

Movements of seabirds off southern Sri Lanka in April

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Abstract

Seabird sightings were recorded during the course of 46 cetacean-watching excursions out of Mirissa, off the southern coast of Sri Lanka, in April 2007–2013. Large-scale, but previously unreported, movements of several species of seabird were noted. The most common species seen was the Bridled Tern *Onychoprion anaethetus*, on passage westward. Bridled Terns have previously been recorded heading south off the west coast of Sri Lanka mainly during July–October; the passage reported here presumably represents the same population on ‘return’ migration. White-winged Terns *Chlidonias leucopterus* were also seen in numbers on passage to the west. This species has previously been reported as a northern winter visitor, in small numbers, to coastal and lowland areas of southern India and Sri Lanka; it might be better categorised as a common passage migrant and winter visitor along the continental shelf-edge of the Indian Subcontinent. Flesh-footed Shearwaters *Ardenna carneipes*, and a single Sooty Shearwater *A. grisea* were both also recorded heading to the west. In contrast to those four species, the Pomarine Skua *Stercorarius pomarinus* was observed in numbers on passage to the east. A potential advantage of heading against the flow of other seabirds is that it may increase opportunities for kleptoparasitism. Other species observed heading eastwards, in much smaller numbers, were Swinhoe’s Storm-petrel *Hydrobates monorhis*, Streaked Shearwater *Calonectris leucomelas*, and Long-tailed Skua *Stercorarius longicaudus*. Wedge-tailed Shearwaters *Ardenna pacificus* were recorded flying in both directions, possibly indicating the movement of two populations through Sri Lankan waters. An additional 12 species of seabird were recorded, not obviously on passage.

Introduction

The seabirds of Sri Lanka have been moderately well studied, with over 50 species recorded to date (Gibson-Hill 1953; De Silva 1990 & 1991; Warakagoda 1994; Kotagama & De Silva 2006; Warakagoda et al. 2012). There has been particular interest in shore-based monitoring of the regular movements of seabirds off the west coast during the southwest monsoon (mainly during July–October) when large numbers of Bridled Terns *Onychoprion anaethetus* are on southward passage (De Silva 1987, 2003). Other species on passage off the west coast, at the same time, include Wilson’s Storm-petrel *Oceanites oceanicus* and Flesh-footed Shearwater *Ardenna carneipes* (van den Berg et al. 1982; De Silva & Perera 1994). More recently, the results of a systematic boat-based seabird survey have been published (Perera & Ilangakoon 2016) and the southward boreal spring migration of Pomarine Skuas *Stercorarius pomarinus* off the west coast has been reported for the first time (Allport et al. 2021).

Another relatively recent development has been the establishment and rapid growth of commercial whale-watching in Sri Lanka, notably from Mirissa on the southern coast, but also from Kalpitiya on the north-western coast and Trincomalee on the north-eastern coast. This has provided platforms of opportunity for pelagic birding (e.g., Pepper & Hettige 2008; de Silva Wijeyeratne 2010).

In a series of papers we described the prediction, ‘discovery’ and observation of the Blue Whale *Balaenoptera musculus* hotspot off southern Sri Lanka previously known only to local fishermen (Anderson et al. 1999, 2012; Anderson 2005;

Anderson & Alagiyawadu 2019). During seven years 2007–2013, RCA visited southern Sri Lanka every April. The main aim of those visits was to survey cetaceans, mostly accompanied by AIA, but records were also kept of most seabird sightings. It soon became apparent that there were offshore movements of large numbers of several species of seabirds. The main aim of this paper is to report those seabird observations.

Methods

Seabird observations were recorded during the course of commercial whale-watching excursions from the fishing port of Mirissa, for 2–13 days each April over a seven-year period, 2007–2013 (Table 1). The primary aims of those excursions were to find cetaceans, to ensure that others on board had enjoyable and informative encounters with cetaceans, and to record details of cetacean encounters (Anderson & Alagiyawadu 2019). Observing and recording seabirds was a secondary aim.

Survey area (Fig. 1) and methodology were outlined by Anderson & Alagiyawadu (2019). Mirissa port is approximately 15 km west of Dondra Head, the southernmost point of Sri Lanka, and the edge of the continental shelf lies just 7–8 km offshore. Excursions were carried out on the 16 m motorised vessel *Spirit of Dondra* [2], which had an average cruising speed of 7–8 knots (13–15 km h⁻¹) and a maximum speed of 11 kts (20 km h⁻¹). Two to four observers maintained a watch for cetaceans, from both the main deck (eye height about 2 m above the waterline) and the roof of the wheelhouse (about 3.5 m) at all times between leaving and returning to port.

Table 1. Records of seabirds off Mirissa in April, 2007-2013
 Notes: numbers in parentheses are of birds for which identification was considered probable; unidentified Crested Terns are listed in parentheses under Greater Crested; 'P' indicates present (numbers not counted)

Date	Duration	Pomarine Skua	Arctic Skua	Long-tailed Skua	Lesser Noddy	Sooty Tern	Bridled or Sooty	Bridled Tern	Little Tern	Saunders Tern	Little or Saunders	White-winged Tern	Whiskered Tern	Common Tern	Greater Crested Tern	Lesser Crested Tern	Unid. Tern	Flesh-footed Shearwater	Wedge-tailed Shearwater	Fresh-footed or Wedge-tailed	Others	
April 2010																						
10	06:30	1					5	411	1		1	1	2		1						2	White-tailed Tropicbird, Persian Shearwater
11	06:20	5 (3)		2		1		107		1											1	Streaked Shearwater, Persian Shearwaterx3
12	08:25	1 (3)		1				13													1	Streaked Shearwater
14	04:00	0 (3)						54	1												2	
15	09:10	0 (4)						158			56	2	2		6						2	Persian Shearwater x4; Red-billed Tropicbird x2
16	08:00							34			37	2	1								2	
April 2011																						
18	06:00				1	68	14	5	30	15	0 (2)	6	3								6	
19	05:15	0 (1)				15	78		14 (13)	1	0 (1)	2	7									
20	06:00	11 (1)			9	165	33	12	8 (5)	P	2	23									24	White-cheeked Tern?
22	06:30	1				23	31	16	51 (7)	1	20	2									4	Red-billed Tropicbird
24	05:45	0 (2)				81	88		2	14	1	4									2	
April 2012																						
16	07:30	5					236														1	7
17	05:35						107		2	P	1?	1	2								1	2
18	07:40	1					155	1	3 (6)	P	1	7	4									
20	05:20	5					56		0 (5)		1	1	1	5								
21	06:40			1		106	208		147 (5)		1	26	6									Streaked Shearwater
April 2013																						
06	05:35				2		643		14	56	6	24	4								1	Roseate Tern? Persian Shearwater
07	04:45						362		4	236	8	90	2									
08	06:10	5			1		155		38	4	1	12	1									Brown Noddy
10	01:05						3		3	2	2											
11	06:00						384		3		2	4	2	1								
		109 (49)	(6)	4	13 (5)	15	861	5259	97	8	62	1041 (49)	76	51	(7)	12	185	23	38	152		

