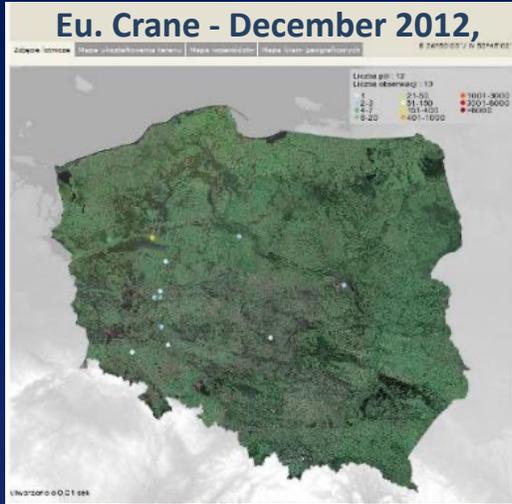




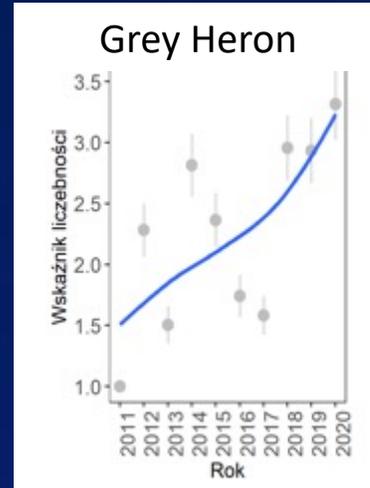
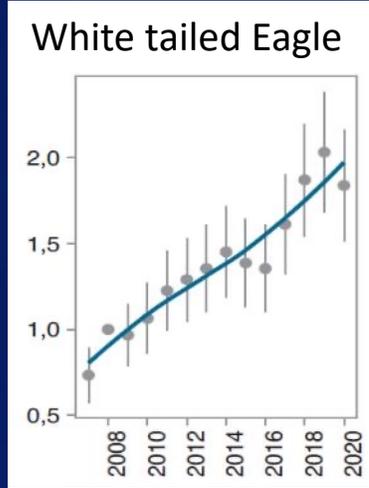
Analysis and investigations show great need of bird/wildlife species detail information



