Species	**Emperor Penguin (*Aptenodytes forsteri*)**
Geographic Range	The Emperor Penguin has a circumpolar range, with 60+ breeding sites located around almost the entire coastline of Antarctica (Fretwell 2024a). The largest colonies (> 15,000 breeding pairs) occur in the Ross Sea and Weddell Sea. Not all colony locations are constant; several colonies have relocated due to the northward movement of ice shelves (gradual change) or calving of icebergs (sudden change) (Ancel *et al.* 2014, LaRue *et al.* 2015, Fretwell and Trathan 2019, Wienecke *et al.* 2024). Although some colonies have increased in recent years, some colonies are now functionally extinct (Trathan *et al.* 2011) or have relocated (LaRue *et al.* 2015, Fretwell and Trathan 2019, Wienecke *et al.* 2024), while others have exhibited substantial reductions in numbers (Robertson *et al.* 2014), and even one of the southernmost colonies, Cape Crozier, may now be vulnerable to climate change (Schmidt and Ballard 2020). There is currently insufficient evidence to indicate that the range is contracting.
Current Category & Criteria	Near Threatened A3c
Proposed Category & Criteria	Endangered A3bc+4bc
Rationale for proposed change	There is now strong evidence that there is an ongoing global population decline, reflecting predictions from population models that incorporate projections of the impacts of climate change on the species' sea ice habitat. While there is considerable uncertainty in the predicted rates of reduction, there is a high probability that rates of change are already rapid. These declines are due to low breeding success caused by the loss of suitable sea ice habitat. Ecological modelling combined with multiple modelled climate scenarios and different General Circulation Models project that these declines are likely to become very rapid, with a consensus model converging on rates exceeding 50% over the next three generations. The range of predictions from the model outputs spans 30-98% reduction by 2100 with results contingent on the climate emissions scenario used. A high-emission scenario predicts declines will exceed 50% and a low-emission scenario predicts declines above 30% but below 50%. Based on a precautionary attitude, recognising that declines have commenced and that they already appear to be rapid, noting the influence of extreme events in increasing extinction risk and the need to account for the potential impact of continued high-emissions scenario, the rate of reduction is suspected to fall between 30-59% over the next three generations. At present both the species' range and population size remain large. However, both breeding habitat and moulting habitat are discontinuous and, importantly, only seasonal and subject to change due to ongoing warming. Multiple colonies have either been lost or have relocated, although new, small, colonies founded as well. The reduction in the suitability of habitat is predicted to be a proximate cause of declines, and while it is unclear that the occupied area of the range is currently declining, it is inferred that habitat quality is declining. There is potential that the area of breeding and moulting habitat may become a limiting factor in the future.
Type of proposed change	Genuine Change (Recent)
Timing of genuine change	The point at which the population decline commenced is not clear due to the challenges in monitoring changes in the extremely remote range. Analysis of satellite images indicates that the population was probably already declining prior to 2009 (LaRue *et al.* 2024, Fretwell *et al.* 2025). LaRue *et al.* (2024) recorded a decline of 9.5% between 2009-2018, while Fretwell *et al.* (2025) recorded a decline of 22% between 2009-2023 for around one-third of the global population, though this value is highly uncertain (95% CI: -44.6 to +8.3%). In the absence of further information, it is assumed that the population decline reached a rate that exceeded the thresholds for listing as

