

EVALUATION OF OCCURRENCE TENDENCY AND HABITAT TYPES FOR WADING BIRDS IN JAPANESE RIVERS USING DATASETS FROM THE NATIONAL CENSUS ON RIVER ENVIRONMENTS

KOTA TAWA

River Restoration Team, Water Environment Research Group, Public Works Research Institute, Tsukuba, Japan, e-mail: k-tawa55@pwri.go.jp

TERUTAKA MORI

Aqua Restoration Research Center, Public Works Research Institute, Gifu, Japan, e-mail: t-mori@pwri.go.jp

YUICHI KAYABA

Water Environment Research Group, Public Works Research Institute, Tsukuba, Japan, e-mail: y-kayaba@pwri.go.jp

KEIGO NAKAMURA

River Restoration Team, Water Environment Research Group, Public Works Research Institute, Tsukuba, Japan, e-mail: nakamura-k573bs@pwri.go.jp

ABSTRACT

We studied the occurrence tendency and habitat types of wading birds in the large river systems of Japan using datasets from the National Census on River Environments. A total of 81 wader species were recorded. A higher number of species of wading birds were found in some regions that have important mudflat habitats in the East Asian-Australasian Flyway, than in other regions. However, not only waders that inhabit estuaries and mudflats but also many waders that inhabit inland freshwater bodies were recorded in most Japanese regions. This result suggests that river environments are important habitats for many wader species. On the other hand, the number of many wader species has recently decreased nationwide. Especially, the populations of waders that use inland wetlands as foraging and breeding sites showed a high decreasing tendency. These results suggested a decline in the number of healthy inland wetlands that contain wader habitats. We suggest that river restoration programs in Japan focus on improving the health of wetland environments by maintaining floodplain water bodies, gravels, and aquatic plant belts.

Keywords: Wader, river restoration, inland wetland, mudflat, flyway,

1. INTRODUCTION

Wading birds are the generic names of birds that use long legs to forage for food in shallow waters. Wader species are often among the top predators in wetland ecosystems. Many wader species 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 ecosystems (Kushlan, 1986; Melvin et al., 1999). The Japanese islands form part of the East Asian-Australasian Flyway (EAAF), which holds the richest diversity of birds (including wading bird species) among the nine flyways worldwide (Conklin et al., 2014). 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). In Japan, the population of waders that inhabit inland wetlands and mudflats greatly declined in the 2000s (Amano, 2006; Amano et al., 2010), which suggests that river environments are one of the most important habitats for these types of waders in Japan (Ezaki, 1998). However, to our knowledge, 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.

2. METHODS

2.1 Analysis of all datasets and sorting of habitat types

We extracted the occurrence data of wader species from the NCRE, i.e., the data of 109 river systems of birds (all datasets), from 1991 to 2015. In our study, members of 11 families (Ardeidae, Ciconiidae, Threskiornithidae,

Gruidae, Rallidae, Rostratulidae, Scolopacidae, Charadriidae, Haematopodidae, Recurvirostridae, and Glareolidae) were defined as wader species in the datasets, based on Ezaki (1998). We then classified waders into three types based on their main habitats in Nakamura and Nakamura (1995): 1) inland freshwater habitats like rivers, gravel-filled floodplains, lakes, marshes, and paddy fields (IF), 2) estuary and tidal flat habitats (ETF), and 3) inland freshwater, estuary, and tidal flat habitats (IF & ETF).

2.2 Evaluation of occurrence tendency

The NCRE is a periodic survey and bird community censuses have been conducted four times between 1991 and 2015. The first, second, third, and fourth surveys were conducted in 1991–1995, 1996–2000, 2001–2005, and 2006–2015, respectively. We excluded the datasets of the first survey because the study area was more limited during this survey than during the other surveys. Overall, we selected the datasets of 57 river systems that were surveyed during all four seasons. To clarify the occurrence tendency of each wader that was recorded in more than 10 river systems, we classified the appearance pattern according to the following three simple indexes (Table 1): 1) the stable tendency (ST), 2) the decreasing tendency (DT), and 3) the increasing tendency (IT). For each wader, we calculated the ratio of each index divided by the total number of recorded river systems.

Table 1. The three indexes used to clarify the occurrence tendency of each wader species based on their appearance pattern during the period National Censuses on River Environments conducted by the Ministry of Land, Infrastructure, and Transportation Government of Japan.

Tendency	Appearance pattern		
	Second survey (1996–2000)	Third survey (2001–2005)	Fourth survey (2006–2015)
ST (stable)	+	+	+
DT (decreasing)	+	–	–
IT (increasing)	–	+	+

Note: +, appearance; –, nonappearance.

