Supplementary Material 3

Monophyly and sister taxa of the genus *Garrulus*

A phylogeny of the family Corvidae based on *cytochrome b* sequence data

To reliably test for monophyly in molecular phylogenetic studies a complete taxon sampling (Graybeal 1998; Johnson 2001) as well as an appropriate outgroup (Smith 1994; Grant 2019) are essential. Previous genetic studies of the Corvidae provide only limited insights (Cibois & Pasquet 1999) or depict slightly varying phylogenetic positions of the genus *Garrulus* (Ericson et al. 2005; Kennedy et al. 2012; Fernando et al. 2017; Liu et al. 2018). A phylogenetic tree of the family Corvidae was therefore constructed for the present study, to test for monophyly of *Garrulus* and determine the best-suited outgroup sequences available for the *cytb* dataset.

Cytb sequences from all the corvid taxa available on GenBank as well as from three outgroup taxa were selected for the analysis (Table S3.1). The alignment contains 151 sequences of 78 species (taxonomically following Dickinson & Christidis 2014) and has 1 143 positions. Following the determination of the best-fitting substitution model independently for each codon position with the programme jModelTest 2.1.7 (Darriba et al. 2012), the settings nst=6 rates=invgamma were applied for all codon positions for BI analysis with MrBayes 3.2.7 (Ronquist et al. 2012). Starting from random trees, two independent runs each consisting of 20×10^6 generations of four Markov chain Monte Carlo chains were performed and sampled every 100 generations. After checking of the output, the first 500 000 generations were discarded as "burn-in".

The resulting phylogenetic tree (Fig. S3.1) reveals that the genus *Garrulus* clusters in a clade with the taxa *Pica*, *Zavattariornis stresemanni*, *Ptilostomus afer* and *Podoces*. Although this clade is poorly supported, some of the surrounding nodes exhibit high posterior probability values and calculated distances support the topology of the tree. It is thereby reasonable to assume that this assemblage represents close relatives of the genus *Garrulus*. In consequence, nine *cytb* sequences of these taxa were added to the *cytb* dataset of the genus *Garrulus* as outgroups.

Figure S3.1. Phylogeny of the family Corvidae in form of a Bayesian 50 % majority-rule tree based on 151 *cytb* sequences (1143 alignment sites) of 78 species. Posterior probability values of the major nodes are shown. All the collapsed clades have posterior probability values of 1.0, except for *Cyanolyca* (0.71), *Corvus* (0.97), *Garrulus* (0.98) and *Dendrocitta* (0.94).

Table S3.1. *Cytb* sequences with GenBank accession numbers (GB-Nr.) used for the present phylogenetic tree of the family Corvidae.

Species	**GB-Nr.**	**Species**	**GB-Nr.**	**Species**	**GB-Nr.**
Platysmurus leucopterus	KY492612	*Pica nutalli*	MG640808	*Aphelocoma woodhouseii*	HQ123846
Temnurus temnurus	AY395626	*Nucifraga columbiana*	KF509923		HQ123849
Crypsirina temia	AY395618	*Nucifraga caryocatactes*	JQ864510		HQ123853
Dendrocitta formosae	MK875763		KJ456365		HQ123855
Dendrocitta cinerascens	KY492611		U86041		HQ123857
Dendrocitta frontalis	JQ864495	*Corvus monedula*	KJ456237		HQ123859
Pyrrhocorax pyrrhocorax	JQ864523		U86033		HQ123860
	KY378773	*Corvus ossifragus*	HQ535807	*Aphelocoma insularis*	HQ123829
	U86044	*Corvus hawaiiensis*	AY005928	*Aphelocoma californica*	U77335
Pyrrhocorax graculus	NC025927	*Corvus frugilegus*	Y16885	*Cyanocitta cristata*	X74258
	JQ864522	*Corvus albicollis*	AY527263	*Cyanocitta stelleri*	AY030113
Urocissa caerulea	NC037486	*Corvus corax*	AY527266		EU075428
Urocissa erythroryncha	KJ456508		AY527269		EU075438
	U86038		JQ864490	*Cyanocorax violaceus*	GU144879
	NC020426	*Corvus cryptoleucus*	AY527265		GU144881
Cissa chinensis	JQ864486	*Corvus ruficollis*	KY378740	*Cyanocorax cyanomelas*	GU144858
	U86037	*Corvus albus*	AY527262	*Cyanocorax cristatellus*	GU144883
Cissa thalassina	KY492609	*Corvus brachyrhynchos*	AY030112	*Cyanocorax caeruleus*	GU144878
Perisoreus canadensis	U77331	*Corvus caurinus*	EF210778	*Cyanocorax morio*	DQ912593
	AY509654	*Corvus corone*	HE805700		AY395625
Perisoreus infaustus	U86042		HE805701	*Cyanocorax colliei*	DQ912591
Perisoreus internigrans	AY395621		HE805754	*Cyanocorax formosus*	U77336
Cyanopica cyanus	AY701174	*Corvus pectoralis*	MN310552	*Cyanocorax yncas*	KJ456245
	AY701177	*Corvus moneduloides*	CM018859		GU144888
	AY701180	*Corvus orru*	FJ498999		GU144889
	AY701181		FJ499000	*Cyanocorax mystacalis*	GU144872
	KT934323	*Corvus coronoides*	AF197837		GU144874
Garrulus glandarius	AB239527	*Corvus splendens*	JQ864493	*Cyanocorax dickeyi*	GU144886
	AB242559		KY018671		GU144887
	EF602122	*Corvus macrorhynchos*	HE805911	*Cyanocorax affinis*	GU144867
	LC332889		HE805915		GU144869
	LC332917	*Corvus kubaryi*	AY005930	*Cyanocorax heilprini*	GU144875
Garrulus lanceolatus	JQ864504	*Cyanolyca mirabilis*	DQ912592	*Cyanocorax cyanopogon*	GU144876
Garrulus lidthi	U86035	*Cyanolyca viridicyanus*	U77333		GU144877
Zavattariornis stresemanni	AY395627	*Gymnorhinus cyanocephalus*	U77332	*Cyanocorax chrysops*	GU144863
Ptilostomus afer	U86040		AY030115		GU144865
Podoces hendersoni	GU592504	*Aphelocoma unicolor*	HQ123865	*Cyanocorax cayanus*	GU144854
	AY395624		HQ123868		GU144856
Podoces biddulphi	AY395623		HQ123871	*Cyanocorax melanocyaneus*	GU144897
Pica pica	KJ456399		HQ123873	*Cyanocorax sanblasianus*	GU144893
	AY701184		HQ123877		GU144894

	AY701185	*Aphelocoma ultramarina*	HQ123803	*Cyanocorax beecheii*	GU144895
	MG640712		HQ123814		GU144896
	MG640744		HQ123818	*Corcorax melanoramphos*	AY064274
	MG640750		HQ123824	*Melampitta lugubris*	AY443253
	MG640762		HQ123825	*Megalampitta gigantea*	AY443252
	MG640820	*Aphelocoma wollweberi*	HQ123810		
Pica hudsonia	MG640818	*Aphelocoma coerulescens*	HQ123862		
			HQ123863		

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