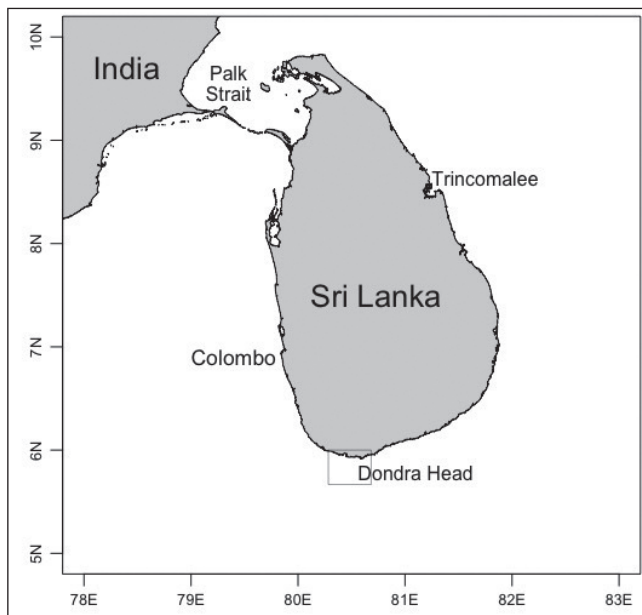


Fig. 1. Location map (the south coast study area is outlined by the rectangular box).



2. Survey vessel MV Spirit of Dondra, Mirissa Harbour, with co-author Anoma Alagiyawadu, before our first day at sea, 21 April 2007.

Seabirds were observed by one to four individuals: RCA, AIA when on board, and any particularly interested clients. The presence of seabirds near the coast (i.e., within roughly one nautical mile, c.2 km) was noted, but numbers were not always recorded. When further offshore, seabirds within about half a nautical mile (c.1 km) of the boat were counted and recorded. In some cases species were simply noted as present, without counting. In most cases, the birds' direction of travel or other activities were noted.

A total of 49 excursions were carried out. Anderson & Alagiyawadu (2019) noted 48 days at sea; the discrepancy is due to their exclusion of one day (10 April 2013) when it was too rough to spot cetaceans and the excursion was cut short, although seabirds were recorded. Seabirds were recorded on a total of 46 out of the 49 days at sea; seabirds were not recorded on the first day (09 April) of the 2008 season, or the first two days of 2009 (30 and 31 March). Furthermore, only 'interesting' seabirds were noted on two days at sea in 2007 (21 and 23 April), so some species were only recorded on 44 days. In addition, only approximate estimates of abundance of Bridled Terns *Onychoprion*

anaethetus were recorded on 10 days in 2008, with numbers of this species only being counted on 34 days.

During the 46 days during which seabirds were recorded, a total of some 293 hours was spent at sea (Table 1), with an average excursion duration of 6 h 22 m (range 1 h 05 m to 10 h 10 m). The boat's position was recorded every two hours (at 08:00, 10:00, 12:00, 14:00, and 16:00 h); these positions are charted in Fig. 2. All excursions during which seabirds were counted were carried out between 01 April and 24 April. In order to identify possible changes in the abundance of particular species over the study period, we subdivided sightings into three time periods (1–8 April, 9–16 April, and 17–24 April) in our analysis.

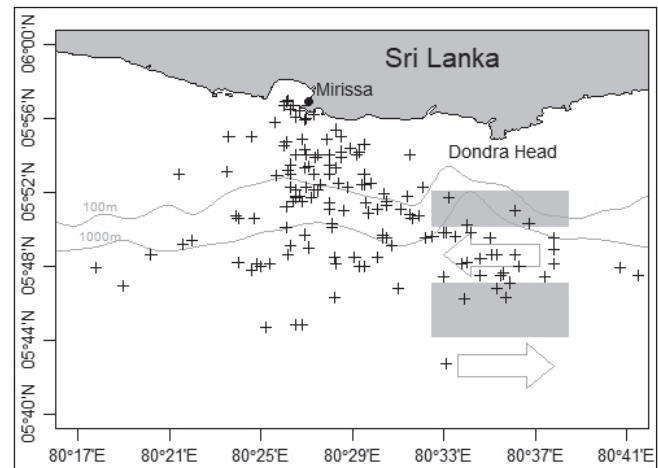


Fig. 2. Distribution of sightings effort (the markers show 2-hourly boat positions, the grey blocks denote shipping separation zones, while arrows denote shipping lanes). Scale: 4' latitude = 4 nautical miles = 7.4 km.

For abundant species, with many individuals flying intently in one direction, there was little doubt that they were on passage. For less common species, when only one or a few individuals were recorded, birds were considered to be on passage if they were flying directly to the east or west (i.e., parallel to the coast), and were known from other studies to migrate through Sri Lankan waters (i.e., directions of travel of resident species were not noted).

Information on migrant seabirds in nearby waters incorporated into the discussion includes unpublished observations by RCA from Trincomalee on the east coast of Sri Lanka in March and April 2010–2019, off the coast of Kerala in January 2002–2007, and from the Maldives over many years.

Results and discussion

A daily summary of seabirds seen is presented in Table 1. Further details, by species, are given below, in order of the checklist of birds of the Indian subcontinent (Praveen et al. 2021). A total of 21 species were positively identified, and a further four were provisionally identified (marked below with a question mark).

