



REPLY TO YANG ET AL.:

Coastal wetlands are not well represented by protected areas for endangered birds

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We thank Yang et al. (1) for their perspective. We are aware of the importance of coastal wetland protection for endangered migratory birds. Our paper in PNAS (2) focuses on the general representation of protected areas for endangered species (e.g., endangered birds) and ecosystem services. Thus, we did not emphasize the representation in nature reserves of coastal wetlands for endangered migratory birds. However, this representation could be evaluated using the results in our paper (2).

First, migratory birds using coastal wetlands were examined in our paper (2). Of the 127 endangered birds examined, 50 are migratory birds. Many migratory endangered birds, including the red-crowned crane (*Grus japonensis*) and oriental stork (*Ciconia boyciana*), are endangered species using coastal wetlands as their main habitat.

Second, we identified important areas for bird conservation, including coastal areas. These areas include Bohai Bay, Yangcheng, Chongming Island, and coastal areas of Hainan Island. Of them, Bohai Bay is of significance for migratory birds in the East

Asian–Australasian Flyway (3). Yancheng is also an important area, with more than 300 species of migratory birds (4).

Third, the representation of protected areas in protecting coastal wetland can be evaluated using the results in our paper (2). By comparing the coastal wetland habitat with current protected areas, we found that 14.7% of wetland habitat is presently covered by protected areas. This coverage percentage is below, but near, the nature reserve network's 15.1% coverage of China's total land surface. Thus, the nature reserves network serves birds moderately well across the entirety of China, but it does not do as well for coastal wetlands and their endangered migratory birds.

Based on the analysis above, we agreed with Yang et al. (1) in their perspective. The protected area network is not sufficient for coastal wetland conservation. More studies are urgently needed of coastal wetlands to reveal their dynamics, their ecosystem services, and their real protection status. Moreover, corresponding actions are also needed for the protection and management of coastal wetlands.

- 1 Yang H, Ma M, Thompson JR, Flower RJ (2017) Protect coastal wetlands in China to save endangered migratory birds. *Proc Natl Acad Sci USA*, 10.1073/pnas.1706111114.
- 2 Xu W, et al. (2017) Strengthening protected areas for biodiversity and ecosystem services in China. *Proc Natl Acad Sci USA* 114:1601–1606.
- 3 Yang HY, et al. (2011) Impacts of tidal land reclamation in Bohai Bay, China: Ongoing losses of critical Yellow Sea waterbird staging and wintering sites. *Bird Conserv Int* 21:241–259.
- 4 Tian W, Bai J, Sun H, Zhao Y (2013) Application of the analytic hierarchy process to a sustainability assessment of coastal beach exploitation: A case study of the wind power projects on the coastal beaches of Yancheng, China. *J Environ Manage* 115:251–256.

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The authors declare no conflict of interest.

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