UN environment programme

Convention on the Conservation of Migratory Species of Wild Animals

CMS

2nd CMS Workshop on Conservation Implications of Animal Culture and Social Complexity – Part II

Parma, Italy & online, 3-4 April 2023

UNEP/CMS/Culture-2-2/Doc.4.1

Reports of the Taxonomic Sub-Groups: Birds

ASSESSING THE STATE OF KNOWLEDGE FOR SOCIAL LEARNING AND CULTURE IN BIRDS

Due to the large number of bird species included on the CMS Appendices, and the poor existing knowledge for many of these species, we have presented an evaluation of taxa at the family or order level. We refer to examples within these groups as appropriate, with the starting proposition that behaviour is generally phylogenetically conserved, and can be applied from species where knowledge exists across to those where there is insufficient species or genus-level data. The full list of species in CMS Appendix I & II can be found at the end of this document.

We then list general principles for how social learning and culture may interact with threatening processes or conservation actions. Combined with the attached spreadsheet, these can be used as guidelines to consider how these threats are likely to impact the species of interest, or will affect the likelihood of successful conservation actions.

Finally, we highlight some taxa where a justification for prioritisation can be made. This list is not definitive, and will be further refined at the upcoming workshop. In these taxa of special interest, species will be further highlighted where a case for prioritisation is most pressing.

Q1: Is there evidence of social learning in this species or population, or can phylogenetic or other inference for potential social learning plausibly be made?

- Refer to attached spreadsheet, where the state of knowledge is summarised for each family and/or order in class Aves. This is based on a review of the literature and expert opinion, and the evidence for social learning and culture is ranked as *known*, *likely*, *unlikely*, *no* or *insufficient data* for the major behavioural domains of migration, movement, foraging and vocal learning. Discussion points and further comments are also listed, where necessary.

Q2: How is conservation action likely to interface with social learning and culture?

- We have subdivided this into some widespread threats and conservation actions:

- *Evaluating the 'unit to conserve'*

For some socially learning species, local cultures arise out of social interactions (e.g. song dialects), and can spread from locally adaptive innovations (e.g. foraging cultures). The current evidence for foraging cultures in birds is that they do not appear to be strongly vertically

transmitted, but can also spread via oblique or horizontal transmission, and acquired as adults. Therefore in these domains, specific cultures do not need to be conserved, as they can be re-invented, as long as the capacity to do so is maintained (e.g. large group sizes and well connected populations).

By contrast, specific migratory routes and movement patterns may be lost if local populations are exterminated. There is growing evidence that new routes can be formed in response to changing environments, and lost routes regained. However this may take multiple generations. There is insufficient knowledge on socially learned movement routes, however this could potentially be similar. Therefore sub-populations that exhibit specific migratory routes are a priority when considering units to conserve.

Most relevant domains of social learning: migration (risk)

- *Reintroductions/translocations*

The success of reintroductions and translocations are likely to be affected by socially learned behaviour that affect *integration* into local social groups, and *knowledge* of local ecology. This is therefore the conservation action where success is most likely to be determined by social learning and culture across multiple domains. In particular, recent evidence from parrots and songbirds has shown that in vocal learners, the success of reintroductions can be enhanced by facilitating the social learning of local song and contact-call dialects. Extensive evidence has also revealed the effect of translocations on emergent songs. Recent conservation actions have also included training captive individuals to recognise predators and foraging items before release. Finally, translocations and reintroductions are most likely to be unsuccessful for species that socially learn migration routes, unless they are incorporated into existing populations.

To note: if provided with opportunities to learn, social learning species may also be more flexible in local adaptation after reintroductions, enhancing the success of programmes. However, in doing so, the developmental stage at which individuals socially learn behaviour should also be considered. For example, some passerines exhibit developmental constraints in song learning. In these cases social integration will be most successful if birds are introduced into the local population as juveniles.