Pomarine Skua *Stercorarius pomarinus* (Temminck, 1815)

The Pomarine Skua was the third most abundant species seen, with a total of 109 counted, plus another 49 *Stercorarius* skuas considered likely to be this species (Table 1). Many were moulting into breeding plumage, with several showing their characteristic

tail 'spoons'. Numbers seen varied greatly between days, with a maximum of 25 (plus 20 probable) on 17 April 2008, but several days with counts of zero. Many birds flew alone, but most flew in small groups, with a maximum of 16 recorded together (Table 2), although one flock of 20 probable Pomarine Skuas was noted. The average group size was 2.95, not dissimilar to the mean of 3.27 recorded by Allport et al. (2021).

Table 2. Pomarine Skua flock sizes

Group size	Number of groups	Number of birds
1	18	18
2	6	12
3	4	12
4	1	4
5	2	10
6	1	6
7	2	14
8	1	8
9	1	9
10–15	0	0
16	1	16
Total	37	109
	Mean group size	2.95

Very few Pomarine Skuas were recorded in early April, with much higher numbers being seen later in the study period (Table 3). This might suggest that the migration only starts in early April. Allport et al. (2021) saw no Pomarine Skuas off Negombo (north of Colombo on the west coast of Sri Lanka) on 14 March 2021, but they did see good numbers on 03 and 04 April 2021. Ilangakoon (2001) conducted a cetacean survey off the north-eastern coast of Sri Lanka from May to October 1994 during which seabirds were counted; Pomarine Skuas were only seen in May.

Table 3. Records of Pomarine Skuas with indication of direction of flight for three time periods during April. 'Other' includes 3 birds for which flight direction was not recorded.

April dates	Survey effort	Pomarine Skua			Total
		E to W	W to E	Other	
Numbers					
1 to 8	10d	0	5	0	5
9 to 16	19d	1	40	0	41
17 to 24	17d	2	58	3	63
Total	46d	3	103	3	109
Numbers per 10 hours					
1 to 8	57h 00m	0	0.9	0	0.9
9 to 16	130h 32m	0.1	3.1	0	3.1
17 to 24	105h 41m	0.2	5.5	0.3	6.0

Most Pomarine Skuas seen off Mirissa (94%) were clearly heading eastwards (Table 3). This eastward migration is consistent with the recent observation of a southward passage off the west coast of Sri Lanka near Colombo in April 2021 (Allport et al. 2021). No Pomarine Skuas were seen on the north-eastern coast of Sri Lanka off Trincomalee in March–April, although sightings

there were only recorded up until 08 April (RCA *pers. obs.*). So it is unlikely that they migrate up the east coast of Sri Lanka, but rather that they continue eastwards across the Bay of Bengal, as proposed by Allport et al. (2021); see also Crossland (2000). We also agree with Allport et al. (2021) who reviewed records from the region and suggested that these birds may have been wintering in the waters off south-western India; we have records of numbers of Pomarine Skuas from the offshore waters of Kerala in January (RCA *pers. obs.*).

If these Pomarine Skuas are indeed migrating across the Bay of Bengal, and up through the north-western Pacific in April–May, to breeding grounds in the high Arctic (Olsen & Larsson 1997), then this raises two intriguing questions. First, while most of the Pomarine Skuas seen in South Asia in the northern winter may breed in northern Asia as expected, is it possible that some breed in the Nearctic (cf., Harrison et al. 2022)? And secondly, how did such a seemingly unlikely migration route evolve? One possibility is that the seasonal movements of Bridled Terns across the Bay of Bengal (see below) may have provided a food trail for the Skuas to follow, serendipitously leading them to the productive waters off south-western India where they spend their winter months.

More generally, the eastward passage of Pomarine Skuas in April is in contrast to the large numbers of other migrating seabirds off Mirissa in April, which fly to the west. For Pomarine Skuas there is a potential advantage to migrating against the flow of other seabird species, as it may increase the number of individuals of other birds encountered and hence the Skuas' opportunities for kleptoparasitism; two cases were observed, both involving Bridled Terns. On the other hand, Allport et al. (2021) noted that 'all Pomarine Skuas ignored the opportunity of chasing abundant locally feeding terns.'

?Arctic Skua *Stercorarius parasiticus* (Linnaeus, 1758)

The identification of skuas, at least in non-breeding plumage, is not always straightforward. A total of six birds were considered to be possible Arctic Skuas *S. parasiticus*, but could not be distinguished from Pomarine Skua (in three cases) or Long-tailed Skua (in another three cases). The Arctic Skua has been considered to be uncommon in Sri Lankan waters (Warakagoda et al. 2012; Allport et al. 2021). In contrast, this species appears to be the commonest *Stercorarius* in Indian waters (Karuthedathu 2019).

Long-tailed Skua *Stercorarius longicaudus* Vieillot, 1819

Four Long-tailed Skuas were recorded. None had fully developed tail plumes, but all were obviously smaller than Pomarine Skuas, had greyish upperparts and just two obvious white primary shafts. Three (two on 11 April 2010, and one on 12 April 2010; exact positions not recorded) were flying eastward. One (on 21 April 2012; 5°48.9'N, 80°25.5'E) was sitting on the water when first seen, and was approached closely enough to be photographed. The photos were poor but had sufficient detail to confirm identification and to show that the bird was moulting from winter to breeding plumage (Gary Allport, *in litt.*, e-mail dated 13 January 2022). The Long-tailed Skua has until recently been considered to be absent or rare in this region (e.g., Rasmussen & Anderton 2012; Praveen et al. 2013). However, it is now recognised as an uncommon northern winter migrant to India and Sri Lanka (de Silva Wijeyeratne 2010; Warakagoda et al. 2012; Karuthedathu 2019). More recently, Allport et al. (2021) have suggested that

in March–May Long-tailed Skuas follow a similar migration to Pomarine Skuas, from the waters off south-western India, around the south coast of Sri Lanka and eastwards across the Bay of Bengal. The observations presented here (with three out of four birds seen in April flying eastwards) support this hypothesis.

Brown Noddy *Anous stolidus* (Linnaeus, 1758)

Most noddies seen were believed to be Lesser Noddies *A. tenuirostris*. However, a single bird, observed closely on 08 April 2013 at 5°52.3'N 80°25.8'E, was confidently identified as a Brown Noddy. The individual seen was part of a feeding flock, with Bridled Terns. It showed two-tone upper wings, a stout bill, a relatively languid wing beat, and was larger than the Bridled Terns; RCA has seen thousands of both Brown Noddy and Lesser Noddy in the Maldives. The Brown Noddy is a regular visitor to Sri Lankan waters, breeding in small numbers (Warakagoda 1994; De Silva 2011; Warakagoda et al. 2012).