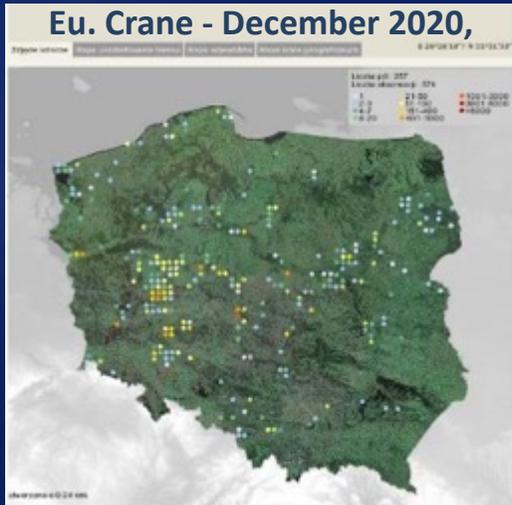
Global Species Risk



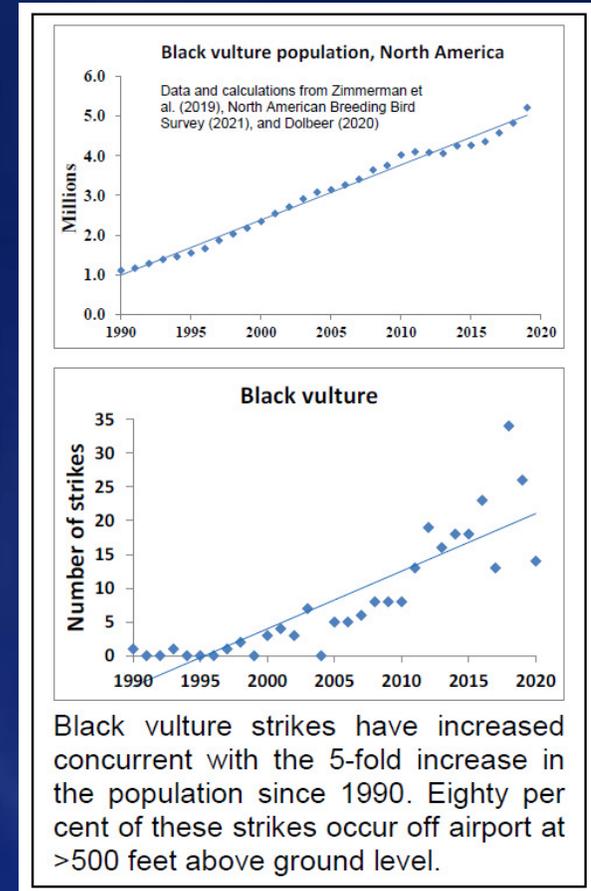
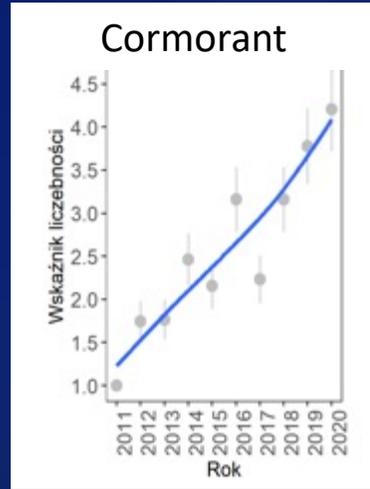
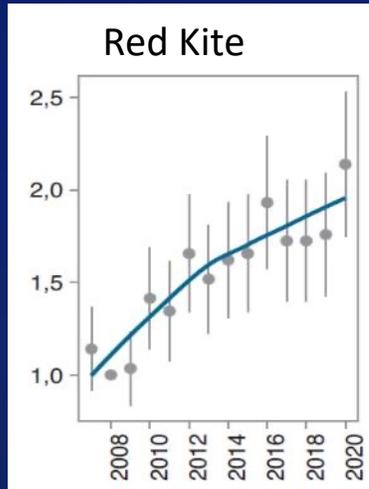
Monitoring Ptaków Polski, GIOŚ, NFOŚiGW



Population increase of some big bird species - local and global scale



www.ormitho.pl



Black vulture strikes have increased concurrent with the 5-fold increase in the population since 1990. Eighty per cent of these strikes occur off airport at >500 feet above ground level.

Dolbeer et al. 2021. Wildlife Strikes to Civil Aircraft in the United States 1990–2020; FAA





Eurasian Crane



Some of large species become more and more abundant on/around aerodromes as an effect of habitat/behavior changes





To effectively mitigate bird/wildlife strike risk we need knowledge and help from wildlife biologist, ornithologist for better understanding of wildlife-aviation interactions

Phot. Kinga Tchurz





HAZARD & RISK





what is HAZARD

Present or potential presence of bird/wildlife that can lead to aviation incident: injury, illness, or death; damage to or loss of a system, equipment, or property;