Most relevant domains of social learning: vocalisations (risk); migration (risk); movement (risk); foraging (risk); predator recognition (risk)

- *Human wildlife interactions or conflict*

Human wildlife interactions and conflict are most likely to occur in species with foraging cultures. Some well known examples include bin-opening behaviour in sulphur-crested cockatoos and milk-bottle opening in tits. The use of bird feeders may also be socially facilitated, as may the following of fishing vessels by sea-birds. Species that socially learn foraging behaviour and foraging locations may therefore also be likely to exhibit innovative and novel behaviour that brings them into interaction with humans, although this is not restricted to socially learning species. No other behavioural domains considered here are likely to lead to human-wildlife interactions or conflict.

Most relevant domains of social learning: foraging (buffer)

- Anthropogenic threats - Noise

Anthropogenic noise is a potentially significant threat for wildlife globally, as noise can mask or disrupt signals and social communication. However there is now extensive evidence from multiple species of passerine birds that cultural evolution can occur in response to anthropogenic noise, with song shifting in frequency to avoid overlap. Vocal learning birds are therefore most likely to be able to show relatively rapid adaptive responses to anthropogenic noise. Taxa that do not exhibit vocal cultures are most likely to be vulnerable to anthropogenic noise. This threat is of less relevance to other behaviour domains.

Most relevant domains of social learning: vocalisations (buffer)

- Anthropogenic threats - Light

Light pollution is a potential threat to migrating and moving birds, with the potential to attract migrating birds off-course, or to pull seabirds on-shore and away from island colonies. It has generally been under-considered how migratory cultures and social learning in movement may interact with this threat, however it seems likely that it may do so. Alternatively, anthropogenic light can also be utilised by birds. For example, birds may learn to take advantage of light that attracts insects when hunting, and communally roosting birds often appear to choose to sleep close to lights, presumably for better detection of nocturnal predators.

Most relevant domains of social learning: movement (risk); migration (risk); foraging (buffer)

- Anthropogenic threats - Hunting

Hunting may depress populations of birds, leading to low social density. Hunting also has the potential to be a greater threat when species cluster together in large groups, especially when these groups represent a large proportion of the population. In this way, hunting is likely to interact with social learning and culture in three domains: vocal learning, foraging, and migration. First, when social density is low, social transmission of vocalisations or foraging behaviour will be less likely to occur. This loss of culture can potentially exacerbate declines, as successful vocal learning may be linked to reproductive success, and loss of foraging culture may result in lower survival or reproductive success. Evidence exists for this effect for song in passerines such as regent honeyeaters. Evidence for an effect of low social density on foraging behaviour potentially exists in Hawaiian crows, however more research is needed on this question. Finally, and unlike in mammals, there is no evidence that hunting in birds is targeted towards older or more knowledgeable individuals, and so it is unlikely to have an effect on culture via selective removal.

Second, species with migratory cultures are more likely to migrate socially, and may be more likely to cluster at a subset of stop-over points. This will leave them vulnerable to hunting, and increase the likelihood that local hunting will have a population-level effect.

Most relevant domains of social learning: migration (risk); vocalisations (risk); foraging (risk)

- Anthropogenic threats - Habitat Loss and Fragmentation

Habitat loss and fragmentation is a globally significant threat to many bird species, leading to small population sizes and disconnected subpopulations. This will in turn lead to reduced

opportunities for social learning and transmission. Previous studies have linked habitat fragmentation to the loss of song cultures in passerines, with potentially important fitness consequences. Bird taxa that learn their song are therefore likely to be much more vulnerable to the effect of such fragmentation than species that do not. The effect of habitat fragmentation on foraging cultures has not been investigated in birds, however it has been shown to erode cultural diversity of foraging behaviour in primates, and it may be expected to have a similar effect. However, conversely, the spread of innovation may buffer against habitat loss, allowing species to take advantage of new resources.

