

Importance of aquacultural ponds at western Taiwan coast in supporting shorebirds in the East Asian-Australasian Flyway

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Laying in the middle of the East Asian-Australasian Flyway, the western coast of Taiwan serves as an important stop over and wintering site for many shorebird species. The intertidal flats along the western Taiwan coast were relatively intact; however, few lands above the high tide line remained natural. Thus managing suitable high-tide roosts is crucial in supporting shorebird population. Since 2011, we conducted monthly counts of shorebirds at several sites in the center of western Taiwan coast. We found shorebird abundance and species richness were higher at sites with intensive clam aquaculture and less fragmentation. The dykes of aquacultural ponds were utilized by 37 shorebird species as high tide roosts. The edge of ponds and the ditch between ponds provided foraging habitat for some species. When the ponds were drained after harvest, large quantity of foraging shorebirds were attracted. Through the study period, overall shorebird abundance remained relatively stable. Some wintering species appeared to have an increasing trend in numbers at some site. Further investigation into how aquacultural practice affect the habitat use of shorebirds may promote the development of optimal local management plans. As large-scale offshore wind power projects are on-going along western Taiwan coast, such management plans may provide potential ecological compensation for shorebird populations.

Theme: Monitoring

Preferred Option: Oral Presentation

The importance of supratidal foraging to coastal shorebirds: a case study from the Western Treatment Plant, Australia

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Coastal shorebirds are widely considered to forage on intertidal flats, and to spend high tide resting at supratidal roost sites. However, roost sites are not only used for resting; some shorebirds in some sites forage in near-coastal wetlands when the tide is high. We studied the importance of supratidal foraging for shorebirds at the Western Treatment Plant (WTP; Victoria, Australia), a site used by 10-15,000 migratory shorebirds during the non-breeding season. Most of these birds forage on productive but small tidal flats at low tide, moving to roosts in nearby non-tidal ponds when the tide is high. Many of these shorebirds forage in the ponds during high tide, and several lines of evidence suggest that they need to do so to persist at the WTP: (1) Species composition on the tidal flats indicates the site is dominated by species (small sandpipers) known to also use non-tidal wetlands, rather than coastal obligate species such as knots and Bar-tailed Godwits. (2) Banding studies show that shorebirds of the WTP lose weight during neap tide series. (3) Modelling of intake rates indicates that during neap tide series, the tidal flats of the WTP are not large enough, and not exposed for long enough, for small sandpipers to meet their daily energy requirements.

Much of the coast of eastern and southern Asia is lined by tidal flats that abut artificial wetlands (such as aquaculture or salt ponds) where water levels are controlled by people. Strategic management of water levels in some of these ponds could potentially greatly benefit shorebirds populations. We therefore conclude with thoughts on how to identify sites where shorebirds most need supplementary feeding opportunities at high tide, the species most likely to exploit these opportunities, and the attributes a near-coastal wetland needs to have in order to attract foraging shorebirds.

Theme: Habitat management

Preferred option: Oral Presentation

East Asian - Australasian Flyway Shorebird Science Meeting

Salt pans can be as alternative feeding habitat for pelagic-foraging and small-medium size shorebirds: a study in Bohai Bay, China

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As environments are altered rapidly by humans, animals may either adjust their behavior to the environment or disappear. In many parts of the world natural habitats (e.g., tidal flats) have been turned into artificial habitats (e.g., salt pans) and the question is what determines shorebirds adjust to using artificial wetlands like salt pans. In this study, we used a combination of counts in the two habitats (in the Luannan coastal complex, Hebei, China) and stable isotopes in different tissues, to examine species and guilds differences in this capacity. Stable isotopes ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) in tissues will reflect the food sources from which they were built over shorter (plasma) or longer periods (red cells). In our study area where extensive tidal flats occur along one of the largest areas of salt pans in the world, we made daytime low tide counts, i.e., during a time when tidal foragers get their fill. We also captured the various examined species and retrieved samples of blood. The results of counter and stable isotope were highly

correlated. The pelagic-foraging species did not commute between intertidal flats and saltpans, and exclusively used saltpans to meet their high energy requirements during migration. The saltpans' food items also contributed significantly to the diet of small-medium visual and tactile-foraging species, which equipped with needle-shaped bills shared with pelagic-foraging species. Large visual and tactile-foraging shorebirds ignore a disproportionately large part of small prey may because they have a low handling efficiency for small prey. The pelagic-foraging species together with small-medium visual and tactile-foraging species may have pre-adapted to newly created saltpans habitats with needle-shaped bills. The conservation managers of artificial wetlands should in terms of guilds, which would increase management effectiveness.

