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Notice of and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the Alaskan bar-tailed godwit *Limosa lapponica baueri* Naumann, 1836 as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Listing of Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that the Alaskan bar-tailed godwit *Limosa lapponica baueri* Naumann, 1836 has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of DCCEEW (2024), the NSW Threatened Species Scientific Committee has made a decision to list the species as Endangered.

Summary of Conservation Assessment

The Alaskan bar-tailed godwit *Limosa lapponica baueri* Naumann, 1836 was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.2 (1)(b)(2)(b) because: 1) the species has undergone a large reduction in population size of 34–67% over a three-generation timespan (25 years); and 2) the causes of this reduction, notably loss and degradation of wetland habitat, have not ceased.

The NSW Threatened Species Scientific Committee has found that:

1. The Alaskan bar-tailed godwit *Limosa lapponica baueri* Naumann, 1836 (family Scolopacidae) is a large shorebird that is 37–39 cm long, has a wingspan of 62–75 cm and weighs 250–450 g. Alaskan bar-tailed godwits show marked seasonal variation in plumage and slight variation between sexes, with females being larger than males, with a longer bill and duller breeding plumage. Adult non-breeding or juvenile plumage is the typical appearance of birds in Australia. The crown, upperparts and innerwing-coverts of non-breeding adults are pale brownish-grey. They are narrowly streaked black and white, appearing variegated above. The neck and sides of the head are slightly paler than the rest of the upperparts and are finely streaked darker. They have a dark eye-stripe and bold white supercilium. The underbody is white with a pale brownish-grey wash. Fine dark streaks run across the breast. The rest of the plumage is similar to breeding adults but without rufous colouration. Juvenile Alaskan bar-tailed godwits appear similar to non-breeding adults. Their crown is more heavily streaked and is darker, giving a capped appearance. Their eye-stripe is also darker, and they have a bolder white supercilium. The mantle, scapulars and tertials are darker and have sharply defined buff notches, giving a curlew-like pattern to upperparts. They have a pale-buff wash and fine dark streaks on the foreneck, breast, and fore-flanks. The rest of the underbody is off-white.

2. The Alaskan Bar-tailed Godwit is a migratory species. In Australia, the Alaskan bar-tailed godwit mainly occurs along the north and east coasts along major coastal river estuaries and sheltered embayments (Clemens *et al.* 2021). The subspecies

is widespread in the Torres Strait and along the east and south-east coasts of Queensland, New South Wales, and Victoria, with small numbers reaching Tasmania, southeast South Australia and the Northern Territory. Alaskan bar-tailed godwits breed in north-east Siberia, and in western and northern Alaska. The Alaskan bar-tailed godwit overwinters in China, Australia, New Zealand, and some Pacific islands (Clemens *et al.* 2021). During its northward passage, Alaskan bar-tailed godwits stage in the Yellow Sea region.

3. The Australian Extent of Occurrence (EOO) for the Alaskan bar-tailed godwit is estimated at 10,900,000 km^2, and the Australian Area of Occupancy (AOO) is estimated at 13,000 km^2 (Clemens *et al.* 2021). The species is not severely fragmented and is not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations, or mature individuals (Clemens *et al.* 2021).

4. The estimated Australian population of Alaskan bar-tailed godwit in 2020 was 41,500 mature individuals (Clemens *et al.* 2021), based on an extrapolation of 2016 data using trends derived from Clemens *et al.* (2016, 2019) and Studds *et al.* (2017). Several studies have recorded declines of the Alaskan bar-tailed godwit with the following change over three generations (25 years): -56.2% (Clemens *et al.* 2016), -67.4% (Studds *et al.* 2017), -52.2% (waterbird meta-analysis; Clemens *et al.* 2019), -34.2% (Clemens *et al.* 2019). From 1995−2012 the population of the Alaskan Bar-tailed Godwit declined by 23% (43% in three generations; Murray *et al.* 2018) but the rate of decline has increased since then based on trends for the subspecies at sites in eastern Australia (Clemens *et al.* 2016, 2019), and declines in survivorship (Conklin *et al.* 2016). The most recent analysis by Rogers *et al.* (2023) estimated the mean change in population was -2.4% annually (1993–2021) for an estimated total decline of -47.2% over three generations. The mean annual change in the last 10 years (2012–2021) is +1.2%, suggesting declines may have recently slowed or even stabilised (Rogers *et al.* 2023). However, given the severe reduction in population size estimated over three generations, a total decline of >50% is assumed until population stabilisation can be confirmed over coming years.