Habitat loss and fragmentation may also lead to the loss of important stop-over sites for migratory birds. Here, species with migratory cultures may be partly buffered against the negative effects of this loss, as they have greater potential for flexibility in their movement patterns. Such adaptive flexibility in migratory behaviour has already been observed in several species of geese with migratory culture.

Most relevant domains of social learning: migration (buffer); vocalisations (risk); foraging (buffer)

Q3: Are there groups highlighted for prioritisation. If so, what is the justification?*

- **Anatidae**

Research on geese, swans and ducks has provided extensive evidence for migratory cultures, with routes often culturally inherited via vertical transmission within family groups. There is evidence that this social learning of migration may lead to the loss of migratory routes after local extinction events. By contrast, social learning of migration may also lead to adaptive flexibility in the face of global threats such as climate change.

- **Gruidae**

Similarly to above, there is extensive evidence that cranes socially learn their migration routes, and that this can have consequences for vital rates and habitat use. This group provides perhaps the best current example of how social learning and culture can be integrated into conservation efforts.

- **Otididae**

There is some evidence that European bustards socially learn migration routes and movement patterns. There is insufficient data at present, but given the high conservation concern of species in this family, further research and better understanding should be a matter of priority.

- **Accipitridae**

There is increasing evidence for the importance of social facilitation on movement patterns and migration in many raptor species. This is an area of rapidly growing understanding, with this understanding likely to have implications for future conservation planning.

- **Pelecanidae**

Pelicans are highly social, and exhibit many complex social behaviours such as cooperative hunting. Many pelican species also show social migration or nomadic movement. However there is very little research into this topic in this family, and it is a priority area for research to improve understanding.

- **Laridae**

In Caspian tern family groups, male parents (genetic and foster) usually migrated with young. There is a cost to lone young (4 young that lost contact with their parent all died) and adults (those

accompanying young migrated more slowly). Subadult terns remained faithful to routes taken with parents as young. Such cultural inheritance of migration knowledge may be common in other long-distance migrant species in this group.

**Details to be included in any request for prioritisation, where possible:*

- *evidence for social learning or culture*
- *evidence for potential Influence on vital rates, or*
- *evidence for interaction with habitat use, or*
- *evidence for interface with conservation efforts (current or future)*

Selected References

General:

Aplin, L.M., 2019. Culture and cultural evolution in birds: a review of the evidence. *Animal Behaviour* 147: 179-187.

Aplin, L. (2022). Culture in birds. *Current Biology 32*: R1136-R1140.

Aplin, L. (in press). Social Learning and Culture in Birds (class Aves). Chapter in "Oxford Handbook of Cultural Evolution" edited by R. Kendal, J. Tehrani & J. Kendal {available on CMS Teams Birds sub-group, please treat as ms in press}

Migration and Movement:

Byholm, P., Beal, M., Isaksson, N. *et al.* Paternal transmission of migration knowledge in a long-distance bird migrant. *Nat Commun* 13, 1566 (2022). https://doi.org/10.1038/s41467-022-29300-w

Chernetsov, N. Berthold, P. & Querner, U. 2004. Migratory orientation of first-year white storks (*Ciconia ciconia*): inherited information and social interactions. *J Exp Biol* 207 (6): 937–943. doi: https://doi.org/10.1242/jeb.00853

Donald, P.F., Kamp, J., Green, R.E. *et al.* Migration strategy, site fidelity and population size of the globally threatened Sociable Lapwing *Vanellus gregarius*. *J Ornithol* 162, 349–367 (2021). https://doi.org/10.1007/s10336-020-01844-y

Wakefield,ED., Furness, RW., Lane, JV., Jeglinski, JWE., & Pinder, SJ. 2019. Immature gannets follow adults in commuting flocks providing a potential mechanism for social learning. J. Avian Biology 50: e02164. https://doi.org/10.1111/jav.02164

Sokolovskis, K., Lundberg, M., Åkesson, S. *et al.* 2023. Migration direction in a songbird explained by two loci. *Nat Commun* 14, 165. https://doi.org/10.1038/s41467-023-35788-7

Flack, A., Aikens, E.O., Kölzsch, A., N *et al.* 2022. New frontiers in bird migration research. *Current Biology*, *32*: R1187-R1199.

