



Conservation Advice for *Limosa limosa* (black-tailed godwit)

In effect under the *Environment Protection and Biodiversity Conservation Act 1999* from 5 January 2024.

This document combines the approved conservation advice and listing assessment for the species. It provides a foundation for conservation actions and further planning.



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Conservation status

Limosa limosa was assessed by the Threatened Species Scientific Committee to be eligible for listing as Endangered under criterion 1. The Committee's assessment is at Attachment A. The Committee's assessment of the species' eligibility against each of the listing criteria is:

- Criterion 1: A2bc+3ce+4bce: Endangered
- Criterion 2: Ineligible
- Criterion 3: Ineligible
- Criterion 4: Ineligible
- Criterion 5: Insufficient data

The main factor that appears to make the species eligible for listing in the Endangered category is that the species has undergone a decline of between 52 - 77.5 percent over the last three generations (Clemens et al. 2016, 2019; Rogers et al. 2023).

Several studies have recorded declines of black-tailed godwit with the following change over three generations: -72 percent (Clemens et al. 2016), -57 percent (Clemens et al. 2019), and -52 percent (Clemens et al. 2019). The most recent analysis by Rogers et al. (2023) estimated the mean change in population was -5.5% annually (1993-2021) for an estimated total decline of 77.5% (95%CI: -89.9, -50.4) over three generations, qualifying the taxon as Endangered.

This population decline is likely due to changes to coastal stopover locations, particularly along the coast of the Yellow Sea, where there is significant habitat loss caused by residential and commercial development; the expansion of large-scale agriculture; and pollution from oil spills, herbicides, and pesticides. The species' habitat area is also shrinking due to a combination of restricted inflow of sediments from increasingly dammed rivers (Murray et al. 2014; Melville et al. 2016) and sea level rise.

There are currently an estimated 126,300 (range 108,400–172,400) mature individuals in the wild with a continuing declining trend (Clemens et al. 2021). The extent of occurrence (EOO) is estimated at 9,400,000 km² (range 8,900,000–9,900,000 km²) and the area of occupancy (AOO) is estimated at 13,000 km² (13,000–20,000 km²). Clemens et al. (2021) considers the species' EOO and AOO to be stable.

At the species level, the black-tailed godwit is a listed migratory species under the EPBC Act. The species is listed on the Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA). Black-tailed godwit is also listed on Appendix II of the Convention on Migratory Species (CMS) as a member of the family Scolopacidae. These legally binding international agreements encourage relevant Contracting Parties to protect black-tailed godwit, their habitats and to remove barriers to migration. While in Australia, black-tailed godwits can be found at a number of Ramsar listed Wetlands of International Importance. Wetlands listed on the Ramsar Convention are Matters of National Environmental Significance under the EPBC Act.

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see the [Species Profile and Threat Database](#).

Species information

Taxonomy

Conventionally accepted as *Limosa limosa* (Linnaeus 1758), the black-tailed godwit is a polytypic species

The black-tailed godwit has a large discontinuous breeding range extending from Iceland to the Russian far east, with wintering populations in Europe, Africa, the Middle East, and Australasia. *Limosa limosa* occurs as three subspecies, *L. l. islandica*, *L. l. limosa*, and *L. l. melanuroides*.

- *L. l. islandica* breeds predominantly in Iceland, with much smaller breeding subpopulations in the Faroe Islands (Denmark), Shetlands (United Kingdom) and the Lofoten Islands

(Norway). This subspecies winters in the Republic of Ireland, the United Kingdom, France, Spain, and Portugal, with small numbers in the Netherlands.

- *L. l. limosa* breeds across a wide area extending from western and central Europe to central Asia and Asiatic Russia. The west European subpopulation of this subspecies migrates south through France and Iberia to winter largely in West Africa. The eastern breeding population winters in southeast Europe and the Middle East and may also be the origin of wintering birds in Mali, Chad and northern Cameroon (Gill et al. 2007; Oomen 2008; Lourenço & Piersma 2008b).
- *L. l. melanuroides* breeds in disjunct populations in Mongolia, northern China, Siberia, and the Russian far east. These birds migrate across a broad front to winter from western South Asia to Australia, encompassing India, Indochina, Taiwan, the Philippines, Indonesia, and Melanesia (Dutson 2011; Van Gils et al. 2017).

A fourth subspecies has been proposed by Zhu et al. (2020) based on morphological and genetic differentiation between black-tail godwits found at Bohai Bay, China and the three recognized subspecies.

This Conservation Advice and Listing Assessment has been conducted for birds occurring in Australia, which represent a portion of the global population of *L.l. melanuroides*.

Description

Black-tailed godwits are 40–44 cm long, have a wingspan between 63–75 cm, and weigh between 200–300 g. The species shows marked seasonal variation in plumage. It also shows slight variation between sexes, with females being slightly larger than males and exhibiting duller breeding plumage.

Adult breeding

Adults in full breeding plumage are unlikely to be observed in Australia. However, observers may see vestiges of the breeding plumage on individuals on arrival and before departure from Australia. Adult non-breeding or juvenile plumage is the typical appearance of birds in Australia. Adult male black-tailed godwits have a chestnut-coloured head, neck, upper mantle, and upper breast. Narrow black streaking runs across the forehead and crown. The adult male has a white chin and a narrow dark loreal stripe. A short white supercilium grades into a chestnut colour behind the eye. Bold black crescents are present on the sides of the lower neck and breast, and the mantle feathers have dark centres. The rest of the underbody is white with chestnut blotches and bold crescentic black barring on the lower breast and upper belly. Blackish barring runs along the flanks to the undertail coverts. The lower mantle, scapulars, and tertials are black, blotched pale cinnamon, and chestnut. The back and rump are a uniform dark grey-brown. The inner-wing coverts are plain and worn grey-brown. The base of the bill is flesh coloured, sometimes orange, with the distal third of the bill black. The legs and feet are grey-black.