3. RESULTS AND DISCUSSION

3.1 Appearance tendency of waders in the Japanese river environment

A total of 81 wader species were recorded from the following families: 37 Scolopacidae, 15 Ardeidae, 11 Charadriidae, 7 Rallidae, 4 Gruidae, and 3 Threskiornithidae, among others. Excluding stray birds and marine species, 95 species of wading birds have been recorded in Japan (Takagawa et al., 2011), 85% of which occur in river habitats. The species number of wading birds in the Kinki, Tokai, Shikoku, and Kyushu regions, which contain important tidal flats for migratory waders in the EAAF (Conklin et al., 2014), was higher than in other regions (Fig. 1). However, these results suggest that river environments are not only important for ETF waders but are very important habitats for IF and IF & ETF waders in most of the Japanese regions (Fig. 1).

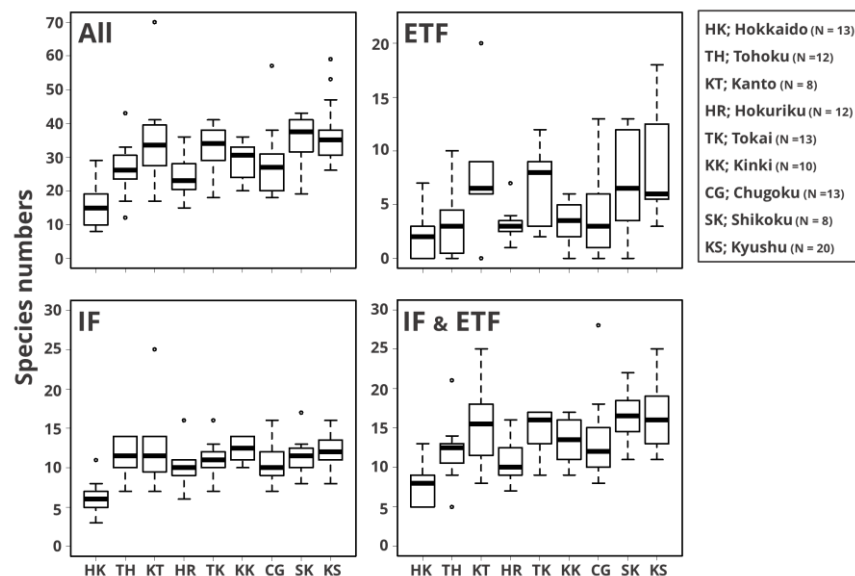


Figure 1. The species numbers of waders in each Japanese region. ETF, estuary and tidal flat habitats; IF, inland freshwater habitats like rivers, gravel-filled floodplains, lakes, marshes, and paddy fields; and IF & ETF, inland freshwater, estuary, and tidal flat habitats.

3.2 Evaluation of occurrence tendency and habitat types

In the 57 river systems, 44 wader species appeared in more than 10 water systems. However, 17 species (39 %) had a higher DT ratio than IT ratio. Especially, 11 waders (25 %) showed the highest DT ratio compared to the IT and ST ratios (Table 2). The habitat types of these species were 3 IF, 4 ETF, and 4 IF & ETF. The Western Water Rail *Rallus aquaticus*, the Greater Painted-snipe *Rostratula benghalensis*, and the Yellow Bittern *Ixobrychus sinensis* use inland wetlands as foraging and breeding sites in Japan (Nakamura and Nakamura, 1995). Additionally, the Pacific Golden Plover *Pluvialis fulva* and the Lesser Sandplover *Charadrius mongolus*, which had previously been shown to be declining in the estuaries and mudflats in Japan (Amano, 2006), revealed high DT ratio. These results suggested a decline in the number of healthy inland wetlands in river environments.

Table 2. 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
Western Water Rail	<i>Rallus aquaticus</i>	25	0.08	0.40	0.16	IF
Black-tailed Godwit	<i>Limosa limosa</i>	14	0.07	0.36	0.00	IF & ETF
American Oystercatcher	<i>Haematopus ostralegus</i>	10	0.10	0.30	0.00	ETF
Greater Painted-snipe	<i>Rostratula benghalensis</i>	14	0.00	0.29	0.07	IF
Pacific Reef-egret	<i>Egretta sacra</i>	14	0.00	0.29	0.00	ETF
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
Wood Sandpiper	<i>Tringa glareola</i>	18	0.00	0.22	0.11	IF & ETF
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
Common Redshank	<i>Tringa totanus</i>	11	0.09	0.18	0.00	ETF

Note: Waders were classified into three types based on their main habitats in Nakamura and Nakamura (1995): IF, inland freshwater habitats like rivers, gravel-filled floodplains, lakes, marshes, and paddy fields; ETF, estuary and tidal flat habitats; and IF & ETF, inland freshwater, estuary, and tidal flat habitats.

4. CONCLUSION

Amano et al. (2010) highlighted that agricultural intensification caused by land consolidation in Japanese rice fields has had a negative impact on wader populations, and that it is important to clarify the effects of agricultural practices on the habitat use of waders. In addition to this, we suggest that We suggest that river restoration programs in Japan focus on improving the health of wetland environments by maintaining floodplain water bodies, gravels, and aquatic plant belts.

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