Lesser Noddy *Anous tenuirostris* (Temminck, 1823)

There were three sightings of small noddies, all with feeding flocks of Bridled Terns *Onychoprion anaethetus* and all in the same year. One on 13 April 2008 at 5°53.9'N, 80°29.6'E; ten on 20 April 2008 at 5°54.7'N, 80°26.7'E; and two on 22 April 2008 at 5°54.6'N 80°27.4'E. They were all uniformly dark brown (appearing almost black), with no contrast on upper wings, bill relatively long and thin, and with a cream-coloured cap, but without extensive white on the neck. This last feature has been suggested to distinguish Black Noddy *A. minutus* from Lesser Noddy. However, it is a regular feature of presumed immature and non-breeding Lesser Noddies commonly seen in the Maldives (Anderson & Shimal 2020). While Black Noddy may occur in Sri Lanka (Warakagoda 1994; De Silva 1998), there has been much confusion over the years (e.g., Bourne 1997; De Silva 1992, 1998, 2011), and the current consensus is that Lesser Noddy is the common small noddy in the central Indian Ocean, including Sri Lankan waters (e.g., Rasmussen & Anderton 2012; Howell & Zufelt 2019; Harrison et al. 2021).

All our records of Lesser Noddies (13 individuals) and of unidentified noddies, which were probably Lesser Noddies (5 individuals), occurred in 2008. A similar concentration of records occurred with Persian Shearwater *Puffinus persicus* in 2010 (Table 1). While the numbers involved are too small to warrant any definitive conclusions, this does suggest that for some species at least, there may be inter-annual variations in abundance in Sri Lankan waters, perhaps associated with variations in oceanographic conditions and reinforcing the value of longer-term surveys.

Sooty Tern *Onychoprion fuscatus* (Linnaeus, 1766)

We had seven sightings of 15 Sooty Terns [3]. Four sightings (5 individuals) were of immatures, three sightings (ten individuals) were of adult birds. Some birds were feeding, and direction of travel was noted in only two cases: one to the west, one to the south. Sooty Tern is considered to be 'rather common' in Sri Lankan waters (Warakagoda et al. 2012). Sooty Terns are ocean wanderers and those seen off Sri Lanka may have come from any direction, although the Seychelles is a likely source for at least some of these birds. Sooty Terns ringed in the Seychelles have

been recovered in Kerala, and at Chilaw in north-western Sri Lanka (Balachandran et al. 2018) while others have been tracked with geo-locators from Seychelles into Sri Lankan waters and the Bay of Bengal before returning to their breeding island in April–May (Jaeger et al. 2017). It is likely that most of the birds recorded in this current study as Bridled or Sooty Terns (Table 1) were indeed Bridled, but it is possible that some were Sooty Terns.



3. Sooty Tern off Mirissa, 20 April 2011.

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Bridled Tern *Onychoprion anaethetus* (Scopoli, 1786)

Bridled Terns were by far the most common species observed (Table 1; 4). A total of 5,259 (and another 861 which were probably Bridled Terns, but were not seen closely enough to distinguish from Sooty Terns) were counted on 34 days; that amounted to 76% of all seabirds counted on those days. A summary of numbers recorded, indicating direction of travel, is provided in Table 4. The majority of the Bridled Terns recorded were in feeding flocks. For those clearly travelling, most (87% of those positively identified and with direction of travel recorded) were flying westward. Only 13% were flying eastward. In several cases these eastward-heading birds were seen to be flying towards feeding flocks, or to later change direction. Such movement, against the general flow of passage, by relatively small numbers of Bridled Terns has been previously reported and attributed to the search for food (De Silva 1987).



4. Bridled Tern off Mirissa, 22 April 2011.

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Table 4. Records of Bridled Terns, with indication of direction of flight for three time periods, during April. 'Other' includes birds flying northwards or southwards, or for which direction of travel was not recorded. Note that Bridled Tern numbers were not recorded on every day, so survey effort is less than for other species.

April dates	Survey effort	Bridled Terns				
		E to W	W to E	Feeding	Other	Total
Numbers						
1 to 8	10d	348	115	1366	2	1831
9 to 16	12d	541	51	999	17	1608
17 to 24	9d	260	4	496	1060	1820
Total	31d	1149	170	2861	1079	5259
Numbers per 10 hours						
1 to 8	57h 00m	61.1	20.2	239.6	0.4	321.2
9 to 16	77h 10m	70.1	6.6	129.5	2.2	208.4
17 to 24	69h 55m	37.2	0.6	70.9	151.6	260.3

The numbers of Bridled Terns seen declined from an average of 37 birds per hour during the early part of the month (01 to 08 April), to 26 birds per hour later in the month (17 to 24 April). Whether this indicates that the migration is coming into its later stages during April, or (given high variability between days) is simply the result of small sample sizes, is unknown.

Bridled Terns have been known, for decades, to migrate southwards along the west coast of Sri Lanka during the southwest monsoon (Hoffman 1975, 1978; van den Berg et al. 1982) and this movement has been particularly well studied by De Silva (1982, 1987, 2003). The southward migration can last from June to November, but peaks in about August–September. More recently, this southward passage has also been reported from Goa during August–October, and from Kerala in September (Praveen et al. 2011; Shivashankar et al. 2011; Lainer & Alvares 2013). The April passage reported here likely consists of the same birds on 'return' migration. Why this April passage has not been previously reported from the west coast of Sri Lanka is unclear. De Silva (2003: 28) noted that 'over two years I carried out weekly observations during the non-migratory season in an attempt to determine if the birds returned ... by the same route ... no birds were seen.' Perhaps the birds fly slightly further offshore in April than during the southwest monsoon (when winds are onshore), and so are not visible from the land. It was certainly the case that off Mirissa, during April, although land was almost always visible from our boat when offshore, the passage of Bridled Terns was not visible from land. Nevertheless, Bridled Terns do not appear in Maldives in large numbers in April–May (RCA *pers. obs.*), so it is unlikely that they move very far offshore, perhaps just towards the edge of the continental shelf. Praveen et al. (2011) recorded hundreds off the Kerala coast in April 2011, albeit in feeding flocks not obviously on passage, while Lainer & Alvares (2013) reported relatively small numbers heading northwards off Goa in May.