Adult breeding females

Breeding females appear similar to breeding males but are usually duller in colour. They often keep much of their grey-brown non-breeding feathers in their upperparts. The mantle, scapulars, and tertials are like that of breeding males. The cap and face are a paler colour and are typically streaked brown. The sides of the neck, foreneck, and breast are a chestnut colour. These are finely barred brown and are often flecked with white. The dark crescentic barring on the underparts is usually a duller brown and less well marked than in adult males.

Adult non-breeding

Non-breeding black-tailed godwits have dark grey-brown upperparts which grade into a slightly paler face, foreneck, and breast. The centre of the breast is often darker, and the rest of the upperparts are white. The inner-wing coverts are dark grey-brown, narrowly fringed white when fresh. A short white supercilium is prominent in front of the eye, contrasting with a dark loreal stripe.

Juvenile

Juveniles appear similar to breeding adults except they exhibit no ventral barring. The forehead and crown are a cinnamon colour and are streaked black. They have a whitish supercilium which is prominent above a dusky loreal stripe. The rest of the head is grey with a varying buff tinge. This grades to a white chin and throat. The neck, breast and fore-flanks are cinnamon-buff, grading to white on the rest of the underbody. Faint brown mottling is present on the centre of the hindneck and on the sides of the breast. The mantle and scapulars are black with narrow cinnamon fringes and subterminal dots, producing a tortoiseshell pattern. The tertials are dull grey, grading to dark grey at the tips. The inner-wing coverts are grey with dark shafts and cinnamon fringes.

Distribution

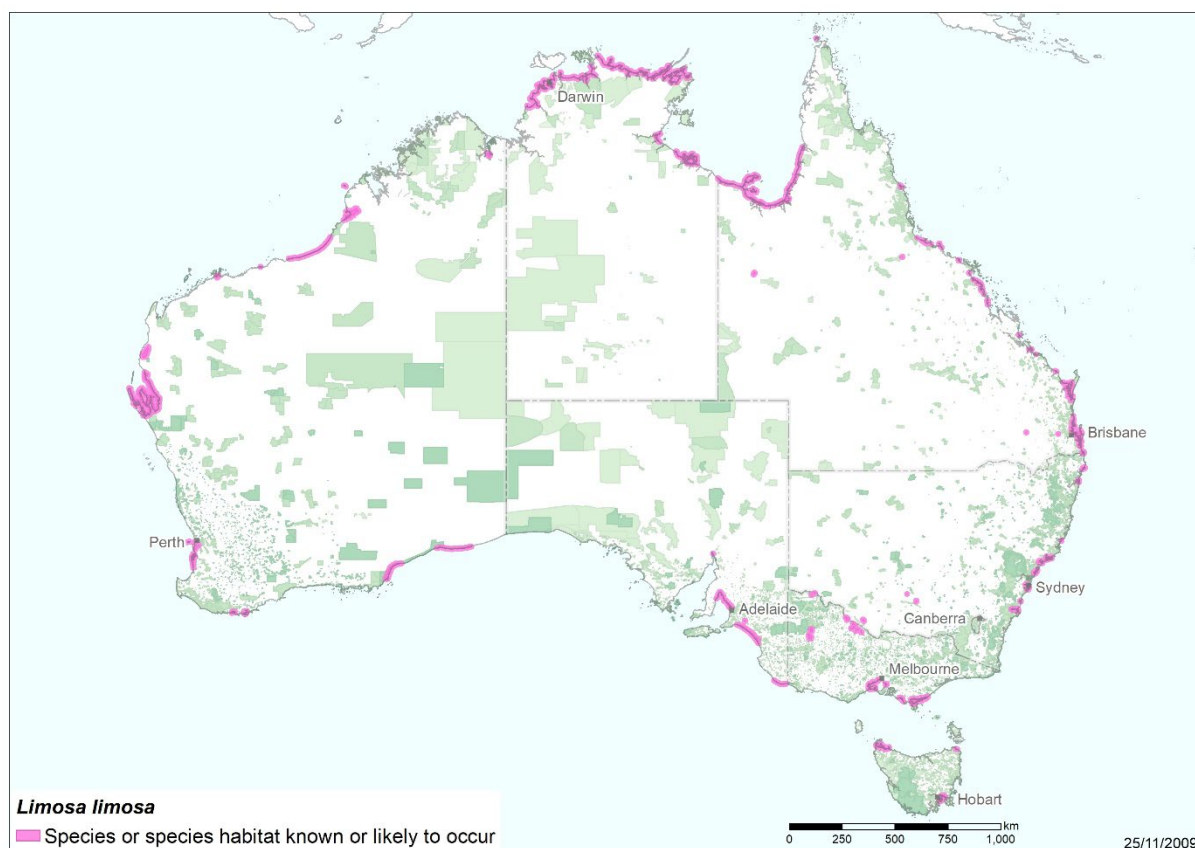
Global distribution

The black-tailed godwit has a large discontinuous breeding range extending from Iceland to the Russian Far East. For populations occurring in the East Asian - Australasian Flyway, breeding probably occurs mostly in the Russian Far East parts of the breeding range. Wintering populations occur throughout Europe, Africa, the Middle East, and Australasia.

Australian distribution

During the austral summer non-breeding season, black-tailed godwits are found in all states and territories of Australia; however, coastal regions support the highest densities of the species. The largest populations are found on the north coast between Darwin and Weipa. The species is generally found in small numbers elsewhere, including scattered inland records (Watkins 1993).

Map 1 Modelled distribution of black-tailed godwit



Source: Base map Geoscience Australia; species distribution data [Species of National Environmental Significance](#) database.

