INTERNATIONAL SINGLE SPECIES ACTION PLAN FOR THE CONSERVATION OF FAR EASTERN CURLEW (*Numenius madagascariensis*)

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EXECUTIVE SUMMARY

The Far Eastern Curlew (*Numenius madagascariensis*) is the largest shorebird in the world and is endemic to the East Asian – Australasian Flyway. Its long neck, long legs and heavy down-curved bill make this species unmistakeably distinctive in its coastal habitat. It breeds in eastern **Russia**, **Mongolia** and north-eastern **China** and travels through **Japan**, the **Democratic People's Republic of Korea,** the **Republic of Korea**, **China**, **Vietnam**, **Thailand** and **Malaysia** to its non-breeding grounds. About 25% of the population is thought to spend the non-breeding season in the **Philippines**, **Indonesia** and **Papua New Guinea** but most (estimated at 26,000 individuals) spend the non-breeding season in **Australia**. Evidence from **Australia** suggests that Far Eastern Curlews have declined by an estimated 81% over 30 years and the species is listed as 'Endangered' on the IUCN Red List.

The greatest threat to the survival of the Far Eastern Curlew is the on-going destruction of tidal mudflats that it utilises on migration, especially in **China**, **Republic of Korea** and south-east Asia. In addition, hunting in some parts of their range is considered a serious threat. Other issues include human disturbance, pollution, overharvesting of prey items and the effects of climate change on habitat.

The goal of this action plan is to return the Far Eastern Curlew to a positive population growth rate for at least three generations. Essential actions to achieve this are to:

(i) Identify and protect remaining sites for the species throughout its annual cycle

(ii) Reduce or eliminate illegal harvesting

(iii) Robustly monitor the species' population trend

(iv) Constitute a Far Eastern Curlew Task Force and keep it functioning until the goal is achieved.

All Range States must act quickly to halt the Far Eastern Curlew's imminent extinction. All threats must be minimised or preferably eliminated within the next decade. International and regional cooperation is essential to prevent extinction of this migratory shorebird. The East Asian – Australasian Flyway Partnership and the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and other multilateral and bilateral agreements provide the frameworks necessary to ensure meaningful conservation efforts and their coordination across the region.

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1. INTRODUCTION

The Far Eastern Curlew is the largest shorebird in the world. Its very large size (900 g) and very long bill (19cm) distinguish it from other similar species within the East Asian – Australasian Flyway (BirdLife International, 2015). It is endemic to the flyway, breeding in **Russia**, **Mongolia** and **China** and migrating as far as **Australia** and **New Zealand**. Declining numbers at the species' staging and non-breeding sites prompted the IUCN Red List to recognise Far Eastern Curlew as 'Endangered' in 2015. In **Australia**, the Far Eastern Curlew has declined by 81% over 30 years (equal to three generations) and the species is now listed as 'Critically Endangered' under Australia's national environmental law (Australian Government 2015a). If the main threats continue, further declines leading to extinction is expected.

Acknowledging the severe decline of Far Eastern Curlew, the Australian Government initiated the development of this Action Plan under the auspices of the East Asian – Australasian Flyway Partnership. The Partnership and the CMS have endorsed similar Action Plans in the flyway including Action Plans for the Siberian Crane (Ilyashenko et al., 2008), Black-faced Spoonbill (Chan et al., 2010), Spoon-billed Sandpiper (Zöckler et al., 2010) and the Chinese Crested Tern (Chan et al, 2010). All of these Action Plans are being successfully implemented and serve as models for this Action Plan.

This Action Plan addresses the issues at important sites along the flyway, ranging from the breeding grounds, stop-over (or staging) and non-breeding sites. To be successful, meaningful international cooperation will be required from all Range States. The mechanism of an international single species action plan has been proven to be effective in improving and coordinating conservation efforts. It is the aim of this document to provide a summary of information on the status, threats, and current levels of protection in each range state and to develop a plan of action. The Action Plan is coordinated by the Far Eastern Curlew Task Force established under the auspices of the EAAFP and is designed to be implemented by governments and non-government bodies.

This Single Species Action Plan provides an important tool for promoting and coordinating conservation at an international, national and regional level. The Action Plan provides guidance for EAAFP Partners, CMS Parties, Range States, conservationists, researchers and habitat managers over the next decade, while also providing a model for further

advancing migratory bird conservation throughout the flyway. The Action Plan outlines an internationally agreed list of activities necessary along the flyway, to improve the understanding of the species' status, to halt its decline and support its long-term survival.

2. BIOLOGICAL ASSESSMENT

2.1 Taxonomy

Class: Aves

Order: Charadriiformes

Family: Scolopacidae

Species: *Numenius madagascariensis*

Common names: Australian or sea curlew, Eastern Curlew, curlew, Courlis de Siberie, Zarapito Siberiano, Allak-kkorimadoyo, Isabellbrachvogel, Burung Gajahan Timur, Gajahan Timur, Gegajahan paruh besar, Gegajahan timur, Burung Kedidi Kendi Timur, Burung Kedidi Timur, Burung Kendi Timur, Kedidi Timor, Kendi Timur, นกอีก๋อยตะโพกสีน้ำตาล,, Chim Choắt mỏ cong hông nâu, Choắt mỏ cong hông nâu, 大喽儿, 大杓鹬, 紅腰杓鷸, 红腰杓鹬, 鵍鷸, Дальневосточный, Дальневосточный кроншеп, Дальневосточный кроншнеп, кроншнеп, Кроншнеп дальневосточный, 알락꼬리마도요, ホウロクシギ, 焙烙鴫, 焙烙鷸, Мадагаскар тутгалжин, [illegible], [illegible], Мадагаскар тутгалжин, Том тутгалжин

Accepted as Far Eastern Curlew *Numenius madagascariensis* Linnaeus, 1766 (BirdLife International 2015).

Monotypic, no subspecies are recognised (del Hoyo and Collar 2014). Taxonomic uniqueness: medium (22 genera/family, 8 species/genus, 1 subspecies/species; Garnett et al., 2011).

2.2 Global Distribution

The Far Eastern Curlew is endemic to the East Asian – Australasian Flyway. Within **Russia** the Far Eastern Curlew breeds in Siberia and Far Eastern Russia, specifically in Transbaikalia, Magadan Region, northern and southern Ussuriland, Iman River, scattered through south, west and north Kamchatka, lower and middle Amur River basin, Lena River basin, between 110° E and 130° E up to 65° N, and on the Upper Yana River, at 66° N. The Far Eastern Curlew also breeds in **Mongolia** and north-eastern **China** (Jílín, Hēilóngjiāng and Inner Mongolia Province).

The Far Eastern Curlew is a migrant in **Japan**, **Democratic People's Republic of Korea**, **Republic of Korea**, and **China**, and is recorded moving through **Thailand** and the Malay Peninsula and Borneo. During the non-breeding season small numbers occur in the southern **Republic of Korea**, **Japan** and **China**. About 25% of the population is thought to

spend the non-breeding season in the **Philippines**, **Indonesia** and **Papua New Guinea** but most of the population (estimated in 2008 at 73%) spend the non-breeding season in **Australia** (Bamford et al., 2008). Far Eastern Curlews are regular non-breeding visitors to **New Zealand** in very small numbers, and occur rarely on Kermadec Island and the Chatham Islands (Higgins & Davies, 1996).