De Silva (2003: 28) also noted, while discussing the southward passage around the west coast, that 'the main migratory stream veers out to open ocean somewhere near Dondra,' suggesting that they do not continue northwards hugging the east coast of Sri Lanka; instead they fly out offshore, into the Bay of Bengal. If this is the case, then they might be expected to return from the same direction (i.e. from the east). In March–April, only relatively small numbers of Bridled Terns were seen off Trincomalee on

the north-eastern coast (RCA *pers. obs.*): the numbers recorded were roughly one third of the numbers of White-winged Terns compared to five times as many in this study. Most of the Bridled Terns heading westwards off the southern coast in April might therefore be coming from the east, from out in the Bay of Bengal, rather than having travelled around the coast from the north. This raises the possibility that these birds might be the same as the ones seen off Singapore, 'migrating west in spring and east in autumn' (Poole et al. 2011: 28, 2014).

Bridled Terns do nest in northern Sri Lanka, but the relatively small numbers involved cannot account for the scale of the biannual offshore passages. It seems to have been assumed that the southward movement in the southwest monsoon (boreal autumn) is a post-breeding migration, with breeding occurring during the northern summer elsewhere in the northwest Indian Ocean (De Silva 1987, 2003; Bourne 2015). This may well be the case. However, the possibility that these Bridled Terns breed, during the southern summer, somewhere to the east of Sri Lanka cannot yet be entirely excluded.

Little Tern *Sternula albifrons* (Pallas, 1764)

Saunders's Tern *Sternula saundersi* (Hume, 1877)

Both species of small terns were positively identified, although many *Sternula* could not be identified to species. Of the two, Little Tern appeared to be much commoner (Table 1), and was most often seen offshore in feeding flocks. Little Tern is a common breeding resident, while Saunders's Tern is an uncommon breeding resident in Sri Lanka (Warakagoda et al. 2012).

?Black Tern *Chlidonias niger* (Linnaeus, 1758)

A single tern seen on 17 April 2008 (5°54.2'N, 80°29.3'E) was initially thought to be a White-winged Tern *C. leucopterus* in breeding plumage. However, it had uniform grey underwings, not contrasting black and white. No other features were noted and no photos were taken; it was therefore recorded as a probable Black Tern. This species has been recorded from Sri Lanka (De Silva et al. 1993), but until recently, without photographic evidence or regional specimens, has been considered 'hypothetical' in South Asia (Rasmussen & Anderton 2012). However, a number of recent, well-documented records from India (Bhatt et al. 2014; Praveen et al. 2014; Praveen et al. 2019) have confirmed its occurrence in the region as a rare northern winter visitor.

White-winged Tern *Chlidonias leucopterus* (Temminck, 1815)

The White-winged Tern was the second-most abundant species recorded (Table 1, 5), with 1,041 counted (and another 49 noted as 'probable'), accounting for some 13% of seabirds recorded on the 34 days when all were counted. A summary, indicating direction of travel, is provided in Table 5. For those clearly travelling, most (92% of those positively identified and with direction of travel recorded) were flying westward. Nevertheless, more White-winged Terns were recorded in feeding flocks than on passage, as was the case with Bridled Terns.



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5. White-winged Terns off Mirissa, 21 April 2012.

Table 5. Records of White-winged Terns with indication of direction of flight for three time-periods during April. 'Other' includes birds flying north or south, or for which direction of travel was not recorded. Note that White-winged Terns were not counted on 2 days in 2007, so survey effort is less than for some other species.

April dates	Survey effort	White-winged Terns				Total
		E to W	W to E	Feeding	Other	
Numbers						
1 to 8	10d	144	0	291	9	444
9 to 16	19d	48	22	82	3	155
17 to 24	15d	172	10	215	45	442
Total	44d	364	32	588	57	1041
Numbers per 10 hours						
1 to 8	57h 00m	25.3	0.0	51.1	1.6	77.9
9 to 16	130h 32m	3.7	1.7	6.3	0.2	11.9
17 to 24	96h 10m	17.9	1.0	22.4	4.7	46.0

Even though the White-winged Tern has been categorised as a winter visitor to the lowlands of Sri Lanka (Warakagoda et al. 2012), we only rarely saw it close to shore, finding it more commonly a few kilometres offshore, with many in the vicinity of the continental slope edge. In other regions, other species of seabird forage along ocean shelf-breaks and other topographical features, which promote productivity (e.g., Freeman et al. 2010).

Our data, if extrapolated, suggest that there may be thousands of White-winged Terns migrating westwards around the south coast of Sri Lanka each April. They are presumably heading towards their northern summer breeding grounds. Many of the birds seen were moulting from their winter plumage, with a few already in their beautiful breeding plumage. White-winged Terns breed in Eastern Europe and across a wide swathe of mostly mid-latitude Asia all the way to northern China and the far east of Russia (Gochfeld et al. 2020; Harrison et al., 2021). Birds from the western part of their breeding range, in Eastern Europe, winter in Africa, while those in the eastern part of their breeding range winter in South-east Asia (Gochfeld et al. 2020). The birds seen off Sri Lanka may breed in the central part of their summer range, possibly in and around Kazakhstan and south-western Russia, where White-winged Tern is known to be common (Schielzeth et al. 2010; Gochfeld et al. 2020).

West of Sri Lanka, the White-winged Tern is an uncommon winter visitor to the oceanic islands of the Maldives (Anderson 2007; Anderson & Shimal 2020) and is unrecorded from Lakshadweep (Aju et al. 2021). This suggests that it tends to keep to the continental margin, and does not often wander further

offshore. If this assumption is correct, the birds seen during this study, in April, may migrate northwards up the west coast of the Indian Subcontinent, after passing Mirissa, and presumably also southwards down the west coast in the northern autumn, after breeding.

Further afield, post-breeding White-winged Terns are present in large numbers in southern Ukraine in July–August (van der Winden & Nesterenko 2003), and are on passage through Oman in September–December with peak numbers in November (Eriksen & Victor 2013), while 50,000–70,000 birds were counted on the Caspian Sea coast in August–November 2011 (Heiss et al. 2020). Even if these are not the same birds, the phenology is compatible with a movement down the west coast of India and Sri Lanka sometime during September to December.

