

Evaluation of occurrence tendency and habitat types for wading birds in Japanese rivers using datasets from the National Census on River Environments



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1 Introduction

Wader species are often among the top predators in wetland ecosystems. Many waders undertake seasonal continental-scale migration for breeding, overwintering, and resting temporarily. As such, they play important roles as indicator species in the health of extensive wetland. The Japanese islands form part of the East Asian-Australasian Flyway (EAAF), which holds the richest diversity of wading bird species among the nine flyways in the world. Unfortunately, the populations of many waders have decreased drastically in the EAAF, owing to the loss of wetlands to landfills, agricultural development, and water pollution (Yong et al., 2018). River environments are one of the most important habitats for these types of waders in Japan (Ezaki 1998). However, very few studies have assessed their habitat status in the river environment. Since 1990, the Ministry of Land, Infrastructure, and Transportation Government of Japan have conducted National Censuses on River Environments (NCRE) to monitor river habitats. During these surveys, bird communities are also surveyed. Using the datasets of the NCRE, we studied the occurrence tendency and habitat types of wading birds in the large rivers of Japan.

Ezaki, Y. (1998). Kasen no chorui-gunshu. In: Ezaki Y, Tanaka T (eds) Mizube-kankyo no hozon. Asakura Shoten, Tokyo, pp. 142-176 (in Japanese).
Yong, D. L., Jain, A., Liu, Y., Iqbal, M., Choi, C. Y., Crookford, N. J., Millington, S., and Provencher, J. (2018). Challenges and opportunities for transboundary conservation of migratory birds in the East Asian-Australasian flyway. Conservation Biology, 32:740-743.

2 Method

- ★ Target | **11 wader families** (Ezaki 1998)
(Ardeidae, Ciconiidae, Threskiornithidae, Gruidae, Rallidae, Rostratulidae, Scolopacidae, Charadriidae, Haematopodidae, Recurvirostridae, and Glareolidae)
- ★ Data set | **The NCRE of a periodic survey and bird community censuses**
(1st: 1991–1995, 2nd: 1996–2000, 3rd: 2001–2005, 4th: 2006–2015)

Analysis of all datasets and sorting of habitat types

- The occurrence data of 109 river systems from 1991 to 2015.
- Classification into **three types** based on their main habitats (Nakamura & Nakamura 1995)



IF
Inland freshwater habitats
rivers, gravel-filled floodplains, lakes, marshes, and paddy fields



ETF
Estuary and tidal flat habitats



IF & ETF
Inland freshwater, estuary, and tidal flat habitats

Evaluation of occurrence tendency

- Datasets of **57 river systems** that were surveyed during all four seasons
- Wader species which was appeared in more than **10 river systems**
- Wader species were classified into **three simple indexes** based on their appearance pattern
- For each wader, **the ratio of each index** was calculated.