Within **Australia**, the primary non-breeding range state, the Far Eastern Curlew has a mostly coastal distribution; they are rarely recorded inland. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Their distribution is continuous from Barrow Island and Dampier Archipelago, Western Australia, through the Kimberley Division and along Northern Territory, Queensland, and New South Wales coasts and the islands of Torres Strait. They occur patchily elsewhere.

Figure 1. Distribution of Far Eastern Curlew (Yellow = Breeding, Pink = Passage and Blue = Non-breeding. Source: BirdLife International 2015)

2.3 Habitat requirements

2.3.1 Breeding habitat

Far Eastern Curlew nest during the boreal summer, from early May to late June, often in small colonies of two to three pairs. Pairs breed in open mossy or transitional bogs, moss-lichen bogs and wet meadows, and on swampy shores of small lakes. Nests are positioned on small mounds in swampy ground, often near where wild berries are growing. The nest is lined with dry grass and twigs. Clutches usually contain four eggs. Juveniles may delay breeding until three or four years of age (del Hoyo et al., 1996; Ueta & Antonov 2000; Antonov 2010).

2.3.2 Non-breeding habitat

During the non-breeding season Far Eastern Curlew is almost entirely dependent on coastal intertidal habitats. It is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass (Zosteraceae). Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms (Higgins & Davies, 1996).

2.3.3 Feeding habitat

The Far Eastern Curlew mainly forages during the non-breeding season on sheltered intertidal sandflats or mudflats, that are open and without vegetation or covered with seagrass. Far Eastern Curlew often forage near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline, however, they have a preference for soft substrates containing little or no hard material (e.g. rock, shell grit, coral, debris) that provide better access to their prey (Finn et al., 2007, 2008). The birds are rarely seen on near-coastal lakes or in grassy areas (Higgins & Davies, 1996).

2.3.4 Roosting habitat

The Far Eastern Curlew roosts during high tide periods on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons, aquaculture ponds and other near-coastal wetlands. Far Eastern Curlews are also recorded roosting in trees and on the upright stakes of oyster-racks (Higgins & Davies, 1996). At Roebuck Bay, Western Australia, birds have been recorded flying from their feeding areas on the tidal flats to roost 5 km inland on a claypan (Collins et al., 2001). Within Moreton Bay, Queensland, Australia, the distance over which Far Eastern Curlew typically travel between feeding and roosting habitat is 5-10 km, with high mobility between alternative roosts and/or feeding grounds occurring at or below this distance (Finn et al., 2002). In some conditions, shorebirds may choose roost sites where a damp substrate lowers the local temperature. This may have important conservation implications where these sites are heavily disturbed beaches (Rogers, 1999). From the requirements known for roosting habitat, it may be possible to create artificial roosting sites to replace those destroyed by development (Harding et al., 1999). Far Eastern Curlews typically roost in large flocks, separate from other shorebirds (Higgins & Davies, 1996).

2.4 Migration patterns

The Far Eastern Curlew is migratory. After breeding, they move south for the austral summer. The birds migrate by day and night at varying altitudes (Higgins & Davies, 1996).

2.4.1 Departure from breeding grounds

Far Eastern Curlew leave Kamchatka Peninsula (Eastern **Russia**) from mid-July (Ueta et al., 2002). Birds migrate through Ussuriland, **Russia**, from mid-July to late September, birds pass through the Kurile Islands and Sakhalin, (Eastern **Russia**), from mid-July to late August

(Higgins & Davies, 1996). Fewer birds appear in continental Asia on the southern migration than on the northern migration (Dement'ev & Gladkov, 1951). Far Eastern Curlews are seen in **Democratic People's Republic of Korea, Republic of Korea**, **Japan** and **China** from June to November with birds seen in **Thailand**, the **Peninsular Malaysia**, **Singapore**, the **Philippines**, and Borneo (**Indonesia**, **Brunei** and **Malaysia**), from August to December (White & Bruce 1986; Dickson et al., 1991; Higgins & Davies, 1996; Mann 2008; Choi et al., 2016) likely to be a mix of passage migrants and overwintering individuals. The birds arrive in north-west and eastern **Australia** as early as July (Lane, 1987). In north-west Australia, the peak arrival time is in mid-August (Minton & Watkins, 1993). There is an onward movement from north-west Australia by October (Lane, 1987). Most birds arriving in eastern Australia appear to move down the coast from northern Queensland with influxes occurring on the east coast from mid-August to late December, particularly in late August (Choi et al., 2016). Counts suggest there is a general southward movement until mid-February (Alcorn, 1988). Records from Toowoomba, Broken Hill and the Murray-Darling region in August and September suggest that some birds move overland (Higgins & Davies, 1996) and the timing of arrival along the east and south-east Australian coasts suggests some fly directly to these areas (Alcorn, 1988). In Victoria, most birds arrive in November, with small numbers moving west along the coast as early as August (Lane, 1987). In southern Tasmania, most arrive in late August to early October, with a few continuing to arrive until December (Higgins & Davies, 1996). When Far Eastern Curlews first arrive in Tasmania they are found at many localities before congregating at Ralphs Bay or Sorell (Thomas, 1968).

Far Eastern Curlews arrive in **New Zealand** from the second week of August and remain until mid-November with a median date of mid-October (Higgins & Davies, 1996). Although in recent years, very few birds have been seen.

2.4.2 Non-breeding season

During the non-breeding season small numbers of Far Eastern Curlew occur in coastal southern **Republic of Korea**, **Japan**, and **China**. Unquantified numbers occur in **Indonesia**, **Papua New Guinea**, Borneo, Peninsular **Malaysia** and the **Philippines** (Higgins & Davies, 1996). The majority of the Far Eastern Curlew population is found in **Australia** during the non-breeding season (Bamford et al., 2008), mostly at a few sites on the east coast and in north-western **Australia** (Lane, 1987). Population numbers are stable at most sites in November or between December-February, suggesting little movement during this period (Lane, 1987; Alcorn, 1988).

Analysis of biometrics of Far Eastern Curlew by Nebel *et al*. (2013) showed that they have a strongly skewed sex ratio in south-eastern **Australia**; only 35.3% of adult Far Eastern Curlew captured were male (*n* = 383 birds). In contrast, 54.3 % of adult Far Eastern Curlew captured in north-western **Australia** were male (*n* = 102). These data suggest that male and female Far Eastern Curlew have preferences for different non-breeding areas, with females migrating further south.

2.4.3 Return to breeding grounds

Most Far Eastern Curlews leave **Australia** between late February and March-April (Higgins & Davies, 1996; Driscoll & Ueta, 2002). The birds depart **New Zealand** from mid-March to mid-May (Higgins & Davies, 1996) and peak in abundance at some sites in the **Republic of**

Korea in early to mid-April (Moores 2012). The species has been recorded on passage elsewhere mostly between March and May, arriving at Kamchatka, **Russia**, during May (Higgins & Davies, 1996).

Like many other large shorebirds, young Far Eastern Curlew can spend their second austral winter in **Australia**, and some may also spend their third winter in **Australia** before undertaking their first northward migration to the breeding grounds (Wilson, 2000). The numbers of birds that remain on the non-breeding grounds during the austral winter are around 25% of the peak austral summer numbers (Finn et al., 2001). Large numbers (locally tens or hundreds) apparently remain throughout the boreal summer at some coastal sites in the **Republic of Korea** (especially in Gyeonggi Bay), and although more research is required these likely include immature birds and failed breeders (N. Moores pers comm.).