And yet, no such major passage has been reported. Indeed, White-winged Tern has, until recently, been considered a relatively uncommon visitor to the Indian Subcontinent. For example, both Harrison (1983) and Olsen & Larsson (1995) completely omitted Sri Lanka from their maps of its non-breeding range. Pittie et al. (2005) were able to review only about 30 records from the whole of India, although Prasad (2005) and Inskipp (2006) added several more.

On average, White-winged Terns tended to fly slightly less far offshore than Bridled Terns, but they also fly much lower. This might make them less visible from the shore, and may help to explain why they have not been observed on passage off the west coast by shore-watchers. There is also the potential for misidentification, particularly when in winter plumage, and particularly with its common congener, the Whiskered Tern *C. hybrida*.

Whatever the case, we suggest that the White-winged Tern is a regular and common northern winter and passage migrant to Sri Lankan waters. Our observations show that it is most common along the edge of the continental shelf off Mirissa. Our observations from Trincomalee also demonstrate that White-winged Tern is found most frequently in the vicinity of the shelf edge, and that it migrates southward in March and April along the north-eastern coast of Sri Lanka (RCA *pers. obs.*). This is compatible with the observation of large numbers of White-winged Terns on passage near Chennai, south-eastern India, in March–April (Frederick 2021). We therefore further speculate that, while some may linger in coastal areas, many White-winged Terns migrate down the west coast of India, around the coast of Sri Lanka, and up the east coast of India during the northern autumn, and back in the northern spring. Whether or not numbers pass through the shallow Palk Strait, between India and Sri Lanka, rather than around the southern coast of Sri Lanka, is unknown. Whether or not White-winged Terns are continually on the move, foraging all along the shelf edge around the Bay of Bengal as far as Bangladesh and perhaps farther, before turning and retracing their 'steps', rather than stopping and aggregating in a particular wintering ground is also unknown. From the Asian Waterfowl Census, counts of 5230 White-winged Terns were reported from Orissa (Odisha State, east coast of India) in January 1991 (Perennou & Mundkur 1991), although some census reports have been questioned (Rahmani 1993; Inskipp 2006). There is clearly much room for further discovery.

Whiskered Tern *Chlidonias hybrida* (Pallas, 1811)

Whiskered Tern was common inshore (where not all individuals were counted), although it was recorded up to 2 km offshore. It is

considered to be a common northern winter visitor to Sri Lankan lowlands and coastal waters (Warakagoda et al. 2012).

?Roseate Tern *Sterna dougallii* Montagu, 1813

A single bird in non-breeding plumage and, tentatively, identified as a Roseate Tern was seen on 06 April 2013 at 5°52.3'N, 80°28.9'E. It was part of a large feeding flock, of at least ten seabird species, including Common Terns *S. hirundo*. It was differentiated from those birds by its uniformly pale upperparts and reduced dark on the wings. However, it was not photographed or seen sufficiently well to confirm identification. The Roseate Tern is an uncommon breeding visitor to Sri Lanka (Warakagoda et al. 2012).

Common Tern *Sterna hirundo* Linnaeus, 1758

Common Terns were seen regularly, mostly offshore, and mostly in mixed feeding flocks (perhaps because they could then be more easily approached and identified). It is a common winter visitor and occasional breeding resident (Warakagoda et al. 2012).

?White-cheeked Tern *Sterna repressa* Hartert, 1916

A single bird in breeding plumage, seen on 20 April 2011 just outside Mirissa harbour (exact position not noted), was tentatively identified as a White-cheeked Tern. It was of similar size to a Common Tern, with a deeply forked tail, black cap, uniform upperparts, grey undersides, and obvious white cheeks. However, it was not photographed or seen sufficiently well to confirm identification. The White-cheeked Tern is considered to be a vagrant to Sri Lanka (Warakagoda et al. 2012).

Greater Crested Tern *Thalasseus bergii* (Lichtenstein, 1823)

Lesser Crested Tern *Thalasseus bengalensis* (Lesson, 1831)

Both species of crested tern were recorded inshore, in relatively small numbers. Lesser Crested [6] is a common winter migrant, while Greater Crested is a common breeding resident (Warakagoda et al. 2012).



Charles Anderson

6. Lesser Crested Tern off Mirissa, 15 April 2008.

White-tailed Tropicbird *Phaethon lepturus* Daudin, 1802

A single bird was seen near Mirissa Harbour on 10 April 2010. The White-tailed Tropicbird is an irregular non-breeding visitor to Sri Lanka's western and southern coasts, mainly from March to July (Warakagoda 1994).

Red-billed Tropicbird *Phaethon aethereus* Linnaeus, 1758

A total of five birds were recorded, on four days: 03 April 2009 at 5°49.0'N, 80°35.7'E [7]; two on 15 April 2010 near Mirissa Harbour; 22 April 2011 at 5°51.5'N, 80°25.0'E; and 17 April 2012 again near Mirissa Harbour. The Red-billed Tropicbird is a regular non-breeding visitor to Sri Lanka's western and southern coasts between March and September, presumably from its nearest breeding sites in the region of Arabia (Warakagoda 1994; Orta et al. 2020).



Anoma Alagiyawadu

7. Red-billed Tropicbird off Mirissa, 03 April 2009.

Swinhoe's Storm-petrel *Hydrobates monorhis* (Swinhoe, 1867)

We had a single sighting of Swinhoe's Storm-petrel: two birds together, heading east, on 21 April 2007 at 5°50'N, 80°30'E. They had a noticeably buoyant flight, were all brown with a lighter diagonal on the upperwing coverts, but did not show white primary flashes. No photos were taken, and there were no other birds nearby, so size could not be estimated with any degree of certainty, but these birds were separated from Matsudaira's Storm-petrel *H. matsudairae* on the basis of their lack of obvious primary wing flashes, and timing: Matsudaira's Storm-petrel is normally absent from the tropical Indian Ocean in April (Howell & Zufelt 2019). Swinhoe's Storm-petrels breed in the northwest Pacific during the northern summer, spending their non-breeding season in the tropical Indian Ocean, although a few may over-summer (Vivek Chandran et al. 2011; Praveen et al. 2013). Numbers have been reported heading westwards off Singapore (towards the Indian Ocean) and northwards off the western coasts of Sri Lanka and India during September–October (Karuthedathu et al. 2013a; Poole et al. 2014; Perera & Ilangakoon 2016; Baidya et al. 2017). Most leave the Indian Ocean in about April–May (Rajathurai 1996; Carboneras et al. 2021). That we had just a single sighting (in late April) might suggest that the majority of Swinhoe's Storm-petrels depart in May rather than April or that they leave by a more southerly route (Poole et al. 2014).