	Vulnerable between 2008-2012. The projections from population models linked to climate change scenarios over the rest of the 21st century indicate future rates of reduction will increase with agreement that the rate will exceed 50% over three generations (Jenouvrier *et al.* 2025). With the rate increase predicted to take place in the future three generations a genuine change to Endangered is assigned to the current time period, 2024-2028.
Drivers of genuine change	There is increased confidence that loss and degradation of the species' sea ice habitat due to regional climate change is driving population declines through reducing breeding success. The observed changes in the extent and duration of sea ice habitat since 2016 has caused breeding failure in nearly half of the known colonies (Fretwell *et al.* 2023, 2025, Fretwell 2024b, Wienecke *et al.* 2024). The shortening of the sea ice duration is expected to continue to degrade breeding habitat (Fretwell *et al.* 2025, Jenouvrier *et al.* 2025) but also foraging and moulting habitat (Trathan *et al.* 2024). The compounding effects of climate change on sea ice habitat over the next century is the driver for the future acceleration in the rate of population reduction.
General request	The BirdLife Red List Team has updated the information held in SIS (IUCN Red List database) on the key parameters relevant to this species (Annex 1) and then applied the IUCN Red List Criteria and guidelines to reassess its status (Annex 2). If you have any information that may affect the value of the key parameters in Annex 1, and thus potentially affect the reassessment, please contribute them directly via the Forum or by email (redlistteam@birdlife.org) by 25 January 2026.
Specific questions	- **Models by Jenouvrier *et al.* (2025) predicting colony extinction use two huddle size values (minimum colony size needed to sustain a colony through to the end of the incubation/chick rearing period). At the higher value, 100 individuals, the models predict a substantial risk of global extinction by 2100, but some colonies counted are smaller than this value (although only 2/66, or less than 1% of the global population in 2009; see Jenouvrier *et al.* (2025, Suppl. Mat. Table A4). To use the predictions of colony extinction probability to determine global extinction probability under Criterion E it is necessary to equate the minimum huddle size with the loss of all mature individuals, i.e. falling below this value in a model run deterministically results in loss of all individuals of each colony from the global population.** - **What value, if any, of huddle size is appropriate to estimate the global extinction probability?** - **Determining this may allow the use of Criterion E (in addition to Criterion A).**

Annex 1: Species data (values of key parameters) *These terms have specific definitions as described by IUCN - please refer to the glossary and definitions page.

Population size	**Estimate**	**Minimum**	**Maximum**	**Derivation**
Number of mature individuals	500,000	450,000	520,000	Estimated*
Justification	Information on the size and location of most colonies is based upon remote sensing, only available recently, as colony access is limited. A survey of satellite images from 2009 (Fretwell *et al.* 2012), updated in 2020, considered 54 colonies comprising approximately 256,500 breeding pairs a plausible breeding population estimate (Trathan *et al.* 2020). Recent studies have shown this figure has now declined (LaRue *et al.* 2024, Fretwell *et al.* 2025). The lower bound of the population is therefore placed around 10% lower, in line with the reduction recorded between 2009-2018 (LaRue *et al.* 2024), at 450,000 mature individuals, while the upper bound is placed at 520,000 mature individuals based			

	on the 2009 data (Trathan *et al.* 2020), noting that additional colonies have been found since 2014, though most of these are small. The numbers of juveniles, sub-adults and non-breeders are unknown.			
Population trend	**Direction/Yes/No**	**Minimum %**	**Maximum %**	**Derivation**
Current population trend	Decreasing			Estimated*
Justification	Despite the challenges of monitoring the species it is now clear that the population is declining (La Rue *et al.* 2024, Fretwell *et al.* 2025), and there are well-evidenced projections that the rate of reduction will accelerate over the following decades (Jenouvrier *et al.* 2019, 2021, 2025). Time-series of population data are available for only a small number of colonies, although 60+ breeding sites are now known (Fretwell 2024a). Remotely sensed environmental data are available for all colonies. An analysis of a decade (2009 to 2018) of satellite images from 50 emperor penguin colonies (LaRue *et al.* 2024) estimated indices of abundance that showed (with 81 % probability) that there were fewer adult emperor penguins in 2018 than in 2009, with a posterior median decrease of 9.6% (95% credible interval (CI) -26.4% to +9.4%). The global population trend was -1.3% per year over this period (95% CI = -3.3% to +1.0%), equivalent to a median three-generation reduction of 58%, and declines probably occurred in four of eight fast ice regions, irrespective of habitat conditions (LaRue *et al.* 2024). A subsequent analysis using similar methods (Fretwell *et al.* 2025) showed that, for one-third of the global population, there was no evidence of a population recovery after 2018, and that the population decline for some colonies began before the recent years of lower sea ice extent (prior to 2016). Historical ground counts during the breeding period since the 1950s suggest that colonies in East Antarctica follow similar trends in abundance (Barbraud *et al.* 2011). While there are large uncertainties, particularly noting the limited scope of the data, if this rate applies across the population it implies the decline is already rapid over the current and future three-generation period.			
Generation length* (years)	22.4	Generation length from BirdLife International (2025).		
3 generations/10 years (years)	67			
Past 3 generations/10 years	Reduction	11	29	Inferred*
Future 3 generations/10 years	Reduction	30	59	Suspected*
Past + future 3 generations/10 years	Reduction	30	59	Suspected*
Justification	If the population were stable prior to 2009 but subsequently declined by 9.6% to 2018 (as estimated by LaRue *et al.* [2024]) the overall reduction for the past three generations is around 11%. As declines likely commenced sooner, the past reduction is inferred to fall between 11% and 29%. Various analyses have been carried out to predict the impact of projected climate change on the species' population size (Jenouvrier *et al.* 2019, 2021, 2025). Rates of reduction based on ecological population modelling converge around a global population decline of greater than 50% over the next three generations (Jenouvrier *et al.* 2019, 2021, 2025). The range of predictions from the model outputs spans 30-98% reduction by 2100, contingent on the climate scenarios used for the predictions (Jenouvrier *et al.* 2025). Based on a precautionary attitude, recognising that declines have commenced and that they already appear rapid (La Rue *et al.* 2024, Fretwell *et al.* 2025), noting the influence of extreme events in increasing extinction risk (Jenouvrier *et al.* 2025) and the need to account for the potential impact of continued high-emissions scenarios (Jenouvrier *et al.* 2019,			