2.5 Important Sites

In this Action Plan 'important sites' are defined as a threshold of the Far Eastern Curlew global population. Here we consider sites that contain ≥1% of the population as internationally important and require special protective measures. In some countries, like **Australia**, 'nationally important sites' are defined as those areas that contain ≥0.1% of the population (Australian Government 2015c).

Internationally, the Yellow Sea region is extremely important as stopover habitat for Far Eastern Curlews. It supports about 80% of the estimated flyway population on the northern migration, but fewer seem to use the region during the southern migration. Relatively few Far Eastern Curlews pass through **Japan**. Thirteen sites of international importance were identified in the Yellow Sea (six in **China**, six in **Republic of Korea** and one in **Democratic People's Republic of Korea**) (Bamford et al., 2008). Twelve sites were considered important during the northern migration and seven during the southern migration, with six sites (Dong Sha, Shuangtaizihekou National Nature Reserve, Ganghwa Do, Yeong Jong Do, Mangyeung Gang Hagu and Dongjin Gang Hagu) important during both (Barter, 2002; Bamford et al. 2008). It is important to note that despite being recognised as internationally important, habitat in some of these sites has been destroyed since the Barter (2002) surveys. More recently, Mangyeung Gang Hagu and Dongjin Gang Hagu in the **Republic of Korea** are no longer considered important sites for Far Eastern Curlew. Ganghwa Do (Island), Yeongjong Do (Island), Janghang Coast and Yubu Do (Island) in the Geum Estuary and Namyang Bay now account for nearly 90% of population in the **Republic of Korea**.

In **China**, Bai et al., (2015) identified seven internationally important sites for Far Eastern Curlew in the Yellow Sea region. During northward migration, Yalu Jiang estuarine wetland, Yellow River Delta and Shuangtaizihekou National Nature Reserve are utilised by large numbers of Far Eastern Curlew, particularly Yalu Jiang with 4,840 individuals recorded in April 2011. During southward migration, Yalu Jiang estuarine wetland, Tianjin coast, Zhuanghe Bay, Shuangtaizihekou National Nature Reserve, Cangzhou coast, Rudong coast, Yellow River Delta considered internationally important. Again, Yalu Jiang is the most important site with 5,289 individuals recorded in July 2011.

Outside the Yellow Sea, the Moroshechnaya River Estuary in Far East **Russia** is an internationally important site for Far Eastern Curlews during the southward migration. In **Indonesia**, the Banyuasin Delta on Sumatra is also important during the southward

migration, while Pulau Bruit, **Malaysia** is internationally important for Far Eastern Curlews during the northward migration. Bamford et al. (2008) identified the Kikori Delta as an important site in **Papua New Guinea**.

During the non-breeding season, **Australia** is the most important country in the EAAF accounting for at least 73% of the population (Bamford et al., 2008). At least 19 sites have been identified as internationally important for the Far Eastern Curlew (Bamford et al. 2008). Most are located along the north and east coasts of **Australia** and four sites are located in the southern state of Victoria. Both Moreton Bay and Buckingham Bay have been identified as internationally important austral wintering sites for the Far Eastern Curlew, likely containing young birds that have not made the migration north.

Many of these sites are based on old count data and an outdated population level threshold (estimate 38 000; 1% = 380 individuals). Recent work suggests the population estimate is no greater than 35,000 individuals (1% = 350) (Hansen et al., 2016). There is an urgent need to reassess the number and location of sites of international importance based on this new population estimate.

2.6 Diet

The Far Eastern Curlew's diet on the breeding grounds includes insects, such as larvae of beetles and flies, and amphipods. During southward migration berries are also consumed (Van Gils and Wiersma 1996). During the non-breeding season, Far Eastern Curlew mainly eats crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects (Dann 2005; Finn et al., 2008; Dann 2014). In Roebuck Bay, Western Australia, the birds feed mainly on large crabs, but will also catch mantis shrimps and chase mudskippers (Rogers, 1999). In southern Australia, Far Eastern Curlews feed on a variety of crabs and shrimps (Dann 2014). Far Eastern Curlews find the burrows of prey by sight during the day or in bright moonlight, but also locate prey by touch. The sexual differences in bill length lead to corresponding differences in diet and behaviour (Higgins & Davies, 1996; Dann 2005; Dann 2014). Male and female Far Eastern Curlews use intertidal habitat area differently, with females using more sandy areas and males use more muddy areas (Dann 2014).

The birds are both diurnal and nocturnal with feeding and roosting cycles determined by the tides. Far Eastern Curlews usually feed alone or in loose flocks. Occasionally, this species is seen in large feeding flocks of hundreds (Higgins & Davies, 1996). The Far Eastern Curlew is extremely wary and will take flight at the first sign of danger, long before other nearby shorebirds become nervous.

2.7 Population size and trend

The global population estimate in 2008 was 38 000 individuals (Bamford et al., 2008), but numbers have recently declined (Garnett et al., 2011). Recent research has revised down the global population estimate to 35,000 (Hansen et al., 2016). The 2008 population estimate is considered out of date given the ongoing population declines and the revised estimate of 35,000 is more plausible. The majority of the estimated population – 26,000 to 28 000 birds – occur in the non-breeding season in **Australia** (Bamford et al. 2008; Hansen et

al., 2016), with an additional 5 000 in **Indonesia**, 3 000 in **China** and 2 000 in **Papua New Guinea** (Australian Government 2015a).

Barter (2002) estimated that 31 500 birds (83% of the then estimated world population) stage in the Yellow Sea on northward migration. The species is affected by habitat loss and degradation of intertidal habitat caused by reclamation and major infrastructural development. There was a 99% decline of Far Eastern Curlew staging at Saemangeum, **Republic of Korea** during northward migration between 2006 and 2014, with evidence of only limited displacement to adjacent sites following seawall closure there in 2006 (Moores et al. 2016). Numbers recorded at the Nakdong Estuary have also declined markedly following a series of development projects including construction of an estuarine barrage in the late 1980s, and reclamation projects and bridge-building in the 2000s, with a maximum count of 635 during southward migration in 1983 but of only 193 during southward migration in 2005 and 46 in 2014 (Wetlands and Birds Korea 2005; Shorebird Network Korea 2015). There are no clear trends in **Japan** between 1978 and 2008 (Amano et al., 2010), but this region lies outside the main migration route of the Far Eastern Curlew, especially during northward migration. There has been a fairly steady decline in Far Eastern Curlew numbers in **New Zealand** since the early 1980s, with an apparent acceleration in the decline since 2004; formerly about 20 birds wintered there (Higgins and Davies 1996) but now fewer do so. Since 2008 fewer than 10 have visited each summer. A few non breeders stay in **New Zealand** over the southern winter.

In **Australia**, numbers appear to have declined on Eighty-mile Beach, Western Australia by c.40% between 2000 and 2008, whereas numbers at Roebuck Bay, Western Australia have remained relatively stable (Rogers et al., 2009). At Moreton Bay, Queensland they declined by c. 2.4% per year between 1992 and 2008 (Wilson et al., 2011), across the whole of Queensland they declined by c. 4.1% per year between 1992 and 2008 (Fuller et al., 2009), in Victoria by 2.2% per year between 1982 and 2011 (Minton et al., 2012) and in Tasmania by 80% between the 1950s and 2000 (Reid & Park, 2003) and by 40% across 49 Australian sites between 1983 and 2007 (BirdLife Australia in litt. 2011). An observation of over 2000 Far Eastern Curlews at Mud Islands, Port Phillip Bay, Victoria in 1953 (Tarr and Launder 1954), compared to current counts of fewer than 50 birds in Port Phillip Bay, suggests that population declines in the Far Eastern Curlew may have begun well before regular shorebird counts were initiated in **Australia**.