Streaked Shearwater *Calonectris leucomelas* (Temminck, 1836)

We had three sightings, all of single birds flying eastward: (1) 11 April 2010 exact position not recorded; (2) 12 April 2010 at 5°46.9'N, 80°19.0'E; and (3) 21 April 2012 at 5°52.6'N, 80°25.8'E. There is another, recent record from off Mirissa on 10 April 2021 (Arachchi 2021a; Bandara 2021a; Roddis & Loseby 2021). An unpublished and undated (probably 1959) manuscript entitled 'Distribution of Shearwaters, Petrels and

Prions' marked 'Duplicate for Dr. Bourne' is among the papers of Dutch sea captain and marine naturalist Willem Mörzer Bruyns at the Bird Section of the British Natural History Museum, Tring, UK. Under 'Whitefaced Shearwater, *Puffinus leucomelas*' he noted that 'In the [winter quarters] in the Indian Ocean on the East coast of Ceylon I recorded one on October the 16th, 200 on November 3rd [probably 1951] ... they winter on a lee-shore (NE monsoon) and the place where we saw so many was on the 100 fath [fathom, 183m] line off Hambamtota [sic]'. This same document also notes a sighting in the Maldives, and is probably the origin of the often-repeated assertion that Streaked Shearwaters occur 'west to the Maldives' (Bourne 1960: 30; Anderson & Shimal 2020). Robertson (1995), Karuthedathu et al. (2013b) and Praveen et al. (2013) reviewed regional records, including some from Sri Lankan waters, the latter concluding that this species was 'probably under reported from Indian seas'. Streaked Shearwater breeds in the northwest Pacific, particularly around Japan, but also on islands off the Korean peninsula, Russia, and China (Carboneras et al. 2020a). Birds are present at the breeding colonies from about March to October–November. During the northern winter they disperse southwards, mainly to the tropical west Pacific, but some birds enter the Indian Ocean from where they return eastwards in March–April.

Flesh-footed Shearwater *Ardenna carneipes* (Gould, 1844)

Wedge-tailed Shearwater *Ardenna pacifica* (Gmelin, 1789)

These two species are considered together because they could not always be distinguished at sea. A total of 213 large, all-brown shearwaters were counted, of which 38 were positively identified as Wedge-tailed Shearwater, and 23 as Flesh-footed Shearwater, while 152 (71%) were considered to be one or other of these species (Table 1). Most of these birds were travelling to the west (Tables 6, 7 & 8). For those for which direction of travel was recorded, all 12 Flesh-footed Shearwaters (100%) and 114 out of 130 unidentified *Ardenna* (88%) were flying westward. However, only 6 out of 11 Wedge-tailed Shearwaters (55%), for which direction of travel was noted, were flying west. Both Flesh-footed and Wedge-tailed Shearwaters (as well as the unidentified *Ardenna*) were very much commoner in the latter part of April than at the beginning of the month, with none recorded before 06 April (Tables 1, 6, 7 & 8).

Table 6. Records of Flesh-footed Shearwaters with indication of direction of flight for three time periods during April. 'Other' includes birds that were resting, feeding or travelling north or south.

April dates	Survey effort	Flesh-footed Shearwater			Total
		E to W	W to E	Other	
Numbers					
1 to 8	10d	1	0	0	1
9 to 16	19d	1	0	1	2
17 to 24	17d	10	0	10	20
Total	46d	12	0	11	23
Numbers per 10 hours					
1 to 8	57h 00m	0.2	0	0	0.2
9 to 16	130h 32m	0.1	0	0.1	0.2
17 to 24	105h 41m	0.9	0	0.9	1.9

Table 7. Records of Wedge-tailed Shearwaters, with indication of direction of flight for three time periods during April. 'Other' includes birds that were resting, feeding or travelling north or south

April dates	Survey effort	Wedge-tailed Shearwater			Total
		E to W	W to E	Other	
Numbers					
1 to 8	10d	0	0	0	0
9 to 16	19d	6	1	2	9
17 to 24	17d	0	4	25	29
Total	46d	6	5	27	38
Numbers per 10 hours					
1 to 8	57h 00m	0	0	0	0
9 to 16	130h 32m	0.5	0.1	0.2	0.7
17 to 24	105h 41m	0	0.4	2.4	2.7

Table 8. Records of *Ardenna* Shearwaters (i.e. all Flesh-footed and Wedge-tailed Shearwaters including those which could not be distinguished when seen) with indication of direction of flight. 'Other' includes birds that were resting, feeding or travelling north or south

April dates	Survey effort	Unidentified <i>Ardenna</i> Shearwaters			All <i>Ardenna</i>	
		E to W	W to E	Other	Total	Total
Numbers						
1 to 8	10d	1	0	2	3	4
9 to 16	19d	47	6	11	64	75
17 to 24	17d	66	10	9	85	134
Total	46d	114	16	22	152	215
Numbers per 10 hours						
1 to 8	57h 00m	0.2	0	0.4	0.5	0.7
9 to 16	130h 32m	3.6	0.5	0.8	4.9	5.7
17 to 24	105h 41m	6.2	0.9	0.9	8.0	12.7

Flesh-footed Shearwaters [8] have been understood for many decades to migrate across the Indian Ocean from their breeding sites in south-western Australia to the productive upwelling areas off Somalia and Arabia in their non-breeding season, i.e., in about May to September (Gibson-Hill 1953; Bailey 1966; De Silva & Perera 1994). It was thought that most birds crossed the Indian Ocean south of the equator when heading westwards, returning eastwards further north, via Sri Lanka. However, it now appears, from two electronic tagging studies, which both covered part of the outward journey from southwest Australia, that at least some birds head further north towards Sri Lanka after leaving Australia (Powell 2009; Lavers et al. 2019). Our observations off Mirissa certainly support this interpretation, as does the regular appearance of large numbers of Flesh-footed Shearwaters from mid-April in the Maldives (RCA *pers. obs.*), and also off Kerala (Karuthadatu & Praveen 2016). The return migration of these birds, down the west coast of Sri Lanka, in September–October, was documented by De Silva & Perera (1994).



