# Wader ringing studies at Bundala National Park, Sri Lanka: three years of the National Bird Ringing Programme

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Sri Lanka has long been recognised as a key site for migratory waders in the Indian Ocean Region, especially for those species that breed in the northern latitudes of the eastern Palearctic. However, very few studies have been carried out in Sri Lanka on migratory waders and their wetland habitats. For many years there were discussions among scientists about the need to set up a permanent bird ringing programme but nothing materialized until 2005 when the National Bird Ringing Programme (NBRP) was initiated by the Field Ornithology Group of Sri Lanka (FOGSL) in collaboration with the Department of Wildlife Conservation (DWC) (Kaluthota & Kotagama 2006, Kotagama *et al.* 2006). The NBRP has now completed three years of uninterrupted activity and this paper presents a summary of the results achieved for waders and discusses information gained.

The main objectives of the NBRP in relation to waders are:

- To identify the origins (mainly the breeding areas) of the migrant populations
- To study the site-fidelity of each species, and
- To study the characteristics of the resident breeding populations of species which also have migrant populations.

Bundala National Park was selected as the primary wetland site for the NBRP as it is a key location for migratory wetland birds and various bird ringing studies were conducted there in the past (Kaluthota & Kotagama 2006).

Bundala National Park is located in the Hambantota District of the Southern Province of Sri Lanka (6°08' to 6°14'N, 81°08' to 81°18'E) and falls within the south-eastern arid zone of Sri Lanka, with a climate classified as semi-arid. The mean annual temperature is 27.1°C, average annual precipitation 1,074 mm, with the highest rainfall occurring in November during the north-east monsoon (CEA & Euroconsult 1993). The park contains several wetlands consisting of many habitat types viz. brackish water lagoons, salt pans, freshwater reservoirs and freshwater marshlands, all of which are important habitats for migratory waders and other waterbirds. The mudflats in the Park are rich in benthic invertebrates and other food sources for waders.

The Bundala wetlands and associated forests were granted sanctuary status in 1969 and were further upgraded to the status of a National Park in 1992. In 1990 Bundala was designated Sri Lanka's first Ramsar site, thereby highlighting its global importance for migratory waterbirds. It was further identified as a habitat supporting large aggregatioins of water birds over an extended period and was therefore confirmed as an Important Bird Area under categories A4(i) and A4(iii) of the criteria specified by BirdLife International (FOGSL 2003, BirdLife International 2004). Since it also harbours globally threatened species (IBA category A1), restricted range species (IBA category A2), and biome restricted species (IBA category A3), it also qualifies under all four IBA criteria (Kaluthota *et al.* 2007).

In order to maximize the value of information collected within the limits of resources available, a study area was identified in the Bundala lagoon for mist netting. It was decided that this would be the primary netting and ringing site. Occasional netting in the adjacent Saltern would also be carried out when time and resources permitted.

Sri Lanka receives migratory birds through three main routes (Kotagama & Wijayasinghe 1998, Phillips 1953). Many of the Holoarctic waders migrating to Sri Lanka (which is effectively the end point of the Central Asia Flyway) are widely distributed in their breeding grounds thereby showing biometric variations, significant enough to be recognized as separate biogeographic populations. Therefore our first and major objective was to determine the populations from which the waders at Bundala originated. The second objective was to measure their site-fidelity and our third objective was to study the characteristics of the waders that are breeding residents. Achieving these objectives necessitates a sustained, long-term ringing programme in selected locations.

As our primary intention was to study the migratory wader populations in Bundala Lagoon, four ringing sessions were planned for each year, three when the main migrant populations are present (in Sep–Oct, Jan–Feb and Mar–Apr) and one in July to study the resident populations. Ringing sessions last for 4–5 days and captures are only made at night. In parallel with the NBRP, regular programmes were also conducted to provide training in bird study techniques and bird ringing for officers of the DWC and members of FOGSL.

Mist netting was the only method used to catch waders. After conducting a preliminary survey of the area to identify concentrations of birds, suitable sites were selected for the mist nets. Netting operations were carried out between 18h00 and 07h00 the following day. The number of nets and netting times varied depending on the availability of human resources and other factors.

All migrant waders and other birds captured were ringed with numbered metal rings inscribed with the address of the DWC. Coloured plastic rings were also used on breeding resident species and other species with both migrant and resident populations.