An unpublished assessment of the numbers of Far Eastern Curlews at roost sites in Tasmania showed decreases of between 55% and 93%, depending on site (cited in Australian Government 2015a). In the southeast, the decrease was 90% for the period 1964/65 – 2010/11, and in the north, the decrease was 93% between 1973/74 and 2010/11 (cited in Australian Government 2015a). At both of these sites, and at other roost sites in Tasmania, the decreases have continued, with fewer birds seen in 2014 (cited in Australian Government 2015a).

In 2015 this species was listed as ‘endangered’ in the IUCN Red List owing to the past, recent and ongoing rapid population decline of 50-79 per cent in three generations (30 years), based on survey data and habitat loss. Time series data from directly observed summer counts at a large number of sites across **Australia** indicated a severe population decline of 66.8% over 20 years (5.8% per year; Australian Government 2015a), and 81.4 %

over 30 years which for this species is equal to three generations (Garnett et al., 2011; Australian Government 2015a).

3. THREATS

The main threat to Far Eastern Curlew is considered to be reclamation of intertidal flats for tidal power plants and barrages, port development, industrial use, agricultural and urban expansion in the Yellow Sea where it stages on migration (Bamford et al., 2008; van de Kam et al., 2010; Murray et al., 2014; Melville et al., 2016). Other threats along their migratory route include hunting, environmental pollution, invasive cordgrass *Spartina,* reduced river flows resulting in reduced sediment flows and human disturbance (Barter, 2002; Chen and Qiang, 2006; Moores, 2006; Melville et al., 2016). Threats in **Australia**, especially eastern and southern **Australia**, include ongoing human disturbance, habitat loss and degradation from pollution and structural modification of soft-sediment feeding flats, changes to water regimes and invasive plants (Rogers et al., 2006; Finn, 2009, Garnett et al., 2011; Australian Government 2015 a,b,c).

Human disturbance can cause shorebirds to interrupt their feeding or roosting and may influence the area of otherwise suitable feeding habitat that is actually used. Far Eastern Curlews are amongst the first shorebirds to take flight when humans approach to within 30–100 metres (Taylor & Bester, 1999), or even up to 250 metres away (Peter, 1990). Coastal development, port development, land reclamation, construction of barrages and stabilisation of water levels can destroy feeding habitat (Close & Newman, 1984; Sutherland et al., 2012; Melville et al., 2016). Pollution around settled areas may reduce the availability of food by altering prey composition and/or reducing substrate penetrability (Close & Newman, 1984; Finn 2009). Formerly, Far Eastern Curlews were taken for food in Tasmania (Higgins & Davies, 1996). The species has been hunted intensively on breeding grounds and at stopover points while on migration (Higgins & Davies, 1996).

3.1 Description of key threats

3.1.1 Habitat loss

Habitat loss occurring as a result of development is the most significant threat currently affecting migratory shorebirds along the EAAF (Melville et al., 2016). Of particular concern in the EAAF is coastal development and intertidal mudflat 'reclamation' in the Yellow Sea region, which is bordered by **China**, the **Democratic People's Republic of Korea** and the **Republic of Korea** (Murray et al., 2014; Melville et al., 2016). A migratory shorebird's ability to complete long migration flights depends on the availability of suitable habitat at sites throughout the EAAF that provide adequate food and roosting opportunities to rebuild energy reserves (Piersma et al, 2015). The Yellow Sea region is the major staging area for several species of shorebird, including significant populations of the Far Eastern Curlew, which fly between **Australia** and the east coast of Asia on migration (Barter, 2002; Bamford et al., 2008; Iwamura et al., 2013; Moores et al., 2016). In a recent study using historical topographical maps and remote sensing analysis, Murray et al. (2014) showed that 65% of the tidal flats existing in the Yellow Sea in the 1950s have disappeared, probably from a combination of coastal development and reduced sediment input to the Yellow Sea. Losses of such magnitude are the key drivers of decreases in biodiversity and ecosystem services in

the intertidal zone of the region (MacKinnon et al., 2012). Further reclamation projects are ongoing or are in the planning stage in the Yellow Sea region.

Overall, coastal development in east and south-east Asia is accelerating and reaching a pace which is unprecedented in other parts of the world. Examples of urban expansion in coastal areas are well known from **Australia**, the **Republic of Korea**, **Japan**, and **Singapore** and most other countries in the region. Development for industry, housing, tourist and transport infrastructure is widespread. In some coastal areas, inter-tidal areas are increasingly used for conversion into land for new settlements and intensive aquaculture.

Habitat loss in the breeding grounds has also occurred, for instance, in the Amur River basin, there are examples of hydroelectric scheme dams inundating nesting areas e.g. the Zea reservoir in the 1970s and further dams in the future could destroy other breeding areas (Brown et al. 2014). Studies analysing satellite images indicated a decrease of 80% marshland (i.e. potential nesting ground for Far Eastern Curlew) over the last 50 years in north-east Heilongjiang Province, **China** (Liu et al. 2004; Liu et al. 2015). The authors' study area overlapped with the breeding ranges identified in Far Eastern Curlew geolocator studies.

3.1.2 Habitat degradation

Modification of wetland habitats can arise from a range of different activities including fishing or aquaculture, forestry and agricultural practices, mining, changes to hydrology and development near wetlands for housing or industry (Lee et al., 2006; Sutherland et al., 2012; Melville et al., 2016). Such activities may result in increased siltation, pollution, weed and pest invasion, all of which can change the ecological character of a shorebird area, potentially leading to deterioration of the quantity and quality of food and other resources available to support migratory shorebirds (Sutherland et al., 2012 and references therein; Ma et al., 2014; Murray et al., 2015; Melville et al., 2016). The notion that migratory shorebirds can continue indefinitely to move to other important habitats as their normal feeding, staging or roosting areas become unusable is erroneous. As areas become unsuitable to support migratory shorebirds, areas that remain will likely attract displaced birds, in turn creating overcrowding, competition for food, depletion of food resources, and increased risk of disease transmission. The areas identified today are likely to represent the vast majority of suitable stop-over sites and are irreplaceable. They need to be protected immediately and managed appropriately to ensure the species' survival.

Structural modification of feeding flats

Far Eastern Curlews require deep deposits of soft, penetrable sediment to realise their greatest foraging potential. Any structural modification of the Far Eastern Curlews' soft-sediment feeding flats that reduces the substrate penetrability may inhibit successful foraging and be detrimental to them (Finn, 2009). There are several causes of structural modification that may reduce the substrate penetrability of intertidal flats. Direct effects include activities such as intertidal oyster farming, the compaction of sediments by vehicles, the dumping of rubbish or debris and the artificial building up of beaches by adding foreign sediment to the intertidal zone. Indirect effects on the structure of soft-sediment intertidal zones can come from processes such as nutrient enrichment.