	2021, 2025), the rate of reduction is suspected to fall between 30-59 % over the next three generations. For the period that includes both the past and the future, the rate will be fastest for the greatest projection into the future but is similarly uncertain. Consequently, is suspected to fall in the same bounds as the future rate of reduction, 30-59%.			
Continuing decline in mature individuals	Yes			Estimated*
Justification	An analysis of a decade (2009 to 2018) of satellite images from 50 emperor penguin colonies (LaRue *et al.* 2024) estimated indices of abundance that showed (with 81% probability) that there were fewer adult emperor penguins in 2018 than in 2009. A subsequent analysis using similar methods (Fretwell *et al.* 2025) showed that, for one third of the global population, there was no evidence of a population recovery after 2018, and that the population decline for some colonies began before the recent years of lower sea ice extent (prior to 2016).			
Continuing decline over 3 years/1 gen	n/a			n/a
Continuing decline over 5 years/2 gens	n/a			n/a
Continuing decline over 10 years/3 gens	n/a			n/a
Justification	While there are indices of abundance that demonstrate a high probability that the population is declining, there is a great deal of uncertainty in the predicted rate of the reduction such that it is not possible to estimate its current rate.			
Subpopulation structure	**Number of subpopulations**	**No. mature individuals in largest subpopulation**		**% individuals in largest subpopulation**
Values	1	450,000-520,000		100%
Justification	No subpopulation structure has been found in the species.			
Trend	Unknown		Derivation:	n/a
Justification	n/a			
Geographic range	**Value**	**Continuing decline?**		**Derivation**
Extent of Occurrence EOO* (km²)	11,600,000	Unknown		n/a
Area of Occupancy AOO* (km²)	Unknown	Unknown		n/a
Justification	The EOO is calculated by drawing a minimum convex polygon around the species' mapped range. The AOO has not been calculated. Currently there is insufficient evidence to indicate that there is a continuing decline in EOO or AOO. The EOO may potentially decline should the decrease of sea ice extent, observed over the last decade, be ongoing. Although some colonies have increased in recent years, some colonies are now functionally extinct (Trathan *et al.* 2011) or have relocated (LaRue *et al.* 2015, Fretwell and Trathan 2019, Wienecke *et al.* 2024), while others have exhibited substantial reductions in numbers (Robertson *et al.* 2014), and even one of the southernmost colonies, Cape Crozier, may be vulnerable to climate change (Schmidt and Ballard 2020). Breeding habitat exists only seasonally and comprises only a fraction of the entire sea ice zone. The seasonal persistence of sea ice is critically important for the species to breed, feed and moult successfully.			
Locations*	>>10	Unknown		n/a
Justification	The number of locations has not been calculated. While there is an overall threat from climate change there are likely >10 geographically or ecologically distinct areas where a single threatening event could affect all individuals of the species present within a period of one generation.			
Area/extent/quality of habitat		Yes		Inferred*