what is RISK

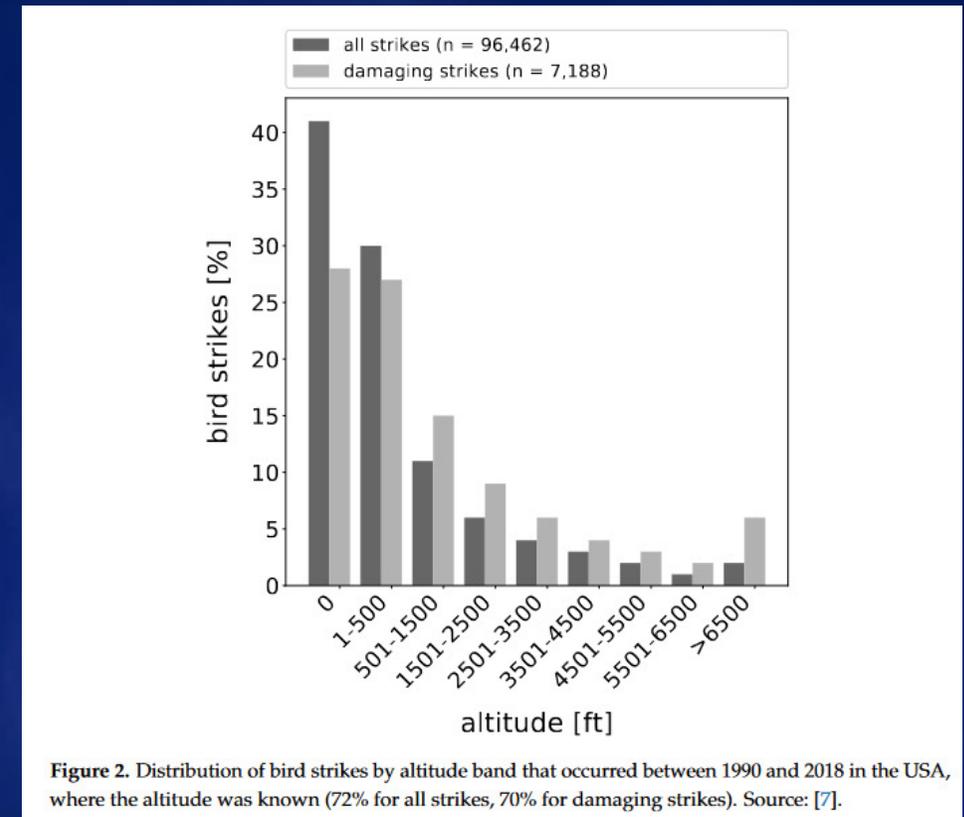
The risk is what may happen if operations interact with any particular hazard/obstacle effected in bird/wildlife strike (like damaging strikes) or air operation incident (go around)





The same HAZARD level may results in different RISK:
like damage to or loss of a system, equipment, or property

LESS VOLNURABLE – LOWER RISK	MORE VOLNURABLE – HIGHER RISK
Wildlife strike certified aircraft (most commercial transport)	Non-certified aircraft (most GA)
Aircraft at lower speed	Aircraft at higer speed
Two engines	One engine
Higher level flight (above 10.000')	Low level flight (below 2.000')



Metz at al. 2020. The Bird Strike Challenge. Aerospace 2020, 7, 26





HAZARD – the key element of RISK analysis

HAZARD LEVEL:

- SPECIES & BEHAVIOUR
- AREAS
- HABITATS
- TIME OF THE YEAR
- ALTITUDE

BIRD SPECIES LIST – HAZARD LEVEL





BIRD SPECIES LIST – HAZARD LEVEL

	BIRD SPECIES	HAZARD LEVEL
1	A
2	B
3	C	
4	D	
5	E	
6	F	
7	G	



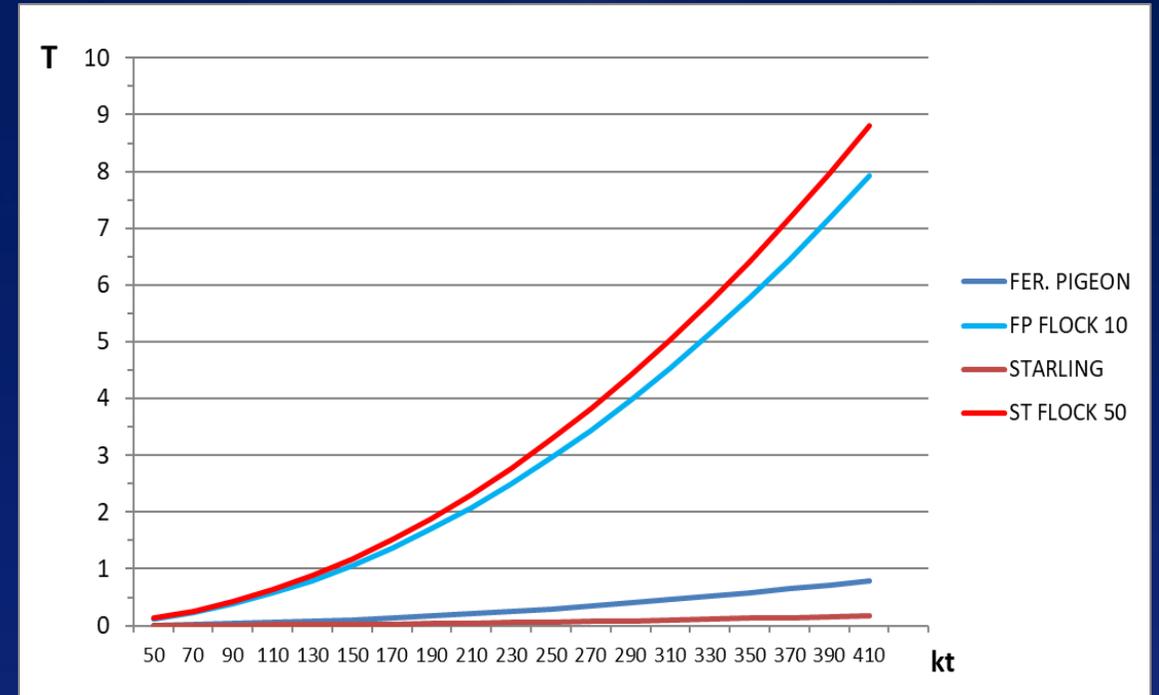
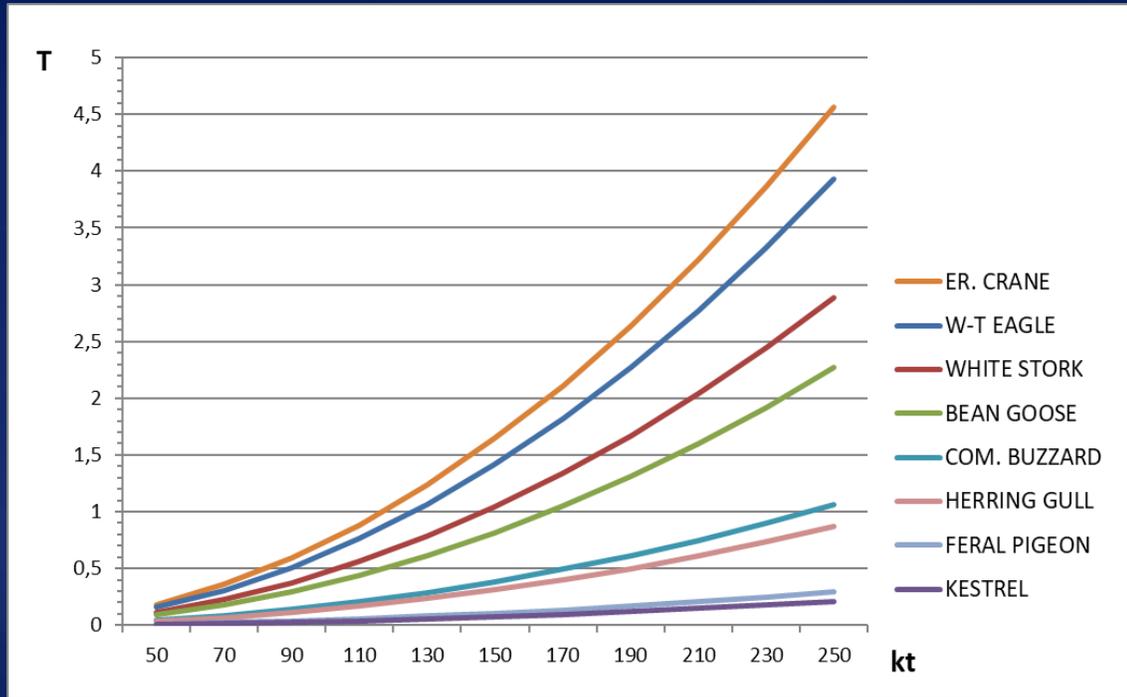


BIRD MASS/WEIGHT





BS Energy impact – a few big bird species





Do not reinvent the wheel
just carefully read Doc 9137





BS Hazard index – the ICAO doc 9137

HAZARD LEVEL:

- SPECIES BODY MASS VALUE
- FLOCKING BEHAVIOUR VALUE

Body Mass	Examples	Body Mass Value
< 50 g	Sparrows	2
51-200 g	Starlings	4
201-1 000 g	Pigeons	8
1-5 kg	Large gulls	16
>5 kg	Big birds of prey	32

Flock size	Examples	Flock value
Usually solitary or widely spaced	Big birds of prey, Sparrows	1
Often in loose flocks	Pigeons, Large gulls	2
Often in tight flock	Starlings	4