Intertidal oyster or mussel farming, whether bottom or suspended culture, may degrade the foraging habitat of shorebirds (Hilgerloh et al., 2001, Caldow et al., 2003, Connolly & Colwell, 2005). The sediment structure may be rendered less penetrable by the presence of hard-shelled bivalves in abnormally high densities, the structures used for attaching bivalves (such as trestles) and/or the use of mechanical devices during harvest (such as dredges; Piersma et al., 2001, Connolly & Colwell, 2005).

The compaction of sediments by vehicles may reduce the penetrability of the substrate and thereby inhibit burying by invertebrates and probing by shorebirds (Evans et al.,1998; Moss & McPhee, 2006; Schlacher et al., 2008).

Physical modifications of soft sediments that increase their coarseness or hardness such as that caused by the dumping of rubbish or debris (including dredge spoil) and even beach filling (nourishment) are highly likely to degrade feeding habitats for deep-probing shorebirds (Peterson et al., 2006). The dumping of dredge spoil may however be important in some areas above highest astronomical tide for providing suitable roosting habitat for shorebirds (Yozzo et al., 2004).

Processes that increase the available nutrients in the intertidal zone (such as sewage discharge and runoff from terrestrial soils) may lead to eutrophication and the proliferation of algal mats (Raffaelli 1999, Lopes et al. 2006). These algal mats may reduce substrate penetrability and are therefore likely to be avoided by deep-probing shorebirds, unless there is an associated increase in suitable prey at the substrate surface (Lewis & Kelly, 2001).

Farming

In southern parts of the breeding range, both arable and livestock farming are increasing, and this thought to be degrading breeding habitats (Brown et al. 2014). The burning of grasslands is an important land management practice in this area. Anecdotal evidence at one breeding site suggests Far Eastern Curlew preferentially nest within recently-burned grasslands, with high nest success recorded (Antonov 2010). After nesting, chicks are frequently observed foraging in nearby swamps and sedge meadows, suggesting a mosaic of unburnt grassland, burnt grasslands and wetlands is important (Antonov 2010). However, burning can also have a devastating impact on breeding success if undertaken during the nesting period: one study to the south of the Amur region recorded 28% of nests destroyed by fires (Antonov 2010). The timing of burning is therefore of critical importance. The impact of regular burning on invertebrate food resources is not well understood.

Invasive species

Of specific concern for migratory shorebirds is the introduction of exotic marine pests resulting in loss of benthic food sources at important intertidal habitat (Neira et al., 2006). Predation by invasive animals, such as cats (*Felix catus*) and foxes (*Vulpes vulpes*) in **Australia** has not been quantified, but anecdotal evidence suggests some individuals are taken as prey.

Invasive species are negatively affecting coastal habitats, causing local species to be displaced by species accidentally or deliberately introduced from other areas. With an increase in global shipping trade the influx of such species is increasing, especially in the coastal zone. *Spartina* cordgrass in **China** is colonising intertidal mudflats and converting

them into meadows (Melville et al., 2016), Zebra Mussels (*Dreissena polymorpha*), in estuaries and along coasts of Asia, are causing the loss of benthic food resources (MacKinnon et al., 2012).

Harvesting of shorebird prey

Overharvesting of intertidal resources, including fish, crabs, molluscs, annelids, sea-cucumber, sea-urchins and seaweeds can lead to decreased productivity and changes in prey distribution and availability (MacKinnon et al., 2012). The recent industrialisation of harvesting methods in **China** has resulted in greater harvests of intertidal flora and fauna with less manual labour required, which is impacting ecosystem processes throughout the intertidal zone (MacKinnon et al., 2012). In many important shorebirds areas, the intertidal zone is a maze of fishing platforms, traps and nets that not only add to overfishing, but prevent access to shorebird feeding areas by causing human disturbance.

Altered hydrological regimes

Altered hydrological regimes can directly and indirectly threaten migratory shorebird habitats. Water regulation, including extraction of surface and ground water (for example, diversions upstream for consumptive or agricultural use), can lead to significant changes to flow regime, water depth and water temperature. Changes to flows can lead to permanent inundation or drying of connected wetlands, and changes to the timing, frequency and duration of floods. These changes impact both habitat availability and type (for example, loss of access to mudflats through permanent higher water levels, or a shift from freshwater to salt-tolerant vegetation communities), and the disruption of lifecycles of plants and animals in the food chain for migratory shorebirds.

Reduced recharge of local groundwater that occurs when floodplains are inundated can change the vegetation that occurs at wetland sites, again impacting habitat and food sources.

Water regulation can alter the chemical make-up of wetlands. For example, reduced flushing flows can cause saltwater intrusion or create hyper-saline conditions. Permanent inundation behind locks and weirs can cause freshwater flooding of formerly saline wetlands, as well as pushing salt to the surface through rising groundwater.

3.1.3 Climate change

Climate change is expected to have a major impact on coastal mudflats and breeding habitat throughout the EAAF. Such changes have the potential to impact on all migratory shorebirds and their habitats by reducing the extent of coastal and inland wetlands or through a poleward shift in the range of many species (Chambers et al., 2005; Iwamura et al., 2013; Wauchope et al., 2015). Climate change projections for the EAAF suggest likely increased temperatures, rising sea levels, more frequent and/or intense extreme climate events resulting in likely species loss and habitat degradation (Chambers et al., 2005, 2011; Iwamura et al., 2013; Nicol et al., 2015).

The Far Eastern Curlew's breeding range is in a region predicted to be one of the most heavily influenced by climate change (Wauchope et al., 2015). Rising annual and summer temperatures will change the vegetation composition making areas less suitable as breeding

habitat for the species. Predictions of decreasing precipitation in both winter and spring will lead to drying breeding habitat and loss of preferred nesting habitat around swampy ground. Depending on the exact geographical location and microclimate conditions, this could mean significant changes in key breeding habitats.

3.1.4 Hunting, Collecting and Poaching

Hunting of migratory shorebirds in **Australia** and **New Zealand** has been prohibited for a number of decades. It is unclear if illegal hunting occurs during the annual duck hunting season in certain Australian states. Far Eastern Curlews were shot for food in Tasmania, **Australia** until the 1970s (Park, 1983; Marchant & Higgins, 1993). Hunting also appears to have decreased in the **Republic of Korea**, with the only reported instance being minor hunting activity in Mangyeung Gang Hagu (Barter, 2002).

In the early 1990s, there had been a number of investigations into shorebird hunting activities at internationally important sites, including in the Chang Jiang Estuary, **China** (Tang & Wang, 1991, 1992, 1995; Barter et al., 1997; Ma et al., 1998). Tang and Wang (1992) estimated that approximately 30 000 and 9 000 shorebirds were captured with clap nets in the 1991 and 1992 northward migrations, respectively. They suggested that the decrease between the two years was due to decreasing hunter numbers, increasing incomes from alternative activities and/or reduction in shorebird habitat due to reclamation. However, a study during the 1996 northward migration showed that hunter numbers had not decreased since 1991 and that the number of shorebirds caught was similar (Barter et al., 1997). Studies during the 2000-2001 period indicate that hunting activity had declined at Chongming Dao, **China** (Ma et al., 2002).