5. Bar-tailed godwits usually forage near the edge of water or in shallow water within tidal estuaries and harbours (Higgins and Davies 1996). Most feeding takes place on exposed sandy or soft mud substrates on intertidal flats and beaches. Bar-tailed godwits wade through the shallows or over exposed mud and probe their long bills rapidly to find food. Like most shorebird populations, the Alaskan bar-tailed godwit spends disproportionately large amounts of time foraging on the upper tidal flats. This is a combined result of the upper zone's longer exposure time, allowing for prolonged periods of feeding, and the shorebirds' preference for it (Wu and Wilcove 2020). The subspecies' diet consists primarily of molluscs, crustaceans, worms, aquatic insects, and some plant material (Higgins and Davies 1996). Feeding parties may number up to 30 or more individuals and include non-breeding migrants and juveniles that remain in Australia year-round. Bar-tailed godwits generally feed during the day, but sometimes by moonlight (Higgins and Davies 1996).

6. Alaskan bar-tailed godwits tends to roost on large intertidal sandflats, spits, and banks. Less frequently, roosting occurs within mudflats, estuaries, coastal lagoons,

and bays. These sites are often near beds of seagrass and sometimes near saltmarshes. Few reports have identified the bird roosting in areas of sandy ocean beach, rock platforms and coral reef flats. Where natural habitat is limited in availability, the species may occur within anthropogenic wetlands such as aquaculture ponds, saltworks, and port, power and wastewater sites (Jackson *et al.* 2020; Lei *et al.* 2021). Local-scale movements within areas of suitable habitat are often tide-driven. Bar-tailed godwits tend to forage on intertidal flats at lower tides, and roost in supratidal areas at higher tides, sometimes in very large aggregations (Jackson *et al.* 2020).

7. Alaskan bar-tailed godwits depart their breeding sites in Alaska in late August, flying across the central Pacific Ocean towards China, Australia, New Zealand, and some Pacific islands. The species' flight speed averages 56 km per hour, which allows it to complete a 11,000 km journey in just over eight days. This is one of the longest non-stop migratory flights known (Wilson *et al.* 2007; Battley *et al.* 2012). Alaskan bar-tailed godwits arrive in Australia between August and October and leave between February and April, with a small number of individuals overwintering in Australia. Most Alaskan bar-tailed godwits remain in the non-breeding range during their second austral winter, and some also remain during their third winter (Wilson 2000).

8. Within Australia and NSW, the Alaskan bar-tailed godwit is threatened by wetland loss and degradation to residential and commercial development, habitat loss due to industrial aquaculture, and disturbance at feeding and roosting sites. 'Clearing of native vegetation' and 'Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands' are listed as Key Threatening Processes under the Act.

9. Wetland loss and degradation in Australia, and the subsequent loss of feeding and roosting habitat for the Alaskan bar-tailed godwit, has occurred mainly due to competing land uses and ignorance of the values of wetlands (Geoscience Australia 2021 in DCCEEW 2024). Due to the distribution of the human population, estuaries and permanent wetlands of the coastal lowlands have experienced most losses due to development, especially in the southern parts of the continent (Lee *et al.* 2006). Shoreline development and changes in local hydrology are the biggest driver of wetland habitat loss. Specific threats include: Landfill or reclamation associated with industrial, housing, port developments, road construction, marinas, canals and resorts. Additional threats include clearing areas of saltmarsh for solar salt production; damage to wetland areas by rubbish dumping, storm water draining, as well as run-off from urban areas, which alters the natural salinity regime of wetland areas (Geoscience Australia 2021 in DCCEEW 2024). Within the rest of the East Asian - Australasian Flyway (EAAF) the most significant threat to Alaskan bar-tailed godwits is the loss and degradation of roosting habitat and feeding habitat. The increasing requirement for residential housing and urban and coastal infrastructure is the primary cause of this loss. The loss of mudflats, wetlands, saltmarshes, sandflats, and beaches reduces the availability of resting and feeding habitat and may limit the individual's ability to build up energy stores required for successful migration and breeding.

10. Australia's coastal environment has undergone rapid changes over the last three decades as the aquaculture industry expands and intensifies to meet the rising demand for seafood products (Ahmed and Thompson 2019). Direct and indirect effects may arise from activities including aquaculture, intertidal oyster farming, bait harvesting, the compaction of sediments by vehicles, beach nourishment, nutrient enrichment, and the dumping of rubbish or debris (Fuller *et al.* 2019 in DCCEEW 2024). Any structural modification of soft-sediment feeding habitat may considerably affect deep-probing shorebirds such as the Alaskan bar-tailed godwit, and may inhibit successful shorebird foraging (Fuller *et al.* 2019 in DCCEEW 2024).