Caveat: The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

Species distribution mapping: The species distribution mapping categories are indicative only and aim to capture (a) the habitat or geographic feature that represents to recent observed locations of the species (known to occur) or habitat occurring in close proximity to these locations (likely to occur); and (b) the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (may occur). These presence categories are created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research.

Cultural and community significance

Nationally and internationally significant populations are known to spend the non-breeding season on the lands of at least the following Traditional Owner groups: Bindal, Birpai, Boon Wurrung, Butchulla, Darkinjung, Giya, Gkuthaarn, Gunaikurnai, Jerrinja, Kabi Kabi, Karajarri, Kukatj, Kurtijar, Larrakia, Malgana, Miriuwung-Gajerrong, Ngarla, Nyangumarta, Quandamooka, Tjungundji, Turrbal, Wodi Wodi, Worimi, Wulgurukaba, Yanyuwa, Yawuru, Yinggarda, Yolgnu, Yugara and Yuin (Clemens et al. 2021).

This statement of significance is not intended to be comprehensive, applicable to, or speak for, all Indigenous Australians and it is acknowledged that Indigenous groups and individuals are the custodians of this knowledge.

Relevant biology and ecology

Habitat

Foraging habitat and diet

Like most shorebird species, black-tailed godwits exhibit substantial site-specific differences in their foraging behaviour. Feeding habitat includes areas of mud or soft, wet sand within sandflats, intertidal mudflats, saltmarshes, and the beaches of oceanic coastlines, bays, and estuaries (Johnsgard 1981; del Hoyo et al. 1996). In general, feeding takes place over the whole tidal range; however, most populations will likely spend disproportionately large amounts of time foraging on the upper tidal flats (Wu & Wilcove 2020). This is a combined result of the upper zone's longer exposure time, allowing for prolonged periods of feeding (Wu & Wilcove 2020).

Black-tailed godwits are omnivorous and are both diurnal and nocturnal. They locate food by touch and sight, using a probing technique and also glean from the ground and vegetation. Their diet consists mainly of insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles, which they probe from soft mud or shallow water (Higgins & Davies 1996). Seeds and berries are particularly important food sources whilst the species is within its northern hemisphere breeding grounds.

Roosting habitat

Black-tailed godwits are primarily a coastal species. They are usually found in sheltered bays, estuaries, and lagoons with large intertidal mudflats and/or sandflats. Further inland, the species can also be found around muddy lakes and within wetlands with water less than 10 cm deep. The species has also been recorded in wet fields and sewerage treatment works. This roosting behaviour is mirrored through the East Asian – Australasian Flyway, where anthropogenic wetlands such as agriculture, aquaculture, saltworks, port, power and wastewater sites often provide alternative coastal habitat (Jackson et al. 2020; Lei et al. 2021). Roosting groups are frequently recorded in mixed flocks with bar-tailed godwits (*Limosa lapponica*; Office of Environment and Heritage 2021).

Breeding habitat

Black-tailed godwits nest in the northern hemisphere summer. Breeding takes place in areas of lowland wet meadow, or grassy marshes and damp pastures. Breeding may also take place within areas of moorland bog.

Reproductive Ecology

Egg-laying occurs from April to mid-June (del Hoyo et al. 1996). Clutch sizes of three to five (usually four) eggs are typical. The incubation period lasts between 22–24 days. They have a nestling period of 28–34 days (del Hoyo et al. 1996).

Migration

The black-tailed godwit is a migratory shorebird. The species leaves breeding locations in Russia by late August and relies on a network of suitable habitat along the migration route, temporarily occupying stopover sites between breeding and non-breeding grounds (Xu et al. 2019). Multiple stopover sites throughout the flyway are required for resting or refuelling (Xu et al. 2019). Hence, connectivity among sites along the flyway is essential for the species' survival and reproduction (Xu et al. 2019). These sites are considered critical in terms of area and site use. The quantity and quality of stopover sites can limit population abundance and affect survival

(Lisovski et al. 2020). A stable network of sites is crucial for maintaining stable or increasing populations (Xu et al. 2019). In contrast, loss of habitat and network connectivity may negatively impact populations (Xu et al. 2019).

Southern passage

The species is a common passage migrant in Japan throughout September and October, and passes through Korea from August to November. It is transient in Manchuria, Mongolia, and along the China from July to September. Small numbers pass through Hong Kong from August to November. Some individuals pass through Myanmar and Thailand. The species is abundant on the west coast of the Malaysian Peninsula but uncommon in Singapore. It also migrates through Borneo, Sumatra, Wallacea, and Bali. The species is locally abundant in New Guinea, arriving as early as July, with the greatest numbers recorded from October to November (Higgins & Davies 1996).

Non-breeding season

Black-tailed godwits first arrive in north-west Australia from late August (Lane 1987). They pass through Darwin from November (Lane 1987) and arrive at the Gulf of Carpentaria from September to December (Garnett 1989). Most individuals stay in north Australia, especially coastal Arnhem Land and south-east Gulf of Carpentaria, and some move to east and south Australia. At Gulf St Vincent, South Australia, most birds arrive between November and December, with some having crossed the entire continent. Small numbers move through the Mt Isa region, Queensland, mainly in September to November, and down the east coast as far south as the estuary of the Hunter River. In Victoria, the species arrives mainly from August onwards but rarely moves further south to Tasmania. Some individuals also move to southwest Australia (Higgins & Davies 1996). During the non-breeding season, numbers are rather stable in the Gulf of Carpentaria and the estuary of the Hunter River in December to February (Lane 1987), although some dispersive movements occur (Higgins & Davies 1996).