Wang et al. (1991, 1992) reported hunting activity in the Yellow River Delta, estimating that 18 000 - 20 000 shorebirds were caught with clap nets during northward migration in 1992 and probably a higher number during southward migration in 1991. However, no hunting was observed in the Delta during surveys in the 1997, 1998 and 1999 northward migrations (Barter, 2002). With the exception of the Chang Jiang Estuary, no hunting activity was detected in **China** during shorebird surveys that covered about one-third of Chinese intertidal areas between 1996 and 2001 (Barter, 2002). They have been hunted at stopover points while on migration as well as on their breeding grounds in **Russia** (Marchant & Higgins, 1993), where hunting has been reported since at least the 1980s (Tomkovich 1996). More recently, hunting of Far Eastern Curlew in **Russia** has been recorded as part of duck hunting (Victor Degtyaryev, Igor Fefelov, personal communication 2014). There is no current data on levels of take in the breeding grounds, and “occasional” hunting remains by most as a qualitative assessment, which is insufficient to assess population-level effects.

Mist-netting of shorebirds for local consumption and to supply local food markets still occurs in a number of countries, including **China** (Melville et al., 2016). It is unclear if the Far Eastern Curlew makes up a significant proportion of the take, however, even if only small numbers are taken, the impact can be devastating in the long-term. Considering that the current level of take across the entire range of this species is unknown, it is not justified to conclude that low levels of hunting at small spatial scales have negligible deleterious population-level effects.

3.1.5 Disturbance

Human disturbance of Far Eastern Curlew includes recreation, fishing, shell-fishing, research and monitoring activities. Disturbance from human activities has a high energetic cost to shorebirds and may compromise their capacity to build sufficient energy reserves to undertake migration (Goss-Custard et al., 2006; Weston et al., 2012; Lilleyman et al., 2016). Disturbance that renders an area unusable is equivalent to habitat loss and can exacerbate population declines. Disturbance is greatest where increasing human populations and development pressures impact important habitats. Migratory shorebirds are most susceptible to disturbance during daytime roosting and foraging periods. As an example, disturbance of migratory shorebirds in **Australia** is known to result from aircraft over-flights, industrial operations and construction, artificial lighting, and recreational activities such as fishing, off-road driving on beaches, unleashed dogs and jet-skiing (Weston et al., 2012; Lilleyman et al., 2016).

A recent study by Martin et al. (2014) examined the responses to human presence of an abundant shorebird species in an important coastal migration staging area. Long-term census data were used to assess the relationship between bird abundances and human densities and to determine population trends. In addition, changes in individual bird behaviour in relation to human presence were evaluated by direct observation of a resident shorebird species. The results showed that a rapid increase in the recreational use of the study area in summer dramatically reduced the number of shorebirds and gulls which occurred, limiting the capacity of the site as a post-breeding stop-over area (Martin et al., 2014). In addition, the presence of people at the beach significantly reduced the time that resident species spent consuming prey. Martin et al. (2014) found negative effects of human presence on bird abundance remained constant over the study period, indicating no habituation to human disturbance in any of the studied species. Moreover, although intense human disturbance occurred mainly in summer, the human presence observed was sufficient to have a negative impact on the long-term trends of a resident shorebird species. Martin et al. (2014) suggested that the impacts of disturbance detected on shorebirds and gulls may be reversible through management actions that decrease human presence. The authors suggest minimum distances for any track or walkway from those areas where shorebirds are usually present, particularly during spring and summer, as well as appropriate fencing in the most sensitive areas.

3.1.6 Pollution

Chronic pollution

Shorebird habitats are threatened by the chronic accumulation and concentration of pollutants. Chronic pollution may arise from both local and distant sources. Migratory shorebirds may be exposed to chronic pollution while utilising non-breeding habitats 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. Shorebirds could be at risk from marine microplastics, as these birds prey on invertebrates

that are known to ingest microplastics by filter-feeding. This gap in our current knowledge provides an opportunity for directed research.

Acute pollution

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 the suitability of important habitat may be reduced for many years through catastrophic loss of marine benthic food sources.

3.2 Threat prioritisation

Each of the threats outlined above has been assessed to determine the risk posed to Far Eastern Curlew populations using a risk matrix. This in turn determines the priority for actions outlined in Section 5. The risk matrix considers the likelihood of an incident occurring and the population level consequences of that incident. Threats may act differently in different locations and populations at different times of year, but the precautionary principle dictates that the threat category is determined by the group at highest risk. Population-wide threats are generally considered to present a higher risk.

The risk matrix uses a qualitative assessment drawing on peer reviewed literature and expert opinion. In some cases the consequences of activities are unknown. In these cases, the precautionary principle has been applied. Levels of risk and the associated priority for action are defined as follows:

Very High - immediate mitigation action required

High - mitigation action and an adaptive management plan required, the precautionary principle should be applied

Moderate – obtain additional information and develop mitigation action if required

Low – monitor the threat occurrence and reassess threat level if likelihood or consequences change

Figure 3. Risk Prioritisation

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain	Low	Moderate	Very High	Very High	Very High
Likely	Low	Moderate	High	Very High	Very High

Possible	Low	Moderate	High	Very High	Very High
Unlikely	Low	Low	Moderate	High	Very High
Rare or Unknown	Low	Low	Moderate	High	Very High

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 – such events are known to have occurred on a worldwide basis but only a few times

Rare or Unknown – may occur only in exceptional circumstances; OR it is currently unknown how often the incident 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 stalls or reduces

Major – population decreases

Catastrophic – population extinction

Figure 4. Far Eastern Curlew Population Residual Risk Matrix

Likelihood of occurrence	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain		Harvesting of shorebird prey	Hunting, Collecting and Poaching Disturbance	Climate change	Habitat loss
Likely		Chronic pollution Invasive species	Altered hydrological regimes Structural modification of feeding flats		
Possible					
Unlikely			Acute pollution		
Rare or Unknown					

4. POLICIES AND LEGISLATION RELEVANT FOR MANAGEMENT

4.1 International conservation and legal status of the species

IUCN Status	CMS
Endangered A2bc+3bc+4bc (2015): A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild: A. Reduction in population size based on any of the following: 1. An observed, estimated, inferred or suspected population size reduction of ≥ 70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following: (a) direct observation (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. 2. An observed, estimated, inferred or suspected population size reduction of ≥ 50% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1. 3. A population size reduction of ≥nbsp;50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1. 4. An observed, estimated, inferred, projected or suspected population size reduction of ≥ 50% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future,	Appendix I (2011) Appendix II as part of the Scolopacidae. Designated for Concerted and Cooperative action at COP11 (Quito, Ecuador, 2014).

and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.	

4.2 International conventions and agreements ratified by Range States

Country	CMS	CBD	Ramsar	EAAFP
Australia	✓	✓	✓	✓
Brunei Darussalam		✓		
Cambodia		✓	✓	✓
China		✓	✓	✓
Fiji*	✓	✓	✓	
Guam (to USA)*			✓	
Indonesia		✓	✓	✓
Japan		✓	✓	✓
Democratic People's Republic of Korea		✓		
Republic of Korea		✓	✓	✓
Malaysia		✓	✓	✓
Federated States of Micronesia*		✓		
Mongolia	✓	✓	✓	✓
New Zealand	✓	✓	✓	✓
New Caledonia & French Polynesia (to France)*	✓	✓	✓	
Northern Mariana Islands (to USA)*			✓	

Palau	✓	✓	✓	
Papua New Guinea		✓	✓	
Philippines	✓	✓	✓	✓
Russian Federation		✓	✓	✓
Singapore		✓		✓
Thailand		✓	✓	✓
Timor-Leste		✓		
Vietnam		✓	✓	✓

* Considered a vagrant.

