

Supplementary Table 1: A summary of empirical studies designed to assess impacts of human presence or human approach distances on Antarctic and Sub-Antarctic penguins.

Authors	Locations	Type of sites	Species	Methods	Key findings	Recommendations
Wilson et al., 1991	NA	NA	Adelie penguins (<i>Pygoscelis adeliae</i>)	EX-PA: Single researcher approaching from 50 m up to 3 m at a slow walk.	Adelie penguin reaction was highly dependent on whether the bird was guarding a nest and the stage of nest development	Incubating Adelie penguins should not be approached by humans on foot closer than 30 m.
Giese 1996	Vestfold Hills, CO	LHA	Adelie penguins (<i>Pygoscelis adeliae</i>)	EX-PA: Two researchers simulating scientific (10m from nest) and recreation activities (5 meters from nest) to compare breeding success with control areas.	Breeding success of Adelie penguins could be significantly affected either by scientific or recreational activities.	The magnitude of effects could be species- and activity-specific for which specific management responses are important.
Giese 1998	Vestfold Hills, CO	LHA	Adelie penguins (<i>Pygoscelis adeliae</i>)	EX-BDA: Single researcher approaching at 30 m, 15 m, and 5 m and comparing with control areas.	Adelie penguins responded differently to approaches. Visitor behaviour can influence the impact of visitation on penguins' behaviour and physiology.	When approaching penguins maintain a separation distance of 15 m from the nearest nesting penguin. Move quietly and avoid sudden movements.
Holmes et al., 2005	Macquarie Island, SA	HHA	Royal penguins (<i>Eudyptes schlegeli</i>)	EX-BDA: Single researcher approaching from 30 m to 5 m.	Minimum approach distance guidelines should be based on the separation distance necessary to allow animals to undertake normal activity.	Less possibilities of disturbance exist at further distances of observation (i.e., 30 m), however proposed distances should be logistically practical.
Holmes et al., 2006	Macquarie Island, SA	LHA, HHA	Gentoo penguins (<i>Pygoscelis papua</i>)	EX-BDA: Single researcher approaching from 30 m to 5 m.	Responses can be site-specific, with previous exposure to human activity influencing how penguins at different locations may react.	Management actions should be site-specific.
Holmes, 2007	Macquarie Island, SA	LLA, HHA	King (<i>Aptenodytes patagonicus</i>), Gentoo (<i>Pygoscelis papua</i>), and royal (<i>Eudyptes schlegeli</i>) penguins	EX-BDA: Single researcher approaching from 30 m to 5 m.	Each species examined demonstrated a different behavioural pattern in response to the same pedestrian stimulus.	Determining interspecies differences in the behavioural responses of penguins can allow greater efficacy of visitor guidelines as they can be tailored to each species' needs.

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Burger & Gochfeld, 2007	Snow Hill, AP.	LHA	Emperor Penguins (<i>Aptenodytes forsteri</i>)	OB: Observations and record of penguins' behaviour when encountering people on their walk to nesting areas.	Two main effects identified: (1) penguins required more time to cover the same distance, and (2) penguins used more energy.	Reducing the effects of people on penguins may include temporal (e.g., restricting the stage in the breeding cycle when people can visit) and spatial restrictions (e.g., limiting the presence of people to a small section of the colony).
Lee et al., 2017	Narebski Point, King George, AP	PA	Gentoo penguins (<i>Pygoscelis papua</i>), chinstrap (<i>Pygoscelis antarcticus</i>)	EX-PA. Single researcher approaching up to 1.5 meters for comparing with the effects of an intruder stuffed skua.	Even within the same population, penguins may have different responses to an intruder depending on their degree of exposure to human disturbance. Chinstrap penguins showed more threatened than gentoo penguins	Consider the effect that human activities may have on different species, including their habituation and its effects on their responses to predators.
French et al., 2019	Enderby Island, Auckland, SA	HHA	Yellow-eyed penguins (<i>Megadyptes antipodes</i>)	OB and EX-PA: Observations of penguin-tourists' interactions EX-PA Single researcher approaching up to 5 m.	Distance from a human to a penguin is a significant predictor of bird displaying disturbance behaviour, with the current minimum approach guideline of 5 m not being sufficient for preventing disturbance.	There is a need to minimise the number of human-penguins; interactions by establishing temporal and spatial management that may include the revision of the current 5 m viewing distance rule.

Location: AP= Antarctic Peninsula, CO=Continent, SA=Sub-Antarctic, NA= Not available **Type of site:** NV= non-visited site, PA= Protected Area (i.e., Antarctic Specially Protected Area (ASP), Antarctic Specially Managed Area (ASMA), LHA= Low Human Activity, HHA= High Human Activity, NA= Not available. **Methods:** OB= Observation, -EX-PA= pedestrian approach to nesting area, EX-BDA= before, during and after approaches experiments

Supplementary Table 2: Focal subject's selection criteria with two preferences: Parent with chick and parent alone and six conditions (rows). There are eight different options for selecting focal subjects PC1 to PA4. Each of these options has three different conditions that should be met when selecting the focal subject (read the table vertically) PC1 reflects the optimal conditions while PA4 showed the least desirable combination of conditions for focal subject selection (reading from left to right).

<i>Conditions</i>	<i>Parent with chick (PC)</i>				<i>Parent alone (PA)</i>			
	PC1	PC2	PC3	PC4	PA1	PA2	PA3	PA4
The first row in the nest	***				***			
Tummy visible	***	***			***	***		
4m to 6 m from the camera	***	***	***		***	***	***	
Beyond 1st row		**	**	**		**	**	**
Just back visible			*	*			*	*
6m to 10m from the camera				*				*