An updated ornithology of the Lakshadweep Islands

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Introduction

Islands, the natural laboratories, have always fascinated naturalists through the ages by their exclusive biogeographic features and real time exposition of more or less elusive bio-geological evolutionary processes and ecosystem functioning. In terms of their origin, many of the world's islands and island groups resulted from tectonic processes at active boundaries along ridges across the oceans. Some islands however, which lie close to the continental landmasses, vary in their origin by being part of the continental crust itself (Wagle & Kunte 1999). One such group is the Lakshadweep Islands, located on the northern part of the Chagos–Laccadive Ridge (comprising the Chagos Archipelago, the Maldives, and the Lakshadweep group of islands). Unlike the Chagos Archipelago and the Maldives, which are oceanic in origin, the Lakshadweep Islands are part of the continental block that forms India. It was during the Lower Eocene that the Laccadive Ridge became separated from the mainland (Nair et al. 2013) and the Lakshadweep Sea was formed in between.

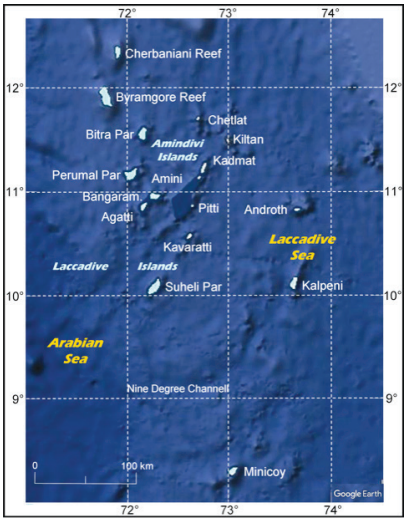

Fig. 1. Islands of the Lakshadweep Archipelago. Map: S. Subramanya.

Lying *c*.300 km westwards off the southwestern coast of the Indian Peninsula, the Lakshadweep Archipelago comprises a group of 36 very small islands scattered in the Lakshadweep Sea. The total land area of all the islands is only 32 sq. km. These islands are located between 8.16° (Minicoy Atoll) and 12.36° (Beliapani Reef) northern latitude, and 71.43° (Cheriapani Reef) and 73.70° (Androtт Atoll) eastern longitude. These tropical islands receive the first touch of the south-western monsoon winds as they progress to the mainland. While the atolls of the Maldives group, located immediately on the south of the southern-most island of Minicoy, are more compactly arranged, those of Lakshadweep are strewn widely apart from each other and are irregularly scattered.

History of ornithology in the Lakshadweep

Historically, Lakshadweep is known from before the Common Era and has been occupied by humans from around 1500 BCE. Excavations on various islands have revealed the presence of Buddhism and related early settlements (Tripati 1999). The position of these islands on the maritime trade routes between India and North Africa made them popular among the sailors before the Common Era. Though the history of human settlement on the islands can be obtained from various sources (Tripati 2009), records of their flora and fauna, from an early period, are absent. The first scientific observations about the nature of these islands started during the British period in India. The Royal Navy ships of Britain with naturalists onboard recorded for the first time the floristic and faunal diversity of the islands besides its geology and marine life. Such surveys and records of British explorers during the 19th and 20th centuries laid the foundation for natural history studies of Lakshadweep islands.

A detailed description by W. Robinson (1848), a British civil servant, threw light, for the first time, on the socio-political, and economic aspects of the islands. Prior to that, Murray et al. (1832: 352) mentioned that the 'Laccadives group of islands has not yet been very accurately surveyed …'. Robinson (1848) provided the first hints about the vegetation, other than the ubiquitous coconut trees of the islands. It also mentions the breeding of seabirds on Bitra Island, probably the first such record from the archipelago. Bitra was then uninhabited and huge flocks of birds used the brushwood to nest and lay eggs, but later abandoned the island for unknown reasons. The islanders' testimony of collecting tens of thousands of eggs for food illustrates the enormity of the flocks present.