There are few records of black-tailed godwits in Victoria after May (Emison et al. 1987). Individuals probably move regularly through the Murray River area between March and April. In Gulf St Vincent, South Australia, numbers increase in February until April, occasionally later, followed soon after by a rapid decline in numbers, possibly as birds migrate North. In southwest Western Australia, small flocks have been reported to move along the coast during April, with inland records reported during March and April. Black-tailed godwits move up the east coast of Queensland during March and April, without receiving influxes in Darwin or northwest Australia. This suggests that birds move north from Arnhem Land and the Gulf of Carpentaria, where they rapidly depart after mid-April (Higgins & Davies 1996).

Northern passage

During the northwards migration back to their breeding grounds, black-tailed godwits are recorded in Vietnam, Myanmar, and Sulawesi around March to April. They pass through Hong Kong and south-east China between March and May, and the Jiangsu coast, east China between April and May. The species is less abundant in Japan than on southward migration, and passes the Republic of Korea around April and May. Individuals are known to pass through south Ussuril and, Russia, and are recorded arriving in Anadyr, Russia, in May (Higgins & Davies 1996).

Substantial numbers of non-breeders remain in north Australia during winter, e.g., in the Gulf of Carpentaria (Garnett 1989). Generally, those individuals wintering further south are found in

small numbers, and occasionally in flocks of hundreds. Winter records reach as far south as Corner Inlet, Victoria (Higgins & Davies 1996).

Habitat critical to the survival

Habitat critical to the survival of the species refers to areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal;
- For the long-term maintenance of the species (including the maintenance of species essential to the survival of the black-tailed godwit, such as macrobenthos);
- To maintain genetic diversity and long-term evolutionary development; or
- For the re-introduction of populations or recovery of the species.

During the non-breeding season in Australia, a large network of sites is required for the species to be able to cope with environmental changes (Xu et al. 2019).

Habitat critical to the survival of black-tailed godwits includes a mosaic of feeding and roosting habitat. Feeding habitat includes areas of mud or soft, wet sand within sandflats, intertidal mudflats, saltmarshes, and the beaches of oceanic coastlines, bays, and estuaries (Johnsgard 1981; del Hoyo et al. 1996). In general, feeding takes place over the whole tidal range; however, most subpopulations will likely spend disproportionately large amounts of time foraging on the upper tidal flats (Wu & Wilcove 2020).

During the non-breeding season, roosting habitat occurs on tropical shorelines, mainly roosting on sandy beaches and foraging on soft, muddy tidal flats. Black-tailed godwits also use freshwater habitats including lake shores, pools, flooded grasslands, and irrigated rice fields (Weller et al. 2020). Modelling summarised in Hansen et al. (2016) estimated that only about three percent of the Australian population of black-tailed godwit occurs in inland wetlands, although limited inland data were available for formal modelling (Clemens et al. 2021).

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

International and nationally important habitat

Under the EPBC Act, 'important habitat' is a key concept for migratory species, as identified in [EPBC Act Policy Statement 1.1 Significant Impact Guidelines - Matters of National Environmental Significance 2009](#). Defining this term for migratory shorebirds in Australia is important to ensure that habitat necessary for the ongoing survival of the 37 species is appropriately managed.

Important habitats in Australia for migratory shorebirds under the EPBC Act include those recognised as nationally or internationally important. The widely accepted and applied approach to identifying internationally important shorebird habitat throughout the world has been through the use of criteria adopted under the Ramsar Convention.

According to this approach, wetland habitat should be considered internationally important if it regularly supports:

- 1 percent of the individuals in a population of one species or subspecies of waterbird or

- a total abundance of at least 20,000 waterbirds.

Nationally important habitat for migratory shorebirds can be defined using a similar approach to these international criteria, i.e., if it regularly supports:

- 0.1 percent of the flyway population of a single species of migratory shorebird or
- 2,000 migratory shorebirds or
- 15 migratory shorebird species.

[The National Directory of Important Migratory Shorebird Habitat](#) identifies all known feeding and roosting sites of black-tailed godwit in Australia (Weller et al. 2020). These areas are identified as internationally or nationally important in accordance with the [EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species](#).

An Internationally Important site is determined for black-tailed godwit if it regularly supports more than 1 percent of the species' total population (1 per cent flyway of the population = 1,600 individuals, Hanson et al. 2016).

A Nationally Important site is determined for black-tailed godwit if it regularly supports more than 0.1 percent of the bird's Flyway population (0.1 per cent of the flyway population = 160 individuals, Hanson et al. 2016).

All internationally or nationally important habitat that exceeds the above thresholds is habitat critical to the survival of the species. The degradation or loss of designated important habitat will have disproportionately detrimental impacts on the species' populations and must be avoided.

Habitat critical to the survival of the species, should not be destroyed or modified. Actions that remove habitat critical to the survival would interfere with the recovery of black-tailed godwit and reduce the area of occupancy of the species. It is important to retain as much foraging and roosting habitat as possible. Actions that have indirect impacts on habitat critical to the survival should also be minimised (i.e., human disturbance or light pollution impacting habitat). Actions that compromise survival, such as the introduction of new diseases, weeds, or predators, should also be avoided.

Threats

The population decline of black-tailed godwit is thought to be due to changes to the species' coastal stopover locations within the East Asian - Australasian Flyway, particularly along the coast of the Yellow Sea. Rapid development for aquaculture, industry, and rapidly increasing human populations are a major driver of these changes. The degradation and loss of stopover locations is amplified by the invasion of cordgrass (*Spartina alterniflora*) and by excessive domestic, industrial, and aquaculture discharges. Black-tailed godwit's habitat area is also shrinking due to a combination of restricted inflow of sediments from increasingly dammed rivers (Murray et al. 2014; Melville et al. 2016) and sea level rise.