Keywords: Stable Isotope, Artificial Wetlands, Pelagic-foraging, Surface Tension, Yellow Sea, EAAF

Trialing Floating Artificial Shorebird habitat: a response to losses in the upper intertidal zone.

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Throughout the East Asian Australasian Flyway, high-tide roost sites for shorebirds are increasingly jeopardised by coastal development, disturbance and sea-level rise, reducing the ability for migratory species to maintain a positive energy balance. We found this to be a limiting factor affecting populations staging in Seocheon tidal flat and neighboring Geum Estuary (ROK). The provision of artificial roosts has the potential to restore resilience into impacted habitats where habitat restoration is not feasible. Construction of shorebird roosts has traditionally involved significant earthworks or hydrological alteration to create static structures. These interventions are successful in creating habitat but can come at significant costs, have undesired effects on intertidal ecology and are subject to rapid degradation. The Floating Roost project is trialing artificial roosts modelled on floating, long-line oyster bags (LLOB) as a cheap, low-impact and adaptable alternative. Floating roosts remain consistent throughout the tide cycle and are immune to climate change induced sea-level rise. In addition, they are resistant to terrestrial predators and vegetation colonisation and can be relocated on, or adjacent to feeding areas. In 2018/19 we deployed 1,080 LLOB in coastal habitats across three Ramsar listed shorebird habitats in the EAAF; Port Philip Bay (VIC), the Hunter Estuary (NSW) and Seocheon Tidal Flat (ROK). In year one of the trial 45 waterbird species were recorded using the roosts including 18 shorebird species and 4 IUCN listed threatened species (VUL, EN & CE). Peak roost use was observed during southern migration at Seocheon tidal flat with over 500 shorebirds flocking on one roost. We will provide a review of floating roost efficacy, microclimate attributes, and influences on intertidal communities, identify how to assess site specific necessity and feasibility of floating roost installation as a management intervention and outline future directions.

Theme: Conservation Management

Preferred option: Oral Presentation

How do wintering shorebirds choose foraging habitats within large intertidal mudflats in coastal Bangladesh?

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Migratory shorebirds are known for their spectacular long-distance movements between northern breeding grounds and wintering grounds further south. But shorebirds have suffered considerable declines because their migratory habits also make them susceptible to threats in many different parts of the world. Migratory shorebirds are therefore in need of focused conservation initiatives that require a thorough understanding of their ecology in breeding areas, stopover sites and non-breeding areas. Our understanding of their wintering ecology is particularly limited, and a key component therefore to inform global conservation action is an understanding of their habitat requirements during winter. Do factors such as available food, risk of predation or disturbance determine where shorebirds aggregate during winter? We sought to partly answer this question by exploring relationships between prey availability and choice of foraging site in 30 200x100m mudflat segments spread across two islands in coastal Bangladesh. To gain insights into a possible mechanism, we also explored whether foraging success was influenced by prey availability. The study was conducted in two seasons: early (December 2019-January 2020) and late winter (February-March 2020). A total of 31 shorebird species were detected during this study including the Critically-Endangered Spoon-billed Sandpiper, and we found that the richness and density of shorebird communities did indeed increase with the density of polychaete worms within each of the two islands. But we also found that one of the islands, Damar Char, hosted more shorebirds than Nijhum Dweep independent of food availability. As foraging success increased with available food, we suggest that food may be a limiting resource for shorebirds during winter. Our study has direct conservation relevance because wintering habitats can be assessed for available food and prioritized or managed accordingly for conservation. We however caution that these results are from a single region and can only be generalized after other similar studies are conducted across the world.

Theme: Non-breeding Ecology

Preferred Option: Oral Presentation