Aikens, E. O., Bontekoe, I. D., Blumenstiel, L., Schlicksupp, A., & Flack, A. 2022. Viewing animal migration through a social lens. *Trends in Ecology & Evolution*.

Vocalisations:

Loo, YY. & Cain, KE. 2021. A Call to Expand Avian Vocal Development Research. Frontiers in Ecology and Evolution 9 https://www.frontiersin.org/articles/10.3389/fevo.2021.757972

ten Cate, C. 2021. Re-evaluating vocal production learning in non-oscine birds. Phil. Trans. R. Soc. B 376: 20200249. https://doi.org/10.1098/rstb.2020.0249

Wright, T. F., & Dahlin, C. R. (2018). Vocal dialects in parrots: patterns and processes of cultural evolution. *Emu-Austral Ornithology*, *118*(1), 50-66.

Crates, R., Langmore, N., Ranjard, L., Stojanovic, D., Rayner, L., Ingwersen, D., & Heinsohn, R. 2021. Loss of vocal culture and fitness costs in a critically endangered songbird. *Proceedings of the Royal Society B*, *288*: 20210225.

Luther, D., & Baptista, L. (2010). Urban noise and the cultural evolution of bird songs. *Proceedings of the Royal Society B: Biological Sciences*, *277*(1680), 469-473

Parker, K. A., Anderson, M. J., Jenkins, P. F., & Brunton, D. H. (2012). The effects of translocation-induced isolation and fragmentation on the cultural evolution of bird song. *Ecology Letters*, *15*(8), 778-785.

Other:

Goss-Custard, J.D., Hoppe, C.H., Hood, M.J. and Stillman, R.A. (2020), Disturbance does not have a significant impact on waders in an estuary close to conurbations: importance of overlap between birds and people in time and space. Ibis, 162: 845-862. https://doi.org/10.1111/ibi.12769

Palacios, E., Vargas, J., Fernández, G., & Reiter, M. E. (2022). Impact of human disturbance on the abundance of non-breeding shorebirds in a subtropical wetland. *Biotropica*, 54, 1160– 1169. https://doi.org/10.1111/btp.13139

Crates, R., Stojanovic, D., & Heinsohn, R. (2022). The phenotypic costs of captivity. *Biological Reviews*.

Full taxonomic list of bird species listed in CMS Appendix I & II:

GALLIFORMES

CMS Appendix I

-

CMS Appendix II

Phasianidae	*Coturnix coturnix coturnix*

ANSERIFORMES

CMS Appendix I

Anatidae	*Oxyura leucocephala* *
	Branta ruficollis *
	Anser cygnoid 11 *
	Anser erythropus *
	Polysticta stelleri *
	Chloephaga rubidiceps *
	Marmaronetta angustirostris *
	Aythya baeri *
	Aythya nyroca *
	Sibirionetta formosa 12 *

CMS Appendix II

Anatidae	A. spp. 52 *
	A. spp. *

PODICIPEDIFORMES

CMS Appendix I

-

CMS Appendix II

Podicipedidae	*Podiceps grisegena grisegena*
	Podiceps auritus (Western Palearctic populations)

PHOENICOPTERIFORMES

CMS Appendix I

Phoenicopteridae	*Phoenicoparrus andinus 13* *
	Phoenicoparrus jamesi 14 *

CMS Appendix II

Phoenicopteridae	Ph. spp. *

COLUMBIFORMES

CMS Appendix I

-

CMS Appendix II

Columbidae	*Streptopelia turtur turtur*

GRUIFORMES

CMS Appendix I

Rallidae	*Sarothrura ayresi* *
Gruidae	*Leucogeranus leucogeranus 15* *
	Antigone vipio 16 *
	Grus japonensis *
	Grus monacha *
	Grus nigricollis *