⊕, appearance; ⊖, nonappearance

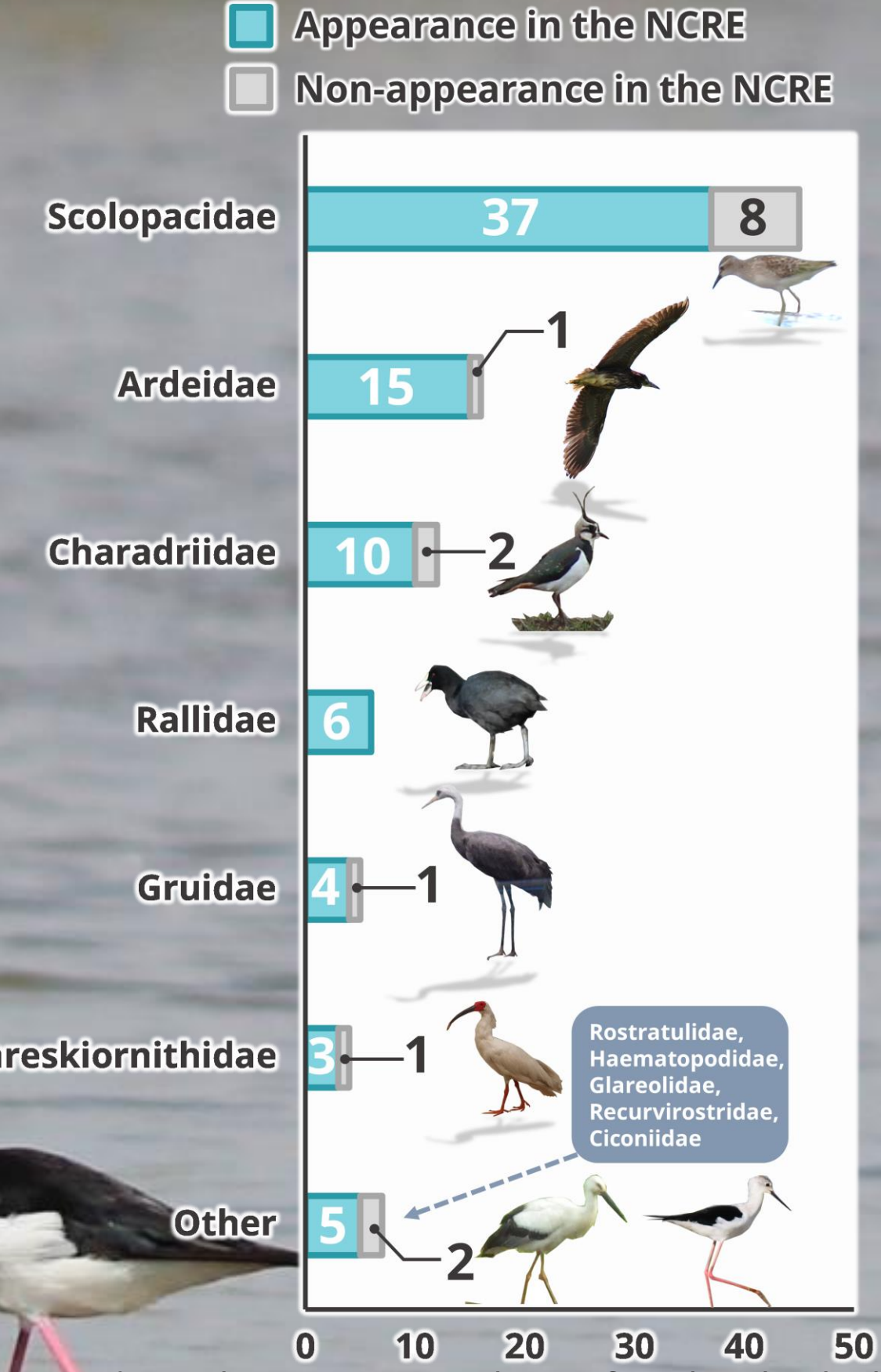
Appearance pattern of wader species		
2nd survey (1996-2000)	3rd survey (2001-2005)	4th survey (2006-2015)
+	+	+
+	-	-
-	+	+
+	+	-
+	-	+
-	-	+
-	+	-

- ➔ ① Stable tendency; ST
- ➔ ② Decreasing tendency; DT
- ➔ ③ Increasing tendency; IT
- ④ Unstable tendency

- ST ratio (1 / (1+2+3+4))
- DT ratio (2 / (1+2+3+4))
- IT ratio (3 / (1+2+3+4))

3 Results & Discussion

Wading bird species in the NCRE



Most species inhabitant Japan has been recorded in river

Fig. 1 The species numbers of wading birds that appeared in the NCRE. Non-appearance waders are based on Takagawa (2011).