Black-tailed godwits that overwinter in Australia depend on multiple types of aquatic ecosystems throughout the East Asian - Australasian Flyway (EAAF). A reduction in the extent or quality of habitat in one part of the Flyway can have far-reaching consequences for the species,

even if its other area of habitat remain in good condition (Dhanjal-Adams et al. 2019; Jackson et al. 2019). Moreover, events affecting the species 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 for the species (Murray et al. 2018). Threats that may impact black-tailed godwits in regions outside of the Australian jurisdiction are outlined below.

Table 1 Threats

Threats in Table 1 are noted in approximate order of highest to lowest impact, based on available evidence. Threats marked with an asterisk (*) are those that occur largely outside of Australia.

Threat	Status ^a	Evidence
Habitat loss, fragmentation, and degradation		
Habitat loss caused by residential and commercial development (In Australia and overseas*)	• Timing: current & future • Confidence: observed • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across part of its range	<u>Australia:</u> Wetland loss and degradation in Australia has occurred mainly due to competing land uses and ignorance of the values of wetlands (Geoscience Australia 2021). 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). <u>Overseas:</u> The increasing requirement for residential housing and urban and coastal infrastructure is causing the draining and filling of wetlands throughout the East Asian - Australasian Flyway. This is currently one of the largest causes of wetland loss (Department of the Environment 2016). The threat is particularly severe in China, where coastal wetlands have declined in both quantity and quality over the last 50 years (Zhang et al. 2012; Murray et al. 2014; Sun et al. 2015). Since 1990, almost 40 percent of naturally occurring coastal wetlands have been lost in China (Gong et al. 2010; Xia et al. 2017). The loss of stopover sites can have two consequences for migratory shorebird populations: 1) birds may not be able to store sufficient energy reserves for the ongoing migratory flight, thus failing to arrive at their destination; and 2) birds can arrive at their destination but perform poorly because of the carry over effects of inadequate refuelling,

Threat	Status ^a	Evidence
		which could reduce reproductive success (Hua et al. 2015). The current conservation status of China's coastal wetlands is inadequate to protect migratory waterbirds (Xia et al. 2017).
Habitat loss caused by industrial aquaculture (In Australia and overseas*)	• Timing: current • Confidence: observed • Likelihood: Almost certain • Consequence: moderate • Trend: increasing • Extent: across part of its range	<u>Australia:</u> 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 (Ayyam et al. 2019; Ahmed & Thompson 2019; Commonwealth of Australia 2020). Direct and indirect effects of aquaculture may arise from activities including 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). Any structural modification of soft-sediment feeding habitat may considerably affect deep-probing shorebirds and may inhibit successful foraging (Fuller et al. 2019). <u>Overseas:</u> Aquaculture is increasing in scale and intensity throughout the East Asian - Australasian Flyway, particularly within the Yellow Sea where China is the world's leader in aquaculture production. Around the Yellow Sea, aquaculture is practised both in artificial ponds and within intertidal and subtidal zones (Melville et al. 2016). Development of artificial aquaculture ponds results in the loss of intertidal habitats. Thus, shorebirds are forced to feed or roost in artificial environments when tidal flats are submerged (Bai et al. 2018) and are often subject to high levels of disturbance (Melville et al. 2016). Artificial wetlands typically host fewer species and fewer individuals of shorebirds compared with natural ones (Bai et al. 2018). Harvesting of edible organisms within natural intertidal areas also occurs throughout the EAAF, including from areas within designated nature reserves. It is not known whether the harvesting of intertidal benthos is significantly affecting shorebirds; however, the amount harvested is, in many cases, substantial and impacts on non-target species may be severe (Melville et al. 2016).
Habitat loss caused by large-scale agriculture*	• Timing: current • Confidence: observed • Likelihood: almost certain • Consequence: moderate • Trend: unknown • Extent: across part of its range	Black-tailed godwit populations which breed on agricultural grasslands have declined in recent years because their preferred habitat of herb-rich meadows has been replaced by highly managed grassland monocultures. Agricultural intensification is one of the main drivers of farmland bird declines (Kleijn et al. 2010). Compared with 25 years ago, a much higher proportion of clutches and chicks are exposed to agricultural activities (Kentie et al. 2015), which often reduces the availability of

Threat	Status ^a	Evidence
		foraging habitat when chicks hatch; and also enhance the predation risk for chicks i.e., the predation risk for godwits is typically higher in recently cut or grazed fields than in tall, uncut grasslands (Schekkerman & Teunissen 2008). There is concern that the intensification of agricultural processes in known black-tailed godwit breeding locations will preclude population recovery and lead to further declines the species' population.
Downstream effects of large dams*	• Timing: current • Confidence: observed • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across part of its range	Many areas of black-tailed godwit habitat are shrinking due to a combination of restricted inflow of sediments from increasingly dammed rivers (Murray et al. 2014; Melville et al. 2016), and sea level rise - with sea walls at many sites preventing suitable habitat migrating inland. Additionally, water regulation and diversion infrastructure along major tributaries has resulted in the reduction of water and sediment flows (Melville 1997; Barter et al. 1998; Barter 2002). Wetlands are particularly vulnerable to the presence of dams and river management activities as they are dependent on seasonal flooding to sustain ecosystem function (Sun et al. 2012; Junk et al. 2013). Damming reduces flooding to wetlands, causing them to shrink and become inhospitable for a range of aquatic biota, including wetland-dependent birds (Sun et al. 2012).
Climate change		
Sea level rise (In Australia and overseas*)	• Timing: current & future • Confidence: inferred • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across the entire range	Global sea level has risen by around 17 ± 5 cm during the 20th century (IPCC 2007; Watson 2011). Current projections predict an increased rate of sea level rise over the duration of the 21st century, with the upper bound global rise ranging from 1.3-1.6m (van de Wal et al. 2022). These increases in sea level are likely to submerge more than 20 percent of coastal wetlands worldwide (Rodriguez et al. 2017). The longest continuous Australasian records show a rise in mean sea level of approximately 12 cm between 1920 and 2000 (Watson 2011). Forecasts predict a further rise of 70 cm by the end of the century (McInnes et al. 2015; Zhang et al. 2017). Coastal wetlands in Australia may be particularly vulnerable to sea level rise, where a reduction in the area of land available for feeding and roosting is likely, and nutrient and sediment flows will likely be altered. The effect of these changes on black-tailed godwit have not been quantified. Further research is required to understand how further sea level rises will affect black-tailed godwit populations.