CMS Appendix II

Rallidae	*Sarothrura boehmi*
	Sarothrura ayresi *
	Crex crex
	Porzana porzana (populations breeding in the Western Palearctic)
	Zapornia parva 53 (Western Eurasia/Africa population)
	Zapornia pusilla intermedia 54
	Amaurornis marginalis 55
	Fulica atra atra (Mediterranean and Black Sea populations)
Gruidae	*Leucogeranus leucogeranus 56* *
	Antigone spp. *56* *
	Bugeranus carunculatus 56
	Anthropoides spp. *56*
	Grus spp. *

OTIDIFORMES

CMS Appendix I

Otididae	*Tetrax tetrax* *
	Otis tarda *
	Chlamydotis undulata (only Northwest African populations)
	Ardeotis nigriceps
	Houbaropsis bengalensis bengalensis

CMS Appendix II

Otididae	*Tetrax tetrax* *
	Otis tarda *
	Chlamydotis macqueenii 57

GAVIIFORMES

CMS Appendix I

-

CMS Appendix II

Gavidae	*Gavia stellata* (Western Palearctic populations)
	Gavia arctica arctica 58
	Gavia immer 59 (Northwest European population)
	Gavia adamsii (Western Palearctic population)

SPHENISCIFORMES

CMS Appendix I

Spheniscidae	*Spheniscus humboldti*

CMS Appendix II

Spheniscidae	*Spheniscus demersus*

PROCELLARIIFORMES

Diomedeidae	*Diomedea antipodensis* *
	Diomedea amsterdamensis
	Phoebastria albatrus 17
Procellariidae	*Pterodroma atrata*
	Pterodroma sandwichensis 18
	Pterodroma phaeopygia
	Pterodroma cahow
	Ardenna creatopus 19
	Puffinus mauretanicus
	Pelecanoides garnotii

CMS Appendix II

Diomedeidae	*Diomedea sanfordi* 60
	Diomedea epomophora
	Diomedea exulans
	Diomedea antipodensis 61 *
	Diomedea dabbenena 61
	Phoebetria fusca
	Phoebetria palpebrata
	Phoebastria irrorata 62
	Phoebastria nigripes 63

	Phoebastria immutabilis 64
	Thalassarche chlororhynchos 65
	Thalassarche carteri 66
	Thalassarche chrysostoma 67
	Thalassarche melanophris 68
	Thalassarche impavida 69
	Thalassarche bulleri 70
	Thalassarche cauta 71
	Thalassarche steadi 72
	Thalassarche eremita 72
	Thalassarche salvini 72
Procellariidae	*Macronectes halli*
	Macronectes giganteus
	Procellaria cinerea
	Procellaria aequinoctialis
	Procellaria conspicillata 73
	Procellaria westlandica
	Procellaria parkinsoni

CICONIIFORMES

CMS Appendix I

Ciconiidae	*Ciconia boyciana*

CMS Appendix II

Ciconiidae	*Mycteria ibis*
	Ciconia nigra
	Ciconia microscelis 74
	Ciconia ciconia

PELECANIFORMES

CMS Appendix I

Threskiornithidae	*Platalea minor*
	Geronticus eremita *
Ardeidae	*Gorsachius goisagi*
	Ardeola idae *
	Egretta eulophotes
Pelecanidae	*Pelecanus crispus* *
	Pelecanus onocrotalus * (only Palearctic populations)

CMS Appendix II

Threskiornithidae	*Platalea alba* (excluding Malagasy population)
	Platalea leucorodia
	Threskiornis aethiopicus 75 (Sub-Saharan Africa and Southwest Asia (Iran/Iraq) populations)
	Geronticus eremita *
	Plegadis falcinellus
	Plegadis falcinellus