Ten netting sessions were completed during the first three years of the NBRP during which a total of 647 waterbirds of 23 species were captured. Of these, 595 were waders of 19 species (Table 1). By far the majority of the waders caught (563 or 94.6%) belonged to just six common species; the other 32 comprised 13 species. The species most frequently caught were Little Stint (180, 30.4%), Curlew Sandpiper (104, 17.5%), Lesser Sandplover (95, 16.0%), Common Redshank (76, 12.8%), Kentish Plover (65, 10.9%) and Marsh Sandpiper (33, 5.5%) (Table 2). Twelve of the wader species

**Table 1.** Summary of wader capture data for ringing sessions conducted in Bundala National Park, Sri Lanka, during 2005–2008.

| | 2005 Apr | 2005 Jul | 2005 Oct | 2006 Feb | 2006 Aug | 2007 Mar | 2007 Jul | 2007 Oct | 2007 Dec | 2008 Apr | Totals |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total net meter hours | – | – | 2,527 | – | 1,648 | 2,475 | 1,584 | 2,370 | 1,320 | 1,002 | 12,927 |
| No. of birds captured | 97 | 6 | 32 | 73 | 48 | 106 | 23 | 86 | 98 | 26 | 595 |
| No. of species | 8 | 4 | 7 | 9 | 4 | 10 | 4 | 10 | 8 | 7 | 19 |
| No. of recaptures | – | – | 1 | – | – | 2 | – | 1 | 3 | 4 | 11 |
| No. of captures/net m hr | – | – | 0.013 | – | 0.029 | 0.043 | 0.015 | 0.036 | 0.074 | 0.026 | 0.046 |

**Table 2.** Number of waterbirds caught during ringing sessions between 2005 and 2008 (the first three years of the National Bird Ringing Programme) at Bundala National Park, Sri Lanka (status: M = migrant, R = resident).

| Species | Status | 2005 Apr | 2005 Jul | 2005 Oct | 2006 Feb | 2006 Aug | 2007 Mar | 2007 July | 2007 Oct | 2007 Dec | 2008 Apr | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Waders** | | | | | | | | | | | | |
| Black-tailed Godwit *Limosa limosa* | M | – | – | – | – | – | 1 | – | – | – | | **1** |
| Common Redshank *Tringa totanus* | M | 14 | – | – | 12 | 3 | 11 | 6 | 19 | 9 | 5 | **76** |
| Marsh Sandpiper *Tringa stagnatilis* | M | 1 | – | – | 21 | – | 4 | – | 4 | 3 | – | **33** |
| Common Greenshank *Tringa nebularia* | M | – | – | – | 3 | – | 3 | – | 1 | 1 | – | **8** |
| Wood Sandpiper *Tringa glareola* | M | – | – | 1 | – | – | – | – | – | – | – | **1** |
| Ruddy Turnstone *Arenaria interpres* | M | – | 1 | – | – | – | – | – | – | – | – | **1** |
| Little Stint *Calidris minuta* | M | 57 | – | 18 | 10 | 4 | 42 | – | 16 | 32 | 2 | **180** |
| Curlew Sandpiper *Calidris ferruginea* | M | 9 | 2 | 1 | 10 | 17 | 25 | 11 | 18 | 11 | 1 | **104** |
| Broad-billed Sandpiper *Limicola falcinellus* | M | – | – | – | – | – | – | – | 4 | 4 | – | **8** |
| Greater Painted-snipe *Rostratula benghalensis* | R | – | – | 1 | – | – | – | – | – | – | – | **1** |
| Eurasian Thick-knee *Burhinus oedicnemus* | R | – | – | 1 | – | – | – | – | – | – | 1 | **2** |
| Great Thick-knee *Esacus recurvirostris* | R | – | – | – | – | – | 1 | – | – | – | – | **1** |
| Black-winged Stilt *Himantopus himantopus* | R | – | – | – | 1 | – | 1 | – | – | – | – | **2** |
| Pacific Golden Plover *Pluvialis fulva* | M | – | – | – | 1 | – | – | – | – | – | – | **1** |
| Kentish Plover *Charadrius alexandrinus* | M/R | 10 | 2 | 3 | 8 | – | 8 | 2 | 11 | 17 | 7 | **65** |
| Lesser Sand Plover *Charadrius mongolus* | M | 4 | 1 | 7 | 7 | 24 | 10 | 4 | 10 | 21 | 9 | **95** |
| Greater Sand Plover *Charadrius leschenaultii* | M | 1 | – | – | – | – | – | – | – | – | – | **1** |
| Red-wattled Lapwing *Vanellus indicus* | R | 1 | – | – | – | – | – | – | 1 | – | 1 | **3** |
| Small Pratincole *Glareola lactea* | R | – | – | – | – | – | – | – | 2 | – | – | **2** |
| **Other waterbirds** | | | | | | | | | | | | |
| Little Tern *Sterna albifrons* | R | 1 | – | – | – | – | – | – | 23 | – | 1 | **25** |
| Whiskered Tern *Chlidonias hybridus* | M | – | – | – | – | – | – | – | 16 | 1 | – | **17** |
| White-winged Tern *Chlidonias leucopterus* | M | 1 | – | – | – | – | – | – | 3 | – | – | **4** |
| Pond Heron *Ardeola grayii* | R | – | – | – | – | – | – | – | – | 3 | 3 | **6** |