Threat	Status ^a	Evidence
Invasive species		
Invasion of mudflats and coastal saltmarshes by mangroves and cordgrass (In Australia and overseas*)	• Timing: current • Confidence: observed • Likelihood: almost certain • Consequence: moderate • Trend: increasing • Extent: across part of its range	A number of studies have revealed significant losses of saltmarsh to mangroves (McTainsh et al. 1988; Morton 1994; Duke 1995). Several factors may drive the incursion of mangroves into saltmarshes and mudflats. These include changing patterns of precipitation; altered tidal regime or sea-level; catchment modifications leading to altered sedimentation and nutrient levels; and land subsidence (Saintilan & Williams, 2001). Incursion by mangroves reduces feeding habitat availability for bar-tailed godwits and may force the subspecies away from traditional feeding sites. 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 (<i>Spartina alterniflora</i>) 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). <u>Australia:</u> 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 <i>S. alterniflora</i> marshes (Kennedy et al. 2017; Jackson et al. 2021). The prolific growth of <i>S. alterniflora</i> reduces the availability of foraging and roosting habitat for shorebirds and hinders their movement through the environment (Gan et al. 2009; Jackson et al. 2021).
Exploitation		
Hunting*	• Timing: historical & current • Confidence: suspected • Likelihood: almost certain • Consequence: moderate • Trend: unknown • Extent: across part of its range	Hunting is a widespread and likely unsustainable threat to migratory waterbirds in the EAAF and has been linked to the decline of many threatened species in the Flyway. There are records of hunting from 14 of the 22 countries within the Flyway - from the breeding grounds, through stopping sites, to the non-breeding grounds. It is of particular concern that records of hunting exist for 34 internationally important shorebird sites (Gallo-Cajiao et al. 2020). Countries with the most records of hunting are Russia, China, Thailand, and Myanmar (Gallo-Cajiao et al. 2020). The total yearly harvest of black-tailed godwits in the Sakhalin oblast, Russia alone can reach 1,600 (Matsyna, 2020). Hunting of migratory shorebirds in Australia has been prohibited for a number of decades.
Pollution		
Chronic and acute pollution	• Timing: current • Confidence: observed	Shorebird habitats are threatened by the chronic accumulation and concentration of pollutants. Chronic pollution may arise from

Threat	Status ^a	Evidence
(In Australia and overseas*)	• Likelihood: almost certain • Consequence: minor • Trend: unknown • Extent: across part of its range	both local and widespread sources. Migratory shorebirds may be exposed to chronic pollution during their time in Australia and along their migration routes, although the extent and implications of this exposure remains largely unknown. In their feeding areas, shorebirds are most at risk from bioaccumulation of human-made chemicals such as organochlorines from herbicides and pesticides and industrial waste. Agricultural, residential and catchment run-off carries excess nutrients, heavy metals, sediments and other pollutants into waterways, and eventually wetlands. Wetlands and intertidal habitats are threatened by acute pollution caused by, for example, oil or chemical spillage. Acute pollution generally arises from accidents, such as chemical spills from shipping, road or industrial accidents. Generally, migratory shorebirds are not directly affected by oil spills, but important habitat may be affected for many years through catastrophic loss of marine benthic food sources.

^aTiming—identifies the temporal nature of the threat

Confidence—identifies the nature of the evidence about the impact of the threat on the species

Likelihood—identifies the likelihood of the threat impacting on the whole population or extent of the species

Consequence—identifies the severity of the threat

Trend—identifies the extent to which it will continue to operate on the species

Extent—identifies its spatial context in terms of the range of the species

Categories for likelihood are defined as follows:

Almost certain – expected to occur every year

Likely – expected to occur at least once every five years

Possible – might occur at some time

Unlikely –known to have occurred only a few times

Unknown – currently unknown how often the threat will occur

Categories for consequences are defined as follows:

Not significant – no long-term effect on individuals or populations

Minor – individuals are adversely affected but no effect at population level

Moderate – population recovery stable or declining

Major – population decline is ongoing

Catastrophic – population trajectory close to extinction

Each threat has been described in Table 1 in terms of the extent that it is operating on the species. The risk matrix (Table 2) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; the spatial extent, and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed using available literature.

Table 2 Risk Matrix (* threat occurs mostly outside Australia)

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain		Chronic and acute pollution	Habitat loss caused by industrial aquaculture* Habitat loss caused by large-scale agriculture Invasion of mudflats and coastal saltmarshes by mangroves and cordgrass Hunting*	Habitat loss caused by residential and commercial development Sea level rise Downstream effects of large dams*	
Likely					
Possible					
Unlikely					
Unknown					

Risk Matrix legend/Risk rating:

Low Risk	Moderate Risk	High Risk	Very High Risk
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* threat occurs mostly outside Australia

Priority actions have then been developed to manage the threats, particularly where the risk was deemed to be 'very high' (red shading) or 'high' (orange shading). For those threats with an unknown or low risk (blue and green shading respectively) research and monitoring actions have been developed to understand and evaluate the impact of the threats, where appropriate.

Conservation and recovery actions

Primary conservation objective

- Minimise further loss of habitat critical to the survival of black-tailed godwit throughout Australia (including habitat predicted to become habitat critical to survival in the future because of climate change).
- Prevent further declines in black-tailed godwit subpopulations by working with relevant Range States to address threats in the East Asian-Australasian Flyway.