Ardeidae	*Botaurus stellaris stellaris* (Western Palearctic populations)
	Ixobrychus minutus minutus (Western Palearctic populations)
	Ixobrychus sturmii
	Ardeola idae *
	Ardeola rufiventris
	Ardea purpurea purpurea (populations breeding in the Western Palearctic)
	Ardea alba alba 76 (Western Palearctic populations)
	Egretta vinaceigula
Pelecanidae	*Pelecanus crispus* *
	Pelecanus onocrotalus * (Western Palearctic populations)

SULIFORMES

CMS Appendix I

Fregatidae	*Fregata andrewsi*

CMS Appendix II

Phalacrocoracidae	*Microcarbo pygmaeus 77*
	Phalacrocorax nigrogularis

CHARADRIIFORMES

CMS Appendix I

Charadriidae	*Vanellus gregarius 20* *
Scolopacidae	*Numenius tahitiensis* *
	Numenius borealis *
	Numenius tenuirostris *
	Numenius madagascariensis *
	Calidris tenuirostris *
	Calidris canutus rufa *
	Calidris pygmaea 21 *
	Calidris subruficollis 22 *
	Calidris pusilla *
	Tringa guttifer *
Laridae	*Saundersilarus saundersi 23*
	Larus relictus
	Larus leucophthalmus *
	Larus audouinii *
	Larus atlanticus
	Sternula lorata 24
	Thalasseus bernsteini 25
Alcidae	*Synthliboramphus wumizusume*

CMS Appendix II

Burhinidae	*Burhinus oedicnemus*
Haematopodidae	H. spp. *78*
Ibidorhynchidae	I. spp. 78
Recurvirostridae	R. spp.
Charadriidae	C. spp. *
Scolopacidae	S. spp.*79* *

Pluvianellidae	P. spp. 80
Dromadidae	*Dromas ardeola*
Glareolidae	*Glareola pratincola*
	Glareola nordmanni
	Glareola nuchalis
Laridae	*Anous minutus worcesteri*
	Rynchops flavirostris
	Larus genei
	Larus ichthyaetus (West Eurasian and African population)
	Larus melanocephalus
	Larus hemprichii
	Larus leucophthalmus *
	Larus audouinii *
	Larus armenicus
	Sternula albifrons 81
	Sternula saundersi 82
	Sternula balaenarum 83
	Gelochelidon nilotica nilotica 84 (West Eurasian and African populations)
	Hydroprogne caspia 85 (West Eurasian and African populations)
	Chlidonias leucopterus (West Eurasian and African population)
	Chlidonias niger niger
	Sterna dougallii (Atlantic population)
	Sterna hirundo hirundo (populations breeding in the Western Palearctic)
	Sterna repressa
	Sterna paradisaea (Atlantic populations)
	Thalasseus bengalensis 86 (African and Southwest Asian populations)
	Thalasseus sandvicensis sandvicensis 87
	Thalasseus maximus albididorsalis 88
	Thalasseus bergii 89 (African and Southwest Asian populations)

CATHARTIFORMES

CMS Appendix I

-

CMS Appendix II

Cathartidae	C. spp. 7

ACCIPITRIFORMES

CMS Appendix I

Accipitridae	*Neophron percnopterus* *
	Sarcogyps calvus *
	Trigonoceps occipitalis *
	Necrosyrtes monachus *
	Gyps bengalensis *
	Gyps africanus *
	Gyps indicus *
	Gyps tenuirostris *
	Gyps coprotheres *
	Gyps rueppelli *

	Torgos tracheliotos *
	Clanga clanga 26 *
	Aquila nipalensis *
	Aquila adalberti 27 *
	Aquila heliaca *
	Haliaeetus leucoryphus *
	Haliaeetus albicilla *
	Haliaeetus pelagicus *

CMS Appendix II

Pandionidae	*Pandion haliaetus*
Accipitridae	A. spp. *

CORACIIFORMES

CMS Appendix I

Coraciidae	*Coracias garrulus* *

CMS Appendix II

Meropidae	*Merops apiaster*
Coraciidae	*Coracias garrulus* *

FALCONIFORMES

CMS Appendix I

Falconidae	*Falco naumanni* *
	Falco vespertinus *
	Falco cherrug * (except Mongolian populations)