Wading bird species in each Japanese region

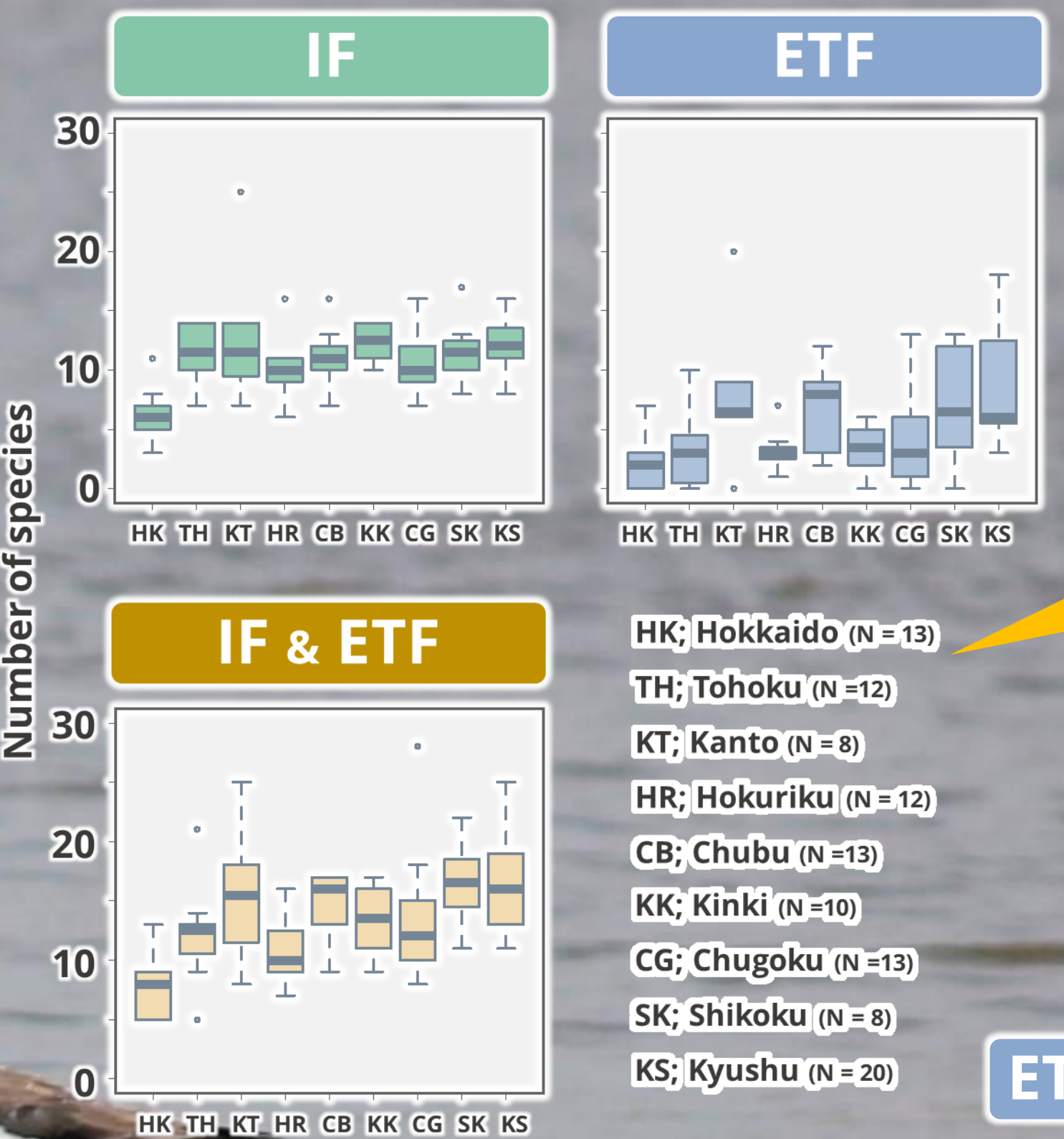


Fig. 2 The species numbers of waders in each Japanese region. ETF, estuary and tidal flat habitats; IF, inland freshwater habitats like rivers, gravel-filled floodplains, lakes, marshes, and paddy fields; and IF & ETF, inland freshwater, estuary, and tidal flat habitats.