Conservation and management priorities

Habitat loss, disturbance and modifications impacts

- Strengthen international cooperation for black-tailed godwit conservation through the full participation and engagement of all Range States in relevant multilateral frameworks (CMS, Ramsar and the World Heritage Convention).

- Continue to identify important habitat for black-tailed godwit in Australia and improve site protection and management using international, national, and state mechanisms (i.e. new national parks, conservation reserves, Ramsar site, biodiversity stewardship payments).
- Unify existing management plans for important shorebird areas into a guided and partially standardised document. Subsequently, develop management plans for each recognised important shorebird area which specifically considers migratory shorebirds.
- Update existing site management plans to ensure they correctly take account of the species' local-scale movement patterns and incorporate all important habitats utilised during their non-breeding period.
- Ensure that future development projects avoid any activities that disproportionately affect the upper tidal flats and/or areas providing major foraging opportunities as identified by species experts, local studies and site managers.
- Ensure that functional connectivity of sites is maintained throughout the species' migration network.
- Develop and implement guidelines for coastal wetland rehabilitation and the creation of artificial wetlands (and roost sites) to support populations of migratory shorebirds, including black-tailed godwit.
- Develop and, where necessary, implement floating roost sites that can support black-tailed godwit roosting in areas severely affected by human development.

Invasive species impacts

- Monitor the spread of cordgrass and mangroves throughout Australia and, if necessary, develop guidelines for wetland rehabilitation which explicitly outline methods to eradicate weeds, restore wetland habitat degraded by cordgrass or encroached upon by mangroves (e.g., develop methods to prevent the further spread of cordgrass and mangroves).

Climate change and severe weather impacts

- Develop and implement a climate change adaptation plan for the species.
- Quantify and predict changes to important habitat because of climate change and identify potential shifts in the breeding and non-breeding distribution of the species.
- Quantify the significance of sea level rise on black-tailed godwit feeding and roosting habitat within Australia.

Hunting

- Work within CMS and the East Asian-Australasian Flyway Partnership to develop a comprehensive program of work to address the illegal hunting, take and trade of migratory waterbirds in the EAAF.
- Publish an updated field guide of shorebirds within the East Asian – Australasian Flyway and develop a series of posters showing common and protected species, and their distribution throughout the Flyway in order to improve knowledge within hunting and fishing communities about which species cannot legally be taken, injured, or traded.
- Identify key areas where black-tailed godwit take occurs.

- Promote the strengthening of legal mechanisms to reduce illegal hunting of migratory shorebirds and encourage stronger enforcement of these mechanisms.

Stakeholder engagement/community engagement

- Continue to engage Range States on the importance of migratory shorebird conservation through bilateral and multilateral agreements.
- Promote exchange of shorebird conservation information between governments, NGOs Traditional Owners and communities through use of networks, publications and web sites.
- Develop and implement a community education and awareness program to reduce the effects of recreational disturbance on migratory shorebirds.
- Train a greater number of volunteers, in particular Traditional Owners, to survey migratory shorebirds and improve involvement in monitoring activities.

Survey and monitoring priorities

- Continue to survey northern and inland Australia for migratory shorebird populations and identify important habitats.
- Monitor the health of coastal wetlands and intertidal habitats throughout Australia.
- Monitor the spread of invasive cordgrass throughout wetlands of the Yellow Sea and Australia and determine its effect on black-tailed godwit roosting and feeding efficiency.
- Consolidate monitoring databases and raw data collected by relevant stakeholders.
- Regularly monitor the level of chemical contamination within areas of important habitat for black-tailed godwit.

Information and research priorities

- Develop a high resolution, spatially explicit habitat model which can be used to guide all other actions.
- Investigate the significance of cumulative impacts of development on black-tailed godwit habitat and populations in Australia.
- Quantify the effects of chronic and acute pollution on black-tailed godwit population health, and where necessary implement and amend strict guidelines which restrict the use of pesticides and herbicides around areas of important habitat for migratory shorebirds, and control the release of aquaculture effluent in areas around important habitat for migratory shorebirds.

Links to relevant implementation documents

- Weller D, Kidd L, Lee C, Klose S, Jaensch R & Driessen J (2020) [*Directory of Important Habitat for Migratory Shorebirds in Australia*](#). Prepared for Australian Government Department of Agriculture, Water and the Environment by BirdLife Australia, Melbourne.
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This Conservation Advice is developed to be able to subsequently inform other planning instruments such as a Bioregional Plan or a multi-entity Conservation Plan.

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THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Threatened Species Scientific Committee finalised this assessment on 7 June 2023.

Attachment A: Listing Assessment for *Limosa limosa*

Reason for assessment

This assessment follows evaluation by experts of the conservation status of the species in accordance with the Action Plan for Australian Birds 2020 (Garnett and Baker 2021).

Assessment of eligibility for listing

This assessment uses the criteria set out in the [EPBC Regulations](#). The thresholds used correspond with those in the [IUCN Red List criteria](#) except where noted in criterion 4, sub-criterion D2. The IUCN criteria are used by Australian jurisdictions to achieve consistent listing assessments through the Common Assessment Method (CAM).

Key assessment parameters

Table 3 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria.