Jerdon (1862–1864) did not include the Lakshadweep Islands in his magnum opus, probably due to the lack of any direct observational data at that time. Blyth (1863: 1) noticed that his work would include 'what little is known of the Ornithology of the Maldives and Laccadives', but did not report anything specific about the avifauna of these islands.

Hume's (1876) was the first dedicated work on the birds of Lakshadweep. In his report, he recorded 35 species of birds from its reefs and atolls. Legge (1878–1880) referred to all the observations of Hume (1876) while describing the

birds of Ceylon. In the last decade of the nineteenth century, the voluminous four-volume work of Oates (1889, 1890) and Blanford (1895, 1898), all the birds of India, together with those recorded by Hume (1876) from Lakshadweep were described. After Hume, it was Alcock (1902) who, during his two months long investigations in the Lakshadweep Sea in 1891, made some observations of the island birds including the first observation of terns breeding on Pitti Island. Gadow & Gardiner (1903) dedicated a small chapter for birds, but most of their records were from the Maldives, and those for Lakshadweep were only from Minicoy.

Ellis (1924: 12–13) published a list of eleven 'permanent residents' (birds) of the island which, however, is contentious. He included the Common Teal *Anas crecca* and the Crab-Plover *Dromas ardeola* in this list, though they are migrants. The Chinese Crested Tern *Thalasseus bernsteini* that he listed, was possibly a misidentified Greater Crested Tern *T. bergii*. Of the species that he listed, only the White-breasted Waterhen *Amaurornis phoenicurus*, Asian Koel *Eudynamys scolopaceus*, and House Crow *Corvus splendens* are now considered permanent residents. The Sooty Tern *Onychoprion fuscatus* is a summer breeding visitor, while the Striated Heron *Butorides striata* is a possible winter visitor. The Black-naped Tern *Sterna sumatrana* has not been recorded from the islands before or after his publication.

Col. R. W. Burton (1940) visited the northern islands, such as Chetlat, Bitra, Kadamat, and Amini, in November 1935 and observed birds on the first three. He noted an Indian Roller *Coracias benghalensis* and a Montagu's Harrier *Circus pygargus* on the first two islands, and some gulls, terns, and waders on Bitra and Kadamat. His was the first record of gulls from the islands, though no details regarding species were given. He also observed a Pallid Harrier *C. macrourus* on Chetlat, and an unidentified water rail, besides, 'whimbrel, golden plover, avocets, stints, herons and a large black and white stork', in Bitra (Burton 1940: 503).

F. N. Betts visited a few of the northern islands in February 1938 and listed some birds including two probable new records for the islands, namely, Brown Shrike *Lanius cristatus* and Osprey *Pandion haliaetus* (Betts 1938). He also collected some terns' eggs from Pitti Island, through the islanders, in May 1938 (breeding had not started in February when he visited), which were later identified by Stuart Baker as Sooty Tern eggs (Betts, 1939).

In October 1963, Mathew & Ambedkar (1964) ringed the hatchlings of Brown Noddies *Anous stolidus* and Great Crested Terns on Pitti. At Amini, they recorded only the Asian Koel and Indian White-eye *Zosterops palpebrosus* as residents. Besides, they recorded an Oriental Turtle Dove *Streptopelia orientalis*, which had been captured by an islander. In Chetlat they observed Ruddy Turnstones *Arenaria interpres*, Little Stints *Calidris minuta*, and Kentish Plovers *Charadrius alexandrinus* while at Bitra they found most of the shorebirds in their list along with an unidentified pipit, and a Western Yellow Wagtail *Motacilla flava*. At one of the islets in Valiayapani, they ringed the hatchlings of Bridled Terns *Onychoprion anaethetus* and noted the eggs of another species, which they failed to identify. Large numbers of Sooty Terns were also observed in Cherbaniani (Valiyapani). The report of Baskaran (1986), about his visit to Minicoy and Kalpeni, added an inconclusive sighting of a flock of Lesser Frigatebird *Fregata ariel* into the putative bird list of the island from near Minicoy.