POLAND –some 220 bird species recorded on aerodromes

BS Hazard index – the ICAO doc 9137 approach

% of species	Nr of species	HAZARD LVL	Hazard Value	Nr of species	% of species
		I	64-32	30,00	14
32	70,00	II	16	40,00	18
14	31,00	III	8	30,00	14
54	118,00	IV	4	49,00	22
		V	2	69,00	32

**Many water birds, ducks including sea ducks were in the lvl I and II
create low hazard unless above waterbodies with wintering flocks**





BEHAVIOUR & HABITATS





Flocking behaviour:

- resting, foraging (Coot, Geese, many Ducks, Gulls)
- migrating (Geese, White Stork, some Eagles, Buzzards, Kites)
 - Breeding (Cormorants, Rooks, Gulls, Terns)





Flocking behaviour that hazardous to aviation:

- Species usually in dense flocks on or close to aerodromes
- Species usually in dense flocks on migration





Birds behaviour on aerodromes

Species habitat use	Examples	Flock value
Aerodromes open areas very often	Starlings, Pipits, Large Gulls, some Corvids, some Geese, Buzzard, Kestrel	2
Aerodromes open areas use occasionally or rarely	Crane, most birds of Prey, Stork, Passerines	1

**Therefore I add one more behavioural/habitats value:
aerodrome open habitats preferences by flocks**





POLAND –some 220 bird species recorded on aerodromes

BS Hazard index – the ICAO doc 9137 approach

% of species in category		HAZARD LEVEL	% of species in category	
I+II (+III)	ICAO 9137		HABITAS	I+II (+III)
32 (46)	14	I	7	22 (34)
	18	II	15	
	14	III	14	
	22	IV	35	
	32	V	29	

We target more precise species of concern for particular location





Having high quality database, you may work toward much precise analysis and calculation of risk as seen below...

USDA Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

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Wildlife Damage

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- Operational Activities
- National Programs
 - Airport Wildlife Hazards
 - National Environmental Policy Act
 - National Rabies Management Program
 - National Wildlife Research Center
 - National Wildlife Disease Program
- Program Directives
- Reports and Publications

Calculating Strike Risks for Different Bird Species

Last Modified: May 13, 2021 [Print](#)

Species	Risk Rank	Damaging Strikes	Total Strikes	Relative Hazard Score	Total Reported Cost
Red-tailed hawk	1	118	515	44	\$17.7M
Canada goose	2	121	232	87	\$10.9M
Turkey vulture	3	89	158	94	\$4.4M
Rock pigeon	4	40	493	23	\$4.0M
Mourning dove	5	36	1,080	9	\$570,000
European starling	6	28	698	11	\$700,000
Mallard	7	34	129	57	\$5.6M
Ring-billed gull	8	28	252	23	\$540,000
Herring gull	9	26	147	37	\$2M
Bald eagle	10	28	64	80	\$8.7M

Number of damaging strikes, total strikes, relative hazard score (RHS) for the 10 riskiest bird species nationally out of 79 reported from 2010-2015. Total reported cost represents all direct and indirect costs associated with strikes reported for a species.





***BIRD ACTIVITY to:
HAZARD LEVEL
RISK LEVEL***





How bird activity impacts hazard and risk level ?





Hazard level as result of bird activity/presence at aerodromes for different aircraft types



WHM Program
in Polish Armed Forces

Aircraft Type	Birds activity/presence				
	1	2	3	4	5
JET	LOW	MODERATE	SEVERE	SEVERE	SEVERE
TURP	LOW	LOW	MODERATE	SEVERE	SEVERE
HELI	LOW	LOW	LOW	MODERATE	SEVERE





on aerodrome Birdstrike Hazard

Similar/same species



different measures

off aerodrome Birdstrike Hazard





SPECIES IDENTIFICATION



Global Species Risk



Bird species has unique characteristics including:



- distribution (breeding, wintering areas),
- habitat preferences (grass, woodland)
- population dynamic (growing or stable)
- behavior (e.g. reaction to airplane),
- migration pattern (when, flight level),
- phenotype (body mass, size),





Knowledge of bird species
should be WHM foundation





**Species identification is crucial
for effective WHManagement based on:**



1. Bird/Wildlife Strike species remains data





2. Bird/Wildlife monitoring





SPECIES OF CONCERN





Wildlife monitoring reveals dynamic in hazard level caused by site specific species of concern