11. Tourist activities such as fishing, power boating, jet skiing, four-wheel driving, walking with dogs, and night lighting can potentially disturb birds. The presence of off-leash dogs has been found to be particularly problematic (Weston and Stankowich 2013). Sustained disturbances can prevent the birds from using parts of their habitat. Constant disturbance prior to migration can affect the ability of the birds to build up the energy stores required to complete long-distance migrations.

12. Invasive plant species can cause major changes in the geomorphology of coastal systems (Kennedy *et al.* 2017). Along the coasts of the Yellow Sea, cordgrass (*Spartina alterniflora*) has spread rapidly throughout intertidal wetlands and now occupies half of all important coastal shorebird sites in mainland China (Hua *et al.* 2015; Jackson *et al.* 2021). The species has also become established in the southern hemisphere, especially Australia and New Zealand. It generally grows seaward from the edge of marshes, facilitating the accumulation of sediment, and eventually replacing open tidal flats with dense, elevated *S. alterniflora* marshes (Kennedy *et al.* 2017; Jackson *et al.* 2021). The prolific growth of *S. alterniflora* reduces the availability of foraging and roosting habitat for shorebirds and hinders their movement through the environment (Jackson *et al.* 2021).

13. Alaskan bar-tailed godwits that overwinter in Australia are dependent on multiple habitats throughout the EAAF at different points in time. A reduction in the extent or quality of habitat in one part of the Flyway can have far-reaching consequences for the subspecies, even if its other habitats remain in good condition (Dhanjal-Adams *et al.* 2019 in DCCEEW 2024; Jackson *et al.* 2019). Moreover, events affecting the subspecies during one stage of its annual cycle can carry-over to subsequent stages (Murray *et al.* 2018). As such, population changes experienced in Australia may be driven by processes occurring thousands of kilometres away and during different life stages (Murray *et al.* 2018).

14. Due to the above threats, the Alaskan bar-tailed godwit is estimated to have undergone a large reduction in the number of mature individuals over three generations (*c.* 25 years), possibly as high as 67.4%, and the causes, especially coastal development in the EAAF and in Australia, have not ceased.

15. *Limosa lapponica baueri* Naumann, 1836 is not eligible to be listed as a Critically Endangered species.

16. *Limosa lapponica baueri* Naumann, 1836 is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it

is facing a very high risk of extinction in Australia in the near future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

Assessment against *Biodiversity Conservation Regulation* 2017 criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Endangered under Clause 4.2 (1)(b)(2)(b)

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment Outcome: Endangered under Clause 4.2 (1)(b)(2)(b)

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 – Restricted geographic distribution of species and other conditions
(Equivalent to IUCN criterion B)
Assessment Outcome: Not met.

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted.
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species.
	(f)	extreme fluctuations occur in any of the following:	

		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 – Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion Clause C)
Assessment Outcome: Not met.

The estimated total number of mature individuals of the species is:					
	(a)	for critically endangered species			very low, or
	(b)	for endangered species			low, or
	(c)	for vulnerable species			moderately low.
and either of the following 2 conditions apply:					
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):			
		(i)	for critically endangered species		very large, or
		(ii)	for endangered species		large, or
		(iii)	for vulnerable species		moderate,
	(e)	both of the following apply:			
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and		
		(ii)	at least one of the following applies:		
			(A)	the number of individuals in each population of the species is:	
				(I) for critically endangered species	extremely low, or
				(II) for endangered species	very low, or
				(III) for vulnerable species	low,
			(B)	all or nearly all mature individuals of the species occur within one population,	
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.	

Clause 4.5 – Low total numbers of mature individuals of species
(Equivalent to IUCN criterion D)
Assessment Outcome: Not met.

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 – Quantitative analysis of extinction probability
(Equivalent to IUCN criterion E)
Assessment Outcome: Data Deficient.

The probability of extinction of the species is estimated to be:

	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 – Very highly restricted geographic distribution of species–vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Not met.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.

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Supporting Documentation:

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2024). Conservation advice for *Limosa lapponica baueri* (Alaskan Bar-tailed Godwit). Australian Government, Canberra, ACT.

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