4.3 National legislation relevant to the Far Eastern Curlew

Country	National Protection Status	Law protecting species	Legal protection from illegal killing, taking, trading, keeping or moving.	Penalties	Responsible Authority
Australia	Commonwealth: **Critically Endangered** State: QLD: **Near threatened** NSW: Not listed NT: **Vulnerable** SA: **Vulnerable** TAS: **Endangered** WA: **Vulnerable** VIC: **Vulnerable**	Australia has a Federal Government with 8 separate State or Territory Governments. The Australian Government has responsibility for matters in the national interest, and for non-state/territory areas, which includes the marine environment from 3 nautical miles out to the edge of the Exclusive Economic Zone (EEZ). The State and Territory governments have responsibility for issues within their jurisdictional borders, including State/Territory waters. Far Eastern Curlews are listed as threatened, migratory and marine under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is an offence to kill, injure, take, trade, keep or move the species in a Commonwealth area (i.e. Commonwealth waters), unless the person taking the action holds a permit under the EPBC Act.	Yes, through Commonwealth and State/Territory implementing legislation.	The EPBC Act provides penalties (financial and incarceration time) for various offences relating to listed threatened and migratory shorebirds. Penalties for offenses relating to native wildlife exist under other Commonwealth, State and Territory legislation.	Department of the Environment (Commonwealth)

Country	National Protection Status	Law protecting species	Legal protection from illegal killing, taking, trading, keeping or moving.	Penalties	Responsible Authority
		Implementing legislation: **Commonwealth**: *Environment Protection and Biodiversity Conservation Act 1999* **QLD**: *Nature Conservation Act 1992* **NSW**: *Threatened Species Conservation Act 1995; National Parks and Wildlife Act 1974* **NT**: *Territory Parks and Wildlife Conservation Act 2000* **SA**: *National Parks and Wildlife Act 1972* **TAS**: *Threatened Species Protection Act 1995; Living Marine Resources Management Act 1995* **WA**: *Wildlife Conservation Act 1950; Conservation and Land Management Act 1984* **VIC**: *Wildlife Act 1975; Flora and Fauna Guarantee Act 1988*			
Brunei Darussalam					
Cambodia					
China	Far Eastern Curlew is listed in the *Lists of terrestrial wildlife under state protection, which are beneficial or of important economic or scientific value.*	*Environmental Protection Law 1989* *Law of the People's Republic of China on the Protection of Wildlife 1988* *Marine Environment Protection Law*	Law of the People's Republic of China on the Protection of Wildlife indicates: -Hunting without license is prohibited		

Country	National Protection Status	Law protecting species	Legal protection from illegal killing, taking, trading, keeping or moving.	Penalties	Responsible Authority
		1999	-Activities which are harmful to the living and breeding of wildlife shall be prohibited. - The areas and seasons closed to hunting as well as the prohibited hunting gear and methods shall be specified by governments at or above the county level or by the departments of wildlife administration under them - The hunting or catching of wildlife by the use of military weapons, poison or explosives shall be prohibited.		
Indonesia					
Japan	National Red List: **Vulnerable**	Far Eastern Curlew is designated as a rare wild animal species under the *Wildlife Protection Control and Hunting Management Act*, and taking of the birds or their eggs is prohibited unless the person taking the action holds a permit by the Minister of the Environment.	Taking of the birds or their eggs is prohibited unless the person taking the action holds a permit by the Minister of the Environment.	The *Wildlife Protection Control and Hunting Management Act* provides penalties (financial and incarceration time) for illegal taking of the birds and their eggs.	Ministry of the Environment

Country	National Protection Status	Law protecting species	Legal protection from illegal killing, taking, trading, keeping or moving.	Penalties	Responsible Authority
Democratic People's Republic of Korea					
Republic of Korea	Endangered Species II	*Wildlife Protection and Management Act*	Protected legally by prohibition of illegal capture, collecting, keeping, trading.	Punished by imprisonment for not more than 3 years or by a fine not exceeding 30 million won.	Ministry of Environment
Malaysia	No National Red List for Birds	Peninsular Malaysia: Wildlife Conservation Act 2010 (Totally Protected) Sarawak: Wildlife Protection Ordinance 1998 (Protected) Sabah: Wildlife Conservation Enactment 1997 (Protected)	No hunting, taking etc in Peninsular Malaysia under the law. For Sabah and Sarawak, limited hunting is permitted with proper licence.	Jail term and/or financial penalties.	Peninsular Malaysia: Department of Wildlife and National Parks (PERHILITAN) Sarawak: Sarawak Forestry Corporation (SFC) Sabah: Sabah Wildlife Department (SWD)

Country	National Protection Status	Law protecting species	Legal protection from illegal killing, taking, trading, keeping or moving.	Penalties	Responsible Authority
Mongolia					
New Zealand	New Zealand Threat Classification Status: Migrant (Robertson et al. 2013)	Far Eastern Curlew are "Absolutely Protected Wildlife" pursuant to the *Wildlife Act 1953*.	Taking of the birds or their eggs is prohibited unless the person taking the action holds an Authority issued by the Department of Conservation.	The Wildlife Act provides penalties (financial and incarceration time) for various offences relating to absolutely protected wildlife.	Department of Conservation.
Palau					
Papua New Guinea					
Philippines		*Wildlife Conservation and Protection Act of 2001* (R.A. 9147)	Illegal capture, trading, transport is prohibited.	Provisions for penalties include financial and imprisonment	Department of Environment and natural Resources
Russian Federation					
Singapore	Rare passage migrant	*Parks & Trees Act, Wild Animals and Birds Act*	Yes	Penalties (financial and/or incarceration)	National Parks Board Agri-Food & Veterinary Authority of

Country	National Protection Status	Law protecting species	Legal protection from illegal killing, taking, trading, keeping or moving.	Penalties	Responsible Authority
					Singapore
Thailand					
Timor-Leste					
Vietnam					

5. FRAMEWORK FOR ACTION

5.1 Goal

To restore the Far Eastern Curlew's population to a positive growth rate for a period of at least three generations.

5.2 Objectives, Actions and Results

The objectives and corresponding actions and results are set out in the tables below for all threats identified for the Far Eastern Curlew in the EAAF. Tables have been listed according to ratings assigned in the risk matrix.

Actions are prioritized as:
- Essential
- High
- Medium
- Low

Timescales are attached to each Action using the following scale:

- Immediate: completed within the next year
- Short: completed within the next 3 years
- Medium: completed within the next 5 years
- Long: completed within the next 10 years
- Ongoing: currently being implemented and should continue

Objective 1: Protect all important habitats for Far Eastern Curlew across its range.				
Result	**Action**	**Priority**	**Time Scale**	**Organisations responsible**
1.1 All important staging and non-breeding sites	1.1.1 Important non-breeding areas are identified Applicable to: **All Range States** that support	Essential	Short	Government institutions in charge of nature

along the EAAF are adequately managed and protected.	staging and non-breeding habitat			conservation International and National conservation NGOs Academic institutions
	1.1.2 Important non-breeding areas are adequately managed Applicable to: **All Range States** that support staging and non-breeding habitat	Essential	Medium	Government institutions in charge of nature conservation International and National conservation NGOs
	1.1.3 Important non-breeding areas are adequately protected Applicable to: **All Range States** that support staging and non-breeding habitat	Essential	Medium	Government institutions in charge of nature conservation International and National conservation NGOs
1.2 Breeding habitats are adequately managed and protected.	1.2.1 Important breeding areas are identified Applicable to: **Russia**, **China** and **Mongolia**	Essential	Short	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
	1.2.2 Important breeding areas are adequately managed Applicable to: **Russia**, **China** and **Mongolia**	Essential	Medium	Government institutions in charge of nature conservation