Wildlife Strike reports and analysis must be based on quality database with confirmed species identification



Wildlife Strikes to Civil Aircraft in the United States, 1990–2020






Smithsonian Feather Lab identifies Cerulean Warbler struck by aircraft on April 28, 2020 as the 600th species of bird in the National Wildlife Strike Database

Federal Aviation Administration
National Wildlife Strike Database
Serial Report Number 27

Report of the Associate Administrator of Airports
Office of Airport Safety and Standards
Airport Safety & Certification
Washington, DC

July 2021



Australian Government
Australian Transport Safety Bureau

Australian aviation wildlife strike statistics

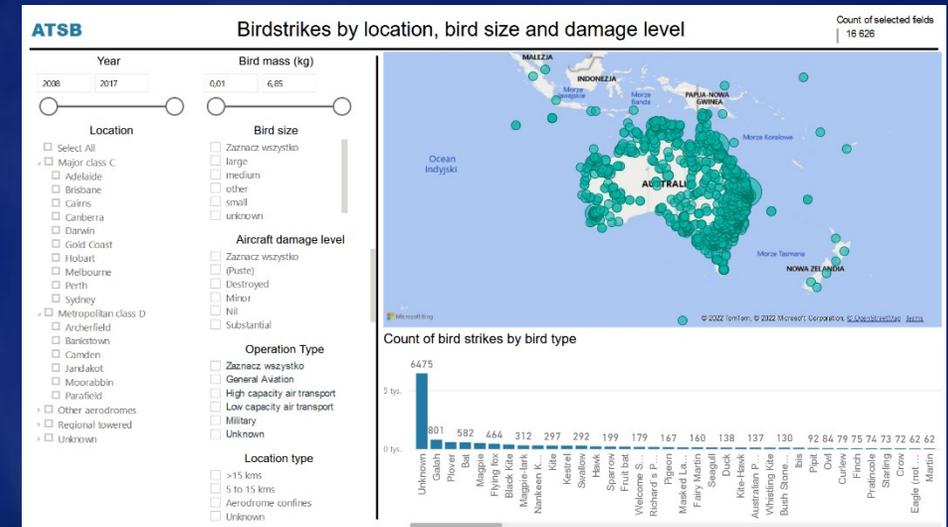
2008 – 2017



ATSB Transport Safety Report
Research Report
AR-2018-035
Final – 13 March 2019

feather remains identification – 50% effective
DNA analysis – more than 95% effective

no DNA analysis no good quality database





CONCLUSION





To standardize ICAO ECCAIRS database
and help wildlife hazard monitoring:

- Use standard nomenclature (bird/wildlife names)
- Use standard bird/wildlife species hazard level





Step 1.

Use HBW and BirdLife International Illustrated Checklist of the Birds of the World for bird species in ICAO IBIS Reporting Form and IBIS Manual

(proposed by WBA in 2018)

IBIS Reporting Form (page 3)

Details concerning Birds / Wildlife

Birds/wildlife seen:

Birds/wildlife struck:

Pilot advised of birds:

Bird/Wildlife species:

Bird size:

Parts struck: Parts struck 2: Parts struck 3:

Parts struck 4: Parts struck 5: Parts struck 6:

Parts damaged: Parts damaged 2: Parts damaged 3:

Parts damaged 4: Parts damaged 5: Parts damaged 6:

Doc	Taxonomic rank	Order	Family name	Family	Subfamily	Tribe	Common name	Scientific name
3007	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	PRODIGE HAWK	<i>Haliaeetus leucorhynchus</i>
3008	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHY SHAW HAWK	<i>Haliaeetus leucorhynchus</i>
3009	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARPTAIL SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3010	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	BROWN-HEADED SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3011	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3012	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3013	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3014	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3015	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3016	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3017	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3018	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3019	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3020	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3021	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3022	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3023	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>
3024	B	ACCIPITRIFORMES	Accipitridae	Haliaeetus	Accipitrinae	Osprey	SHARP SHAW-HAWK	<i>Haliaeetus leucorhynchus</i>

BirdLife International | Partnership for nature and people | **Data Zone**

Species | Sites (IBAs) | Country Profiles | Case studies | Tools | Request data | Publications | Citizen Science

Taxonomy

HBW and BirdLife Taxonomic Checklist v6 (current version)

BirdLife International uses the taxonomy published in the two volumes of the *HBW and BirdLife International Illustrated Checklist of the Birds of the World* and subsequent updates.