**Table 3.** Summary of recaptures of waders caught in the Bundala National Park, Sri Lanka, during 2005–2008.

| Species | Ringed | Recaptured | Recapture season | Recapture rate (%) |
|---|---|---|---|---|
| Little Stint | 180 | 1 | (1) 1 season later | 0.55 |
| Lesser Sandplover | 95 | 2 | (1) same season, (2) 3 seasons later | 2.10 |
| Kentish Plover | 65 | 3 | (1) 2 × same season , (2) 1 later, (3) 2 later | 4.61 |
| Common Redshank | 76 | 3 | (1) 2 seasons later, (2) 1 later, (3) 1 later | 3.95 |
| Curlew Sandpiper | 104 | 1 | (1) 1 season later | 0.96 |
| **Total** | **520** | **10** | | **1.92** |

caught are long distance migrants, six are breeding residents and one, Kentish Plover, occurs in two populations, one a migrant, the other a breeding resident.

Ten waders ringed at Bundala were recaptured at least once during the three year period. These were from the five most commonly ringed species (Table 3). A single Kentish Plover was recaptured twice.

The number of birds captured in ten ringing sessions during the three year period was relatively small in comparison to ringing activities in other parts of the world. However, as the project is in its initial stages with rather limited resources, we feel that the results obtained are satisfactory. No conclusions are possible based on these results on account of the small sample size. However, already we have been able to identify various patterns and trends.

Re-capture rate is very low (1.89%) in comparison with other sites where regular ringing operations are carried out (Keija *et al.* 2006). This is explicable by the relatively small numbers ringed and the relatively short time that the project has been in existence. As the project progresses a somewhat higher recapture rate can be expected. However, several ringed birds have been observed in the Bundala National Park in recent years.

To date, no recoveries of birds ringed by the project have been reported from outside Sri Lanka. However, the observation of a yellow flagged Curlew Sandpiper from NW Australia at Bundala National Park (Bellio & Kaluthota 2006) shows that there are good chances of long-distances recoveries. It also raises questions about the migratory routes taken by birds wintering and passing through Sri Lanka which is located in the middle of the Central Asia Flyway. Perhaps our ideas about the integrity of flyways may need to be revised if Sri Lanka regularly receives strays from the adjacent East Asia–Australasia and Africa–Eurasia Flyways. Implementation of a color flagging scheme will be very helpful in resolving these issues.

One of the issues we have resolved is the identity of the subspecies of the Lesser Sandplover that occurs in Bundala. Almost all of those caught showed clear plumage characteristics of the subspecies *mongolus*. Hopefully, as we obtain more extensive morphometric data through continued catching, we will be able to determine the subspecific and biogeographic status of other species as well. Eventually, through a combination of morphometrics, ringing recoveries, colour-flag resightings and perhaps molecular studies, we hope to be able to identify the breeding grounds and other destinations of all the waders that winter or pass through Sri Lanka.

The main arrival of arctic and north temperate breeding species at Bundala normally occurs towards the end of August or early September, but in 2006 and 2007 adults of several species, many with breeding plumage, arrived in July and early August. Possibly this is an indication of widespread breeding failure leading adults to depart early from the breeding grounds. Further studies, especially measuring breeding success through the proportion of juveniles caught, should provide the answer.

Bundala is a key wetland habitat right in the middle of the Central Asia Flyway. It is important for both wintering and staging waders and, currently, is the only location in Sri Lanka where the marking of migrant waders is carried out on a regular basis. Compared with other wader flyways, relatively few migration studies have been carried out in the Central Asia Flyway. Therefore the ringing team at Bundala is well placed to advance our knowledge of waders in the region.

The NBRP provides training in bird ringing and other ornithological field studies, especially for field officers of the DWC. Already in the first three years, 60 DWC staff officers have received training. Their participation in training programmes is supervised by FOGSL instructors and they are provided with certificates to confirm what they have learnt. Several members of FOGSL have also trained as bird ringers.

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