				International and National conservation NGOs
	1.2.3 Important breeding areas are adequately protected Applicable to: **Russia**, **China** and **Mongolia**	Essential	Medium	Government institutions in charge of nature conservation International and National conservation NGOs
Objective 2: Establish a climate change response plan for Far Eastern Curlew				
2.1 The impacts of climate change on Far Eastern Curlew are buffered.	2.1.1 Quantify and predict changes to important breeding habitat Applicable to: **All Range States** that support breeding habitat	Medium	Medium	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
	2.1.2 Quantify and predict changes to important staging and non-breeding sites Applicable to: **All Range States** that support staging and non-breeding habitat	Medium	Medium	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
	2.1.3 Validate predictions of population response to climate change against measured data Applicable to: **All Range States**	Medium	Long	Government institutions in charge of nature conservation

				International and National conservation NGOs Academic institutions
	2.1.4 Identify potential shifts in nesting and non-breeding distribution and ensure adequate coverage of these areas in protected areas Applicable to: **All Range States** that support breeding and non-breeding habitat	Medium	Long	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
Objective 3: Ensure the legal direct take of Far Eastern Curlew is eliminated				
3.1 Far Eastern Curlew populations subject to legal direct take are protected	3.1.1 Immediately cease all forms of legal direct take of Far Eastern Curlew Applicable to: **All Range States** where legal hunting occurs.	Essential	Short	Government institutions in charge of nature conservation International and National conservation NGOs
Objective 4: Reduce, or eliminate, illegal take of Far Eastern Curlew				
4.1 The areas where the illegal take of Far Eastern Curlews occurs are identified	4.1.1 Identify key areas where Far Eastern Curlew illegal take occurs Applicable to: **All Range States**	Essential	Short	Government institutions in charge of nature conservation International and National conservation NGOs
	4.1.2 Strengthen legal mechanisms in areas affected by harvesting, trading and illegal use	Essential	Medium	Government institutions in charge of nature

	Applicable to: **All Range States**			conservation.
4.2 Reduced illegal take of Far Eastern Curlew	4.2.1 Promote the enforcement of legal mechanisms to reduce illegal take Applicable to: **All Range States**	Essential	Short	Government institutions in charge of nature conservation International and National conservation NGOs
	4.2.2 Implement an educational awareness programme, which may include incentives for best practice, aimed at reducing the illegal take of Far Eastern Curlew in the EAAF Applicable to: **All Range States**	Medium	Immediate	Government institutions in charge of nature conservation International and National conservation NGOs
Objective 5: Assess the risk and impact of chronic and acute pollution on Far Eastern Curlew in coastal foraging areas				
5.1 A review of chronic pollution on shorebirds is conducted	5.1.1 Conduct a risk assessment that reviews available information on the effects of chronic pollution Applicable to: **All Range States**	Low	Medium	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
5.2 Monitoring programmes are in place to measure the impact of chronic pollution within coastal waters on the health of Far Eastern	5.2.1 Monitor water quality and Far Eastern Curlew health in key coastal staging and non-breeding sites Applicable to: **All Range States** that support staging and non-breeding habitat	Low	Medium	Government institutions in charge of nature conservation International and National conservation NGOs

Curlew				Academic institutions
Objective 6: To monitor the population dynamics of Far Eastern Curlew in the EAAF to detect population responses to management implemented under this Single Species Action Plan				
6.1 Demographic data are available to allow assessment of the response of Far Eastern Curlew to anthropogenic impacts throughout the EAAF	6.1.1 Establish, or maintain long-term monitoring system of key demographic parameters following best practice guidelines Applicable to: **All Range States**	High	Medium	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
	6.1.2 Monitor numbers of birds at a statistically robust sample of staging and non-breeding sites and undertake analysis of data to improve the accuracy of the global population estimate Applicable to: **All Range States** that support staging and non-breeding habitat	Essential	Immediate	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
	6.1.3 Monitor numbers at a statistically robust sample of breeding areas in Russia, China and Mongolia Applicable to: **Russia**, **China** and **Mongolia**	Essential	Immediate	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
	6.1.4 Initiate research to accurately determine:	Low	Ongoing	Government institutions in charge of nature

	• Population trends • Adult and juvenile survival • Productivity • Nest survival and causes of nest loss • Chick survival • Breeding density Applicable to: **All Range States**			conservation International and National conservation NGOs Academic institutions
	6.1.5 Identify through satellite tracking the migratory routes of the birds, particularly while on southward migration. Applicable to: **All Range States**	Medium	Immediate	International and National conservation NGOs Academic institutions
	6.1.6 Maintain an internationally coordinated colour-marking scheme through the EAAFP Colour-marking Task Force and relevant national bird banding programmes Applicable to: **All Range States**	Medium	On-going	Government institutions in charge of nature conservation International and National conservation NGOs East Asian – Australasian Flyway Partnership
Objective 7: Assess the risk and impact of disturbance on Far Eastern Curlew				
7.1 The effect of disturbance on Far	7.1.1 Quantify the impact of disturbance on the breeding grounds and assess the likely impact on	High	Medium	Government institutions in charge of nature

Eastern Curlew has been quantified	the population Applicable to: **Russia**, **China** and **Mongolia**			conservation International and National conservation NGOs Academic institutions
	7.1.2 Quantify the level of disturbance in key staging and non-breeding sites and assess the likely impact on the population Applicable to: **All Range States** that support staging and non-breeding habitat	High	Medium	Government institutions in charge of nature conservation International and National conservation NGOs Academic institutions
Objective 8: All Range States are actively implementing the Single Species Action Plan				
8.1 International cooperation is maximised through the full engagement of all Range States in relevant multilateral frameworks	8.1.1 Consider developing national action plans to assist in the implementation of this Single Species Action Plan Applicable to: **All Range States**	High	Immediate	Government institutions in charge of nature conservation International and National conservation NGOs
	8.1.2 Consider accession to all relevant multilateral frameworks by Range States Applicable to: **All Range States**	High	Long	Government institutions in charge of nature conservation International and National conservation NGOs
	8.1.3 Maintain the active work of the EAAFP Far Eastern Curlew Task Force to coordinate	Essential	Long	Government institutions in charge of nature

	implementation of the Single Species Action Plan Applicable to: **All Range States**			conservation International and National conservation NGOs
	8.1.4 Hold regular meetings to exchange information and plan joint actions for the conservation of the Far Eastern Curlew Applicable to: **All Range States**	Essential	On-going	Government institutions in charge of nature conservation International and National conservation NGOs Academic Institutions
Objective 9: Raise public awareness of the Far Eastern Curlew and disseminate information material				
9.1 Use modern technologies and social media to raise public awareness	9.1.1 Prepare a brochure in Range States' languages and disseminate widely Applicable to: **All Range States**	High	Short	International and National conservation NGOs
9.2 Target local authorities and decision-makers on the needs of Far Eastern Curlew	9.2.1 Develop materials to raise awareness amongst local authorities responsible for approving developments at important sites identified in Action 1.1 and 1.2	High	Short	International and National conservation NGOs

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