Justification	From 1979 to 2015, the overall Antarctic sea ice extent slightly increased annually; regional losses in the Amundsen and Bellingshausen seas were offset by gains in the Weddell and Ross seas. However, since late 2016, total maximal sea ice extent has decreased (Meredith and Sommerkorn 2019) and has been generally lower than the long-term average, particularly from 2022 to 2025 (see nsidc.org/data/seaice_index; accessed 6 January 2026). The ice season has also been getting shorter by 8.9 days from 2017 to 2022 compared with the period from 1980 to 2016, particularly in the Ross, Bellingshausen, Weddell and Indian sectors (Himmich *et al.* 2024). In 2024, the minimum sea ice extent measured 1.98 million square kilometres; this was the fourth year in a row that the minimal sea ice cover was less than 2.0 million square kilometres (NSIDC 2026). These changes in the sea ice environment put pressure on Emperor Penguins as the extent of their breeding habitat decreases and the ice season shortens, potentially decreasing breeding success, whilst moult habitat is reduced which affects adult survival (Trathan *et al.* 2024). Trends in sea ice extent are potentially independent of changes in coastal fast ice: e.g. altered winds may lead to more extensive large-scale sea ice, but possibly reduced fast ice (Ainley *et al.* 2010). However, in the long-term, the loss of sea ice in general means that ultimately fast ice is also affected.		
Severe fragmentation and extreme fluctuations	**Yes/No**	**Parameter if yes**	**Justification**
Severely fragmented*	No		n/a
Extreme fluctuations*	No	n/a	n/a
Restricted AOO/number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time	No		n/a

Annex 2: Application of IUCN Red List Criteria. *These terms have specific definitions as described by IUCN - please refer to the glossary and definitions page.					
Categories and Criteria thresholds	**Critically Endangered**	**Endangered**	**Vulnerable**	**Met or approached by species?**	**Threshold level reached**
Criterion A: Rate of population decline over 3 generations/10 years (whichever is longer)					
A1	≥ 90%	≥ 70%	≥ 50%	No	
A2	≥ 80%	≥ 50%	≥ 30%	Approached	
A3	≥ 80%	≥ 50%	≥ 30%	Met	EN
A4	≥ 80%	≥ 50%	≥ 30%	Met	EN
Criterion B: Geographic range					
B1: Extent of Occurrence EOO* (km²)	< 100	< 5,000	< 20,000	No	
B2: Area of Occupancy AOO* (km²)	< 10	< 500	< 2000	No	
And at least two of (a), (b) and (c):					
(a): Severely fragmented*/Number of locations*	=1	≤ 5	≤ 10	No	
(b): Continuing decline observed/estimated/inferred/projected in	(i) EOO, (ii) AOO, (iii) Habitat area/extent/quality, (iv) Locations/subpopulations, (v) mature individuals			Yes	(iii,v)
(c): Extreme fluctuations* in	(i) EOO, (ii) AOO, (iii) Locations/subpopulations, (iv) mature individuals			No	
Criterion C: Small population size and decline (population size must be ESTIMATED – it cannot be inferred or suspected [see IUCN Standards and Petitions Committee 2024])					
Number of mature individuals	< 250	< 2,500	< 10,000	No	

And at least one of C1 or C2:					
C1: An observed/estimated/projected continuing decline of at least:	25% in 3 years or 1 generation	20% in 5 years or 2 generations	10% in 10 years or 3 generations	No	
C2: An observed, estimated, projected or inferred continuing decline				Met	
Plus at least 1 of 3:					
a(i): Mature individuals per subpopulation	≤ 50	≤ 250	≤ 1,000	No	
a(ii): % mature individuals in largest subpopulation	90-100%	95-100%	100%	Met	
b: Extreme fluctuations* in number of mature individuals				No	
Criterion D: Very small or restricted population (population size must be ESTIMATED - it cannot be inferred or suspected [see IUCN Standards and Petitions Committee 2024])					
Number of mature individuals	< 50	< 250	D1. < 1,000	No	
Restricted AOO/number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time	-	-	D2. Typically: AOO < 20 km² or ≤ 5 locations	No	
Criterion E: Quantitative Analysis					
Indicated probability of extinction in the wild (in 100 years max)	≥ 50% in longer of 10 years/3 generations	≥20% in longer of 20 years/5 generations	≥ 10% in 100 years	n/a	
Proposed Red List Category	Emperor Penguin is proposed to be listed as **Endangered**.				
Species Range Map					

Possibly extant

Passage

Reintroduced

Introduced

Native breeding

Native non breeding

Native resident

Possibly extinct

Extinct

Assisted colonisation

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