Table 3 Key assessment parameters

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Number of mature individuals	42,900	Not calculated	Not calculated	The estimated population of black-tailed godwits in the East Asian - Australasian Flyway in 2016 was 160,000 birds, of which 50,500 were thought to come to Australia (Hansen et al. 2016). The estimated Australian population in 2020 (42,900 mature individuals) is based on an extrapolation of the 2016 data using trends derived from Clemens et al. (2016, 2019).
Trend	Declining			Clemens et al. (2021); Rogers et al. (2023)
Generation time (years)	7.7	7.3	8.1	Generation times are from Bird et al. (2020).
Extent of occurrence	9,400,000 km ²	8,900,000 km ²	9,900,000 km ²	In Australia, the species is widespread around coastlines and occasionally occurs inland (Weller et al. 2020).
Trend	Stable			Clemens et al. (2021)
Area of Occupancy	13,000 km ²	13,000 km ²	20,000 km ²	Estimated and minimum AOO is based on the number of 2x2 km squares encompassing all records since 1990; the highest assumes true AOO ≥50 percent higher.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
AOO is a standardised spatial measure of the risk of extinction, that represents the area of suitable habitat known, inferred or projected to be currently occupied by the taxon. It is estimated using a 2 x 2 km grid to enable comparison with the criteria thresholds. The resolution (grid size) that maximizes the correlation between AOO and extinction risk is determined more by the spatial scale of threats than by the spatial scale at which AOO is estimated or shape of the taxon's distribution. It is not a fine-scale estimate of the actual area occupied. In some cases, AOO is the smallest area essential at any stage to the survival of existing populations of a taxon (e.g. breeding sites for migratory species).				
Trend	Contracting			Clemens et al. (2021)
Number of subpopulations	1	1	1	Clemens et al. (2021)
Trend	Stable			Clemens et al. (2021)
Basis of assessment of subpopulation number	No genetic evidence but birds are assumed to mix freely across the breeding sites			
No. locations	>10			Clemens et al. (2021)
Trend	Not calculated			Clemens et al. (2021)
Basis of assessment of location number	The spatial nature of the threats is such that there are >10 geographically or ecologically distinct areas in Australia where a single threatening event could affect all individuals of the species present within a period of one generation.			
Fragmentation	Not severely fragmented			
Fluctuations	Not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals.			

Criterion 1 Population size reduction

Reduction in total numbers (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased. A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible. A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) <i>cannot be used for A3</i>] A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible. Based on any of the following (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites			

Criterion 1 evidence

Eligible under Criterion 1 A2bc+3ce+4bce for listing as Endangered

Several studies have recorded declines of black-tailed godwit with the following change over three generations: -72 percent (Clemens et al. 2016), -57 percent (waterbird meta-analysis; Clemens et al. 2019) and -52 percent (Clemens et al. 2019). The trend is consistent with declines described a decade ago (Garnett et al. 2011).

The most recent analysis by Rogers et al. (2023) estimated the mean change in population was -5.5% (95%CI: -8.3, -2.7) annually (1993-2021) for an estimated total decline of -77.5% (95%CI: -89.9, -50.4) over three generations.

The Committee considers that the species has undergone a severe reduction in numbers over three generations, and the cause has not ceased. Therefore, the species has met the relevant elements of Criterion 1 to make it eligible for listing as Endangered.

Criterion 2 Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy

	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Criterion 2 evidence

Not eligible

The black-tailed godwit's EOO is estimated at 9,400,000 km² (range 8,900,000 – 9,900,000 km²) and its AOO is estimated at 13,000 km² (range 13,000 – 20,000 km²) (Clemens et al. 2021). The species' EOO is thought to be stable. The species' AOO is thought to be contracting. 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). Therefore, the species has not met all the requirements of this criterion.

Criterion 3 Population size and decline

	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generation (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

Criterion 3 evidence

Not eligible

The number of mature black-tailed godwit is estimated to be 42,900 mature individuals (Clemens et al. 2021). The estimated Australian population in 2020 (42,900 mature individuals) is based on an extrapolation of 2016 data using trends derived from Clemens et al. (2016, 2019). Therefore, the species has not met all the requirements of this criterion.

Criterion 4 Number of mature individuals

	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
D. Number of mature individuals	< 50	< 250	< 1,000
D2.¹ Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time			D2. Typically: area of occupancy < 20 km ² or number of locations ≤ 5

¹ The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments may include information relevant to D2. This information will not be considered by the Committee in making its recommendation of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the [common assessment method](#).

Criterion 4 evidence

Not eligible

The total number of mature individuals is estimated to be 42,900 (Clemens et al. 2021). The estimated Australian population of black-tailed godwit in 2020 is based on an extrapolation of the 2016 data using trends derived from Clemens et al. (2016, 2019). Therefore, the species has not met all the requirements of this criterion.

Criterion 5 Quantitative analysis

	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

Criterion 5 evidence

Insufficient data to determine eligibility

Population viability analysis has not been undertaken. Therefore, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Adequacy of survey

The survey effort has been considered adequate and there is sufficient scientific evidence to support the assessment.

Public consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 30 business days between 30 March 2023 and 15 May 2023. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process and provided to the Minister for the Environment with the Committee's advice.

Listing and Recovery Plan Recommendations

The Threatened Species Scientific Committee recommends:

- i) that the list referred to in section 178 of the EPBC Act be amended by **including** *Limosa limosa* in the Endangered category.
- ii) that there not be a Recovery Plan for this species in accordance with the provisions of the EPBC Act and the Committee's conservation planning principles as follows:
 - An approved conservation advice is an effective, efficient and responsive document to guide the implementation of priority management actions, mitigate key threats and support the recovery for this EPBC Act listed Endangered species.
 - An approved conservation advice would support the species recovery by identifying priority actions, stakeholders for engagement, and the survey and research priorities to facilitate a better understanding of key threats as well as biological and ecological knowledge gaps.
 - The threats facing the entity, and the recovery actions needed can most effectively be guided via an approved conservation advice.
 - The threats facing the entity, and the recovery actions needed can most effectively be guided via an approved conservation advice.
- iii) Having regard to the above factors, a recovery plan is not required as it would not provide a significant conservation planning benefit above existing mechanisms.

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