BirdLife uses this list as the basis for much of its global, regional and national priority-setting work, including, for example, the assessment of all birds for the IUCN Red List, and the identification of Important Bird and Biodiversity Areas (IBAs). However, some national BirdLife Partners may use other checklists and taxonomic sources that are particularly relevant in their context.

Download an Excel version of the current list [here](#).

Download a PDF version of the current list [here](#).

The Excel version of the Checklist includes the scientific and common names used, the authority (for the original description of the taxon), the latest global IUCN Red List category (e.g. Extinct, Vulnerable, Least Concern, etc.), taxonomic notes where relevant, and a record ID number unique to the taxonomic entity. Previously recognised taxa are also included and distinguished as 'Not recognised'. In addition the zipped file contains an Excel file listing taxonomic and status changes in the current version, plus tabs listing those species that have updated range maps and factsheets. There is also a separate Word copy of the taxonomic references and this taxonomic approach document. The pdf version is the static version of the current Checklist.

The HBW/BirdLife International Taxonomic Working Group makes decisions on modifications to the Checklist, making extensive use of systematic criteria by which species rank can be consistently assessed where this is necessary (e.g. for newly described species or proposed splits). These criteria (Tobias *et al.* 2010) involve weighting morphological and acoustic differences as compared with the nearest believed relative, and are particularly intended to help make decisions involving allopatric taxa (as opposed to those in sympatric, parapatric or hybrid zone situations, where the situation is generally clearer).

Further details on the basis of the Checklist, the application of these criteria and the incorporation of molecular data are given in the Introductions to the two published volumes:

[Introduction to Volume 1: Non-passerines](#)

[Introduction to Volume 2: Passerines](#)





Step 2.

Creat a standard table to ICAO doc 9137 using maximum mass data, flocking and habitat values for all bird species (SME team task)

Species English name	Species Latin name	HAZARD LEVEL	HAZARDVAL UE	MASS MAX	MASS VALUE	FLOCK VALUE	HABIT VALUE
1 Eurasian Crane	<i>Grus grus</i>	I	64,00	5,58	32,00	2,00	1,00
2 Feral Pigeon	<i>Columba livia f. urbana</i>	I	64,00	0,38	8,00	4,00	2,00
3 Bean Goose	<i>Anser serrirostris</i>	I	32,00	4,00	16,00	4,00	1,00
4 Herring Gull	<i>Larus argentatus</i>	I	64,00	1,50	16,00	2,00	2,00
5 White Stork	<i>Ciconia ciconia</i>	I	32,00	4,50	16,00	2,00	1,00
6 White-tailed Eagle	<i>Haliaeetus albicilla</i>	II	32,00	6,92	32,00	1,00	1,00
7 Eurasian Starling	<i>Sturnus vulgaris</i>	II	32,00	0,09	4,00	4,00	2,00
8 Common Buzzard	<i>Buteo buteo</i>	II	32,00	1,30	16,00	1,00	2,00
9 Eurasian Lapwing	<i>Vanellus vanellus</i>	III	16,00	0,33	8,00	2,00	1,00
10 Eurasian Kestrel	<i>Falco tinnunculus</i>	III	16,00	0,25	8,00	1,00	2,00
11 Eurasian Swift	<i>Apus apus</i>	IV	8,00	0,05	4,00	2,00	1,00
12 Barn Swallow	<i>Hirundo rustica</i>	IV	8,00	0,02	2,00	2,00	2,00
13 Blackbird	<i>Turdus merula</i>	V	4,00	0,15	4,00	1,00	1,00
14 Chiffchaff	<i>Phylloscopus collybita</i>	V	2,00	0,01	2,00	1,00	1,00





Effective wildlife hazard management shall include:

- Wildlife biologist/ornithologist co-operation
- Wildlife species approach in hazard/risk identification
- Wildlife BS remains identification (preferable by DNA)
- Wildlife identification training for Wildlife Control Units



Thank you very much for your attention

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