From the second half of the 1980s, and throughout the 1990s, the birds of Lakshadweep gained increasing attention from ornithologists. Some concentrated on the breeding terns on uninhabited sandbanks while others added new species to the archipelago's bird list. During this period the uninhabited south-western islands of Suheli were surveyed for the first time to study its avifauna (see below). Daniels (1992) produced one of the most substantial works on the avian diversity of Lakshadweep; visiting five inhabited islands in 1988. He also compiled and updated the list of birds recorded up to that date: a total of 67 species.

Kurup & Zacharias (1995) conducted a year-long assessment from August 1985 to July 1986, during which they visited the Suheli Atoll twice and collected information on the past breeding of terns. They also noted the breeding of Grey Heron *Ardea cinerea* on Suheli as well as in the Bangaram group of islands for the first time (however, there are no recent updates of such breeding events), and updated the archipelago's checklist by adding their own records.

Notwithstanding the above studies, Pitti Island remained a priority site for many ornithologists, and repeated attempts were made to elucidate the seasonality of it's breeding of terns. By this time Pitti Island had become the last breeding site for terns in this region as they abandoned all other islands. Based on previous survey data, Mathew et al. (1996) tried to infer the breeding time of terns but failed to resolve it due to the lack of data from monsoon months.

Among the different islands in this group, the triple islets of Bangaram, Thinakara, and Parli, which share a common lagoon, have gained prominence as an important area for migratory shorebirds and waterfowl. Summarizing a decade of birding, Gent (2007) listed over 150 species of birds for the region. Even though some of his observations are doubtful, especially in the absence of supporting notes or photographs, his contributions were found significant in understanding the diversity of the birds visiting a single atoll.

In the past decade, a new revolution in bird observations has taken place in India with the widespread use of online bird monitoring platforms such as eBird. This trend rippled down to Lakshadweep where tourists, and now-a-days knowledgeable natives too, have begun to create checklists of birds. For a relatively remote place like Lakshadweep, every open access observation has immense importance when it comes to studying the diversity, seasonality, and population trends of migratory birds visiting these islands. When recent studies are compared with the historical observations and studies of the birds of these islands one can easily understand that these, often casual, observations seem more reliable since many of them are supported by photographs, almost the exact number of the birds observed, and the actual geographic location at which they are sighted. While compiling this checklist (see Appendix), those unpublished primary observations were found to be of utmost importance.

Current surveys

Efforts continue to update the checklist of birds of the Lakshadweep Islands by both, birders, as well as ornithologists. This section deals with our attempts to study the diversity of the archipelago's birds, during the last two years.

Between January 2019 and January 2020 we visited Kavaratti, Chetlat, and Kalpeni and recorded 56 species including a few new records such as the eastern race of the Common Swift *Apus a. pekinensis*, and European Bee-eater *Merops apiaster*, both from the northern island of Chetlat.

The general pattern of habitats in all these inhabited islands is the same: there is a narrow sandy beach on the windward side, coral rocky outcrops towards the northern and southern corners, which sometimes extend all-round, besides the tripods and other wall structures constructed to prevent the wave action on the leeward side. Islands are almost homogenous in terms of vegetation where coconut groves are dotted with home yard plants like *Carica* sp., *Moringa* sp., *Tamarindus* sp., *Mangifera* sp., *Artocarpus altilis*, *Thespesia populnea*, *Azadirachta indica*, *Ficus* sp., *Gliricidia* sp., *Psidium* sp., and *Musa* sp. *Scaevola* sp., and *Hymenocallis* sp., are among the common flowering plants that can be seen along the shorelines. Some of these plants are regularly grown as natural fences. Mangroves are mostly absent across the islands of Lakshadweep, though small patches can be seen in Minicoy. Patches of mangrove associates such as *Derris trifoliata* are quite restricted to small areas, e.g., as on Kavaratti Island. Wastelands on the extremities of the islands, formed either by uncontrolled growth of vegetation, or