CMS Appendix II

Falconidae	F. spp. *

PSITTACIFORMES

CMS Appendix I

Psittacidae	*Brotogeris pyrrhoptera* 28

CMS Appendix II

Psittacidae	*Amazona tucumana*

PASSERIFORMES

CMS Appendix I

Tyrannidae	*Alectrurus tricolor* *

	Alectrurus risora *
Acrocephalidae	*Acrocephalus sorghophilus* *
	Acrocephalus paludicola *
	Acrocephalus griseldis *
Hirundinidae	*Hirundo atrocaerulea**
Turdidae	*Geokichla guttata 29* *
Fringillidae	*Serinus syriacus*
Emberizidae	*Emberiza aureola*
Icteridae	*Xanthopsar flavus 30* *
Parulidae	*Setophaga kirtlandii 31*
	Setophaga cerulea 32
Thraupidae	*Sporophila hypochroma* *
	Sporophila cinnamomea *
	Sporophila palustris 33 *

CMS Appendix II

Tyrannidae	*Polystictus pectoralis pectoralis*
	Pseudocolopteryx dinelliana
	Alectrurus tricolor *
	Alectrurus risora *
Maluridae	M. spp.*90*
Dasyornithidae	D. spp. 90
Meliphagidae	M. spp. *90*
Acanthizidae	A. spp. 90
Orthonychidae	O. spp. *90*
Pomatostomidae	P. spp. *90*
Mohouidae	M. spp. *90*
Eulacestomidae	E. spp. *90*
Oriolidae	O. spp. *90*
Oreoicidae	O. spp. *90*
Cinclosomatidae	C. spp. *90*
Falcunculidae	F. spp. *90*
Pachycephalidae	P. spp. *90*
Psophodidae	P. spp. *90*
Vireonidae	V. spp. *90*
Rhagologidae	R. spp. *90*
Artamidae	A. spp. *90*
Machaerirhynchidae	M. spp. *90*
Vangidae	V. spp. *90*
Platysteiridae	P. spp. *90*
Rhipiduridae	R. spp. *90*
Ifritidae	I. spp. *90*
Monarchidae	M. spp. *90*
Laniidae	*Lanius minor* (European population)
	Lanius excubitor excubitor
Melampittidae	M. spp. *90*
Picathartidae	P. spp. *90*
Eupetidae	E. spp. *90*
Chaetopidae	C. spp. *90*
Petroicidae	P. spp. *90*
Hyliotidae	H. spp. *90*
Stenostiridae	S. spp. *90*
Panuridae	P. spp. *90*
Macrosphenidae	M. spp. *90*
Cisticolidae	C. spp. *90*

Acrocephalidae	A. spp. *90*
Pnoepygidae	P. spp. *90*
Locustellidae	L. spp. *90*
Hirundinidae	*Hirundo atrocaerulea* *
Bernieridae	B. spp. *90*
Phylloscopidae	P. spp. *90*
Scotocercidae	A. spp. *90*
Aegithalidae	A. spp. *90*
Sylviidae	S. spp. *90*
Zosteropidae	Z. spp. *90*
Timaliidae	T. spp. *90*
Pellorneidae	P. spp. *90*
Leiotrichidae	L. spp. *90*
Polioptilidae	P. spp. *90*
Turdidae	T. spp. *90*
Muscicapidae	M. spp. *90*
Regulidae	R. spp. *90*
Hylocitreidae	H. spp. *90*
Motacillidae	M. spp. *90*
Emberizidae	*Emberiza sulphurata*
Icteridae	*Xanthopsar flavus 30* *
	Dolichonyx oryzivorus
Parulidae	*Cardellina canadensis*
Thraupidae	*Sporophila ruficollis*
	Sporophila hypochroma *
	Sporophila cinnamomea *
	Sporophila palustris 33 *