

Supplementary Material

Appendix 1. Literature review: potential response traits of birds to environmental changes.

Traits: **BD:** Bill depth length at the base level; **BW:** Bill width length at the base level; **WL:** Wing length; **TL:** Tail length; **CL:** Culmen length; **Tarl:** Tarsus length; **Weight:** body mass; **SB:** Social behavior; **D:** Diet; **MS:** Migratory status; **F:** Foraging stratum; **FB:** Foraging behavior; **NL:** Nest location. Carnivore diet doesn't include either fish or aquatic macroinvertebrates.

Trait	Justification	Categories	Description
BD	Related to food manipulation and bite force (Willson, 1971; Herrel et al., 2005; Tellería et al., 2013). It influences the food consumed, foraging strategy, and preferred habitat (Luck et al., 2013; López Ordoñez et al., 2016).	Quantitative (mm)	Length of the perpendicular line to the longitudinal axis of the bill, between culmen and lower mandible at base level (López Ordoñez et al., 2016).
BW	Related to food manipulation and its consumption (Willson, 1971; Tellería et al., 2013; López Ordoñez et al., 2016). It influences the food consumed, foraging strategy, and preferred habitat (Luck et al., 2012; López Ordoñez et al., 2016).	Quantitative (mm)	Length of the base of the bill between the corners of the mouth (López Ordoñez et al., 2016).
WL	Related to flight efficiency (Edwards et al., 2013; Tellería et al., 2013). It influences the dispersion ability, maneuverability of flight, foraging behavior, and predation avoidance (Swaddle and Lockwood, 1998; Claramunt et al., 2012; Luck et al., 2012).	Quantitative (mm)	Length of the wing between the carpus and the longer primary feather. (López Ordoñez et al., 2016).
TL	Related to maneuverability, stability, lift, and body resistance during flight (Thomas, 1993; Tellería et al., 2013). It influences the dispersion ability, maneuverability of flight	Quantitative (mm)	Length of the tail from dorsal view between the pygostyle and the longer rectrix feather tip (López Ordoñez et al., 2016).

Trait	Justification	Categories	Description
	(Tellería et al., 2013; López Ordoñez et al., 2016).		
CL	Related to the ability to access food and mandible movement velocity (Lederer, 1975; Moermond and Denslow, 1985). It influences the food consumed, foraging strategy, and preferred habitat (Luck et al., 2012; López Ordoñez et al., 2016).	Quantitative (mm)	Length of the bill between the nasofrontal hinge and the maxilla tip (López Ordoñez et al., 2016).
TarL	Related to the ability to forage and access food (Moermond and Denslow, 1985; Tellería et al., 2013). It influences the foraging behavior (Luck et al., 2012; López Ordoñez et al., 2016).	Quantitative (mm)	Length of the leg between the bone protrusion and the last frontal scale (López Ordoñez et al., 2016).
Weight	Related to metabolic rate and foraging abilities. It influences foraging behavior, aerodynamic, and dispersion ability (López Ordoñez et al., 2016).	Quantitative (grams)	Weight measurement record on the collecting label. It represents the weight of living individuals at the time of collecting.
SB	It influences the foraging behavior and probability of survival (Buskirk, 1976; Morse, 1977; Powell, 1985; Jullien and Clobert, 2000; Henle et al., 2004; Sridhar et al., 2009).	Mixed flocks	Species whose individuals overall cluster in flocks with individuals of different species.
		Monospecific flocks	Species whose individuals overall cluster in flocks with individuals of the same species.
		Opportunistic flocks	Species whose individuals overall are mainly solitary or in pairs, or cluster in mixed flocks.

Trait	Justification	Categories	Description
D	It influences the foraging and social behavior, and the food preference (Sridhar et al., 2009; Luck et al., 2012; López Ordoñez et al., 2016).	Opportunistic gregarious	Species whose individuals overall are mainly solitary or in pairs, or cluster in monospecific flocks.
		Solitary	Species whose individuals overall are mainly solitary or in pairs.
		Carnivore	Species that mainly feed on vertebrates (*).
		Scavenger	Species that mainly feed on dead animals in decomposition.
		Frugivore	Species that mainly feed on fleshy fruits.
		Frugivore-granivore	Species that mainly feed on fleshy fruits, seeds, and grains.
		Frugivore-insectivore	Species that mainly feed on fleshy fruits and small arthropods.
		Granivore	Species that mainly feed on seeds and grains.
		Granivore-Insectivore	Species that mainly feed on seeds and grains and small arthropods.
		Herbivore	Species that mainly feed on vegetal material like leaves, roots, and shoots.

Trait	Justification	Categories	Description
MS	It influences habitat selection (Leck, 1972; Hutto, 1989; Flather and Sauer, 1996).	Insectivore	Species that mainly feed on small arthropods.
		Malacofage	Species that mainly feed on macro-invertebrates associated with bodies of water.
		Nectarivore	Species that mainly feed on nectar.
		Piscivore	Species that mainly feed on fishes.
		Altitudinal migration	Species whose individuals migrate along different altitudes (Naranjo et al., 2012; López Ordoñez et al., 2016).
		Continental migration	Species whose individuals migrate large latitudinal distances (Naranjo et al., 2012; López Ordoñez et al., 2016).
		Local migration	Species whose individuals migrate in the same latitudinal belt respond to resource availability (Naranjo et al., 2012; López Ordoñez et al., 2016).
		Resident	Species whose individuals don't present migrations movements (López Ordoñez et al., 2016).

Trait	Justification	Categories	Description
FB	It influences habitat selection, foraging behavior, social behavior, and the probability of survival (Robinson and Holmes, 1982; Martínez et al., 2016).	Hunter	Species that overall get food by catching prey through stalking techniques.
		Hunter-gatherer	Species that overall get food by catching prey through stalking techniques and active search for resources.
		Gatherer	Species that overall get food through active search for resources on the substratum.
		Digger	Species that overall get food through active digging of the substratum for resources.
F	It influences habitat selection, foraging behavior, social behavior, and the probability of survival (Martin and Possingham, 2005; Hua et al., 2016; Sitters et al., 2016).	Water	Species that overall foraging directly or indirectly in aquatic environments.
		Air	Species that overall foraging on-air airspaces.
		Canopy	Species that overall foraging on the canopy and emergent layer.
		Understory	Species that overall foraging between sub-canopy and floor.
		Ground	Species that overall foraging on floor.
		All levels	Species that overall foraging on all vegetation levels

Trait	Justification	Categories	Description
NL	It influences the habitat selection and probability of survival (Root, 1967; Mainwaring et al., 2014; Higginson, 2017).	Excavated	Species that overall nest in excavations or burrows.
		Cavities	Species that overall nest in cavities.
		Ground	Species that overall nest on the ground.
		Branches	Species that overall nest on branches.

The literature review was based on a search on literature engines (i.e. Scopus, Web of Science, Elsevier, Google scholar). Search equations included titles, keywords, and abstracts that could fit the following parameters: functional trait AND bird AND (morphology OR natural history) AND responses.

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