Ian Robinson

8. Flesh-footed Shearwater off Mirissa, 19 April 2011.

For Wedge-tailed Shearwaters [9], only 55% were heading westward, with 45% heading eastward. However, given the small numbers involved and the high proportion of unidentified *Ardenna* which were flying westward (88%), many of which were likely to be Wedge-tailed Shearwaters, it is possible that the estimate of 55% is too low. Certainly, many north-westward-flying Wedge-tailed Shearwaters appear in Maldives with the Flesh-footed Shearwaters from mid-April (RCA *pers. obs.*). However, it is also the case that Wedge-tailed Shearwaters make extended feeding excursions into the central Indian Ocean from the Seychelles during their non-breeding season, roughly from February to May (Catry et al. 2009). It is therefore possible that Wedge-tailed Shearwaters from more than one population are on passage through Sri Lanka waters in April, heading in different directions, as seems to be the case in the Maldives (Anderson 2007; Anderson & Shimal 2020). Also in agreement with the Maldives (Anderson & Shimal 2020), all the Wedge-tailed Shearwaters seen were dark-phase birds.



Both: Charles Anderson

9. Wedge-tailed Shearwaters off Mirissa, 21 April 2012.

Sooty Shearwater *Ardenna grisea* (Gmelin, 1789)

We had a single sighting of a Sooty Shearwater, on 22 April 2008, at 5°48.2'N, 80°28.9'E. It flew straight towards our boat, heading westward, passing within 20 m and offering excellent views of its obvious and strongly contrasting silver-grey underwing linings. It was separated from Short-tailed Shearwater *A. tenuirostris* not only by its underwing colouration but also by its relatively large and bulky appearance (it was initially thought to be a Flesh-footed Shearwater, before the underwings were seen), its relatively long tail without any sign of foot projection, and its lack of any suggestion of a dark hood (Onley & Scofield 2007). More recently, this species was seen and photographed off Mirissa on 27 March, 10 April, and 24 April 2021 (Arachchi 2021b; Bandara 2021b; Roddis & Loseby 2021). Sooty Shearwater breeds on islands off south-eastern Australia, New Zealand, and Tierra del Fuego, and

during the non-breeding season (southern winter) undertakes extraordinary migrations around the Atlantic and Pacific Oceans (Shaffer et al. 2006; Carboneras et al. 2020b). Although said to be absent from the northern Indian Ocean (Carboneras et al. 2020b) Sooty Shearwater does occur in the Arabian Sea in small numbers (reviewed by Anderson et al. 2017). The recent Sri Lankan sightings are consistent with southern birds, perhaps from the nearest breeding colonies on islands off southeast Australia, migrating north-westwards towards the upwelling areas off Arabia and Somalia during their non-breeding season.

Persian Shearwater *Puffinus persicus* Hume, 1872

A total of nine Persian Shearwaters were recorded (Table 1, 10), eight in 2010. Four were feeding, three flying west and two flying east (i.e., there was no clear net movement). Persian Shearwater was, until recently, considered a rarity off southern South Asia (Rasmussen & Anderton 2005; Onley & Scofield 2007). However, a spate of recent sightings off south-western India (Praveen et al. 2011; Shivashankar et al. 2011; Praveen 2013), and Sri Lanka (de Silva Wijeyeratne 2010; De Silva 2011) suggests that it is a regular non-breeding visitor to these areas. In contrast, it appears to be no more than a vagrant to the Maldives (Anderson et al. 2016). It therefore seems likely that this species rarely wanders far from the continental margins, moving south-eastwards from its Arabian breeding sites towards Sri Lanka in its non-breeding season along the west Indian shelf, as first suggested by Bourne (1960).



10. Persian Shearwater off Mirissa, 15 April 2010.

Conclusions

Off the south coast of Sri Lanka, in April, there are major migratory movements of at least four species of seabird: Bridled Tern, White-winged Tern, and Flesh-footed Shearwater to the west, and Pomarine Skua to the east. Small numbers of another four species, believed to be on passage, were also observed: Sooty Shearwater to the west, with Long-tailed Skua, Swinhoe's Storm-petrel, and Streaked Shearwater flying eastward. In addition, Wedge-tailed Shearwaters, from at least two separate populations, may pass through southern Sri Lankan waters in different directions. On top of those nine species, another 12 species of seabird were positively recorded, including both residents and seasonal visitors. Thus, the waters off Mirissa and Dondra Head appear to be a significant seasonal feeding area and flyway for seabirds [11].



Charles Anderson

11. A small flock of White-winged Terns with three Bridled Terns, Dondra Head lighthouse in the background, 15 April 2010.

Dondra Head is not only the southern tip of Sri Lanka, but also the southernmost point of the entire Indian Subcontinent. Shipping and cetaceans passing from one side of the northern Indian Ocean to the other are all concentrated into a narrow strip of ocean just offshore (e.g., De Vos et al. 2016; Anderson & Alagiyawadu 2019). So it should not be surprising that the waters of southern Sri Lanka are also a major cross-roads for migratory seabirds. Species recorded during this study in April included both northern hemisphere breeders heading back to their breeding sites (e.g., Pomarine Skua and Long-tailed Skua heading to the Beringian Arctic, Streaked Shearwater and Swinhoe's Storm-petrel to the northwest Pacific, and White-winged Tern to west-central Asia), and southern hemisphere breeders visiting the northern Indian Ocean during their non-breeding season (e.g., Flesh-footed Shearwater from south-western Australia, Sooty Shearwater perhaps from south-eastern Australia, and Wedge-tailed Shearwater perhaps from both Seychelles and western Australia). The breeding location(s) of the commonest passage migrant, the Bridled Tern, may be in the north-west Indian Ocean but remain unknown.

These mass movements of many thousands of seabirds, of several different species, within sight of land (albeit not always within sight from land), have gone almost unremarked until now. For South Asian ornithology has, until very recently, concentrated on the great diversity of its terrestrial avifauna, turning its back on the ocean. However, as noted by Praveen (2013), these are exciting times for pelagic birding in the region.

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