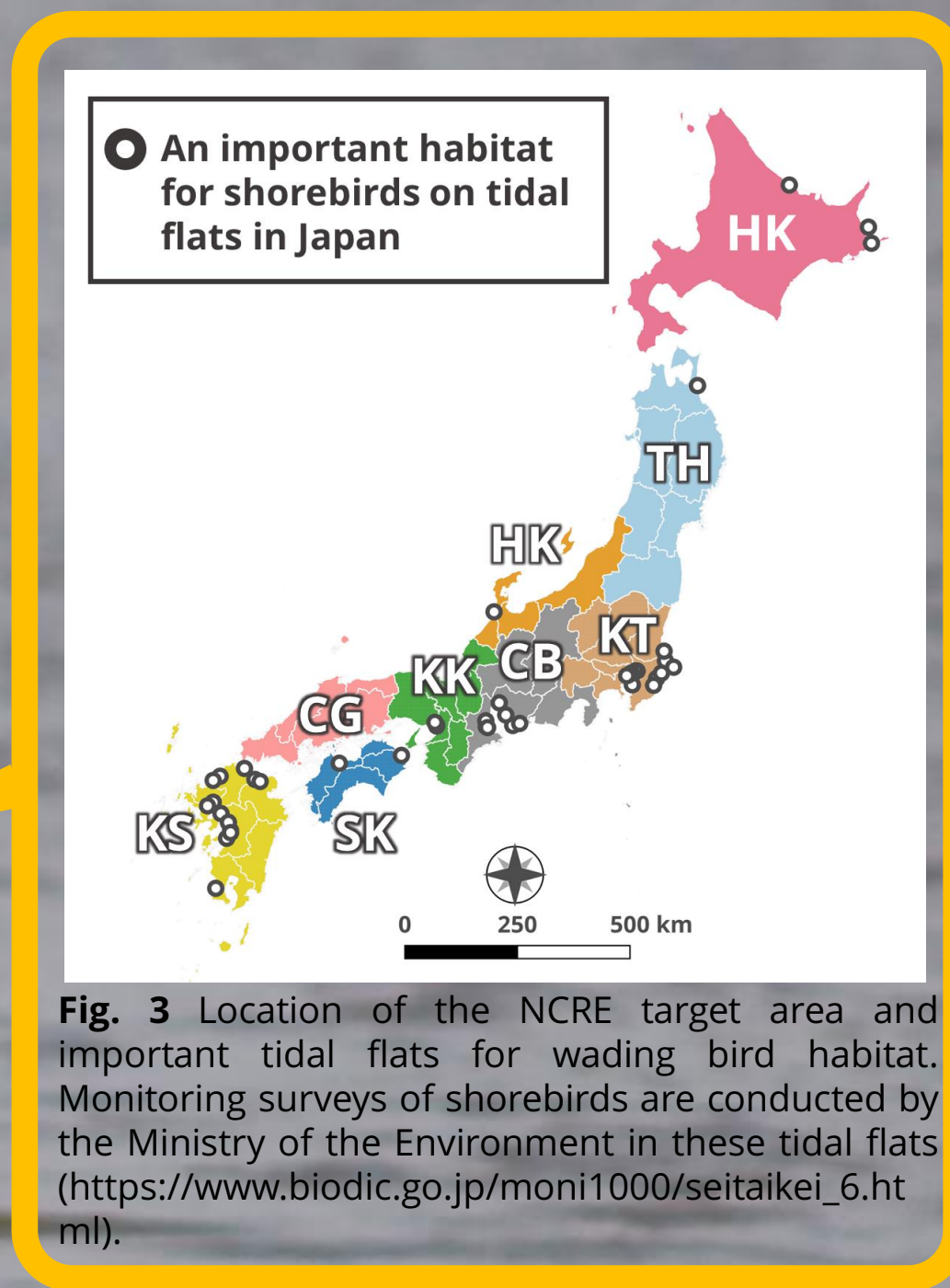


Fig. 3 Location of the NCRE target area and important tidal flats for wading bird habitat. Monitoring surveys of shorebirds are conducted by the Ministry of the Environment in these tidal flats (https://www.biodic.go.jp/moni1000/seitaikai_6.html).

- ETF | IF & ETF
⇒ Appearance in areas where have many important tidal flats
- IF
⇒ No regional differences (excluding Hokkaido)

Wading birds with high DT ratio

- 44 wader species appeared in more than 10 water systems
- **11 waders (25%) showed the highest DT ratio** compared to the IT and ST ratios

Table 1 The list of 11 waders that had the highest decreasing tendency (DT) ratio than the increasing tendency (IT) and stable tendency (ST) ratios.

Common name	Scientific name	The number of recorded river systems	ST ratio	DT ratio	IT ratio	Habitat types	Breeding site	IUCN Red List	Japanese Red List	National Endangered Species
Western Water Rail	<i>Rallus aquaticus</i>	25	0.08	0.40	0.16	IF	Wet meadow			
Black-tailed Godwit	<i>Limosa limosa</i>	14	0.07	0.36	0.00	IF & ETF	-	NT		
American Oystercatcher	<i>Haematopus ostralegus</i>	10	0.10	0.30	0.00	ETF	-	LC		
Greater Painted-snipe	<i>Rostratula benghalensis</i>	14	0.00	0.29	0.07	IF	Wet meadow		VU	
Pacific Reef-egret	<i>Egretta sacra</i>	14	0.00	0.29	0.00	ETF	Tree & quay			
Pacific Golden Plover	<i>Pluvialis fulva</i>	30	0.10	0.27	0.07	IF & ETF	-			
Yellow Bittern	<i>Ixobrychus sinensis</i>	20	0.15	0.25	0.10	IF	Wet meadow		NT	
Wood Sandpiper	<i>Tringa glareola</i>	18	0.00	0.22	0.11	IF & ETF	-		VU	
Ruddy Turnstone	<i>Arenaria interpres</i>	25	0.04	0.20	0.12	ETF	-			
Lesser Sandplover	<i>Charadrius mongolus</i>	35	0.17	0.20	0.09	IF & ETF	-			Yes
Common Redshank	<i>Tringa totanus</i>	11	0.09	0.18	0.00	ETF	Marsh land*		VU	

* The Common Redshank breeds only in a small area of Hokkaido.

Using inland wetlands as foraging & breeding sites

Declining in the estuaries and mudflats in Japan (Amano 2006)

4 Conclusion

- Importance of the river environment for wading birds in the EAAF
⇒ **Species with a variety of habitat characteristics are found in rivers.**
- Decline in species breeding in inland wetlands
- Decline of rare species that are also inhabiting tidal flats and estuaries
⇒ **It may reflect that healthy wetland environments have been drastically reduced in river.**
- ⇒ **We need to restore healthy wetland environments for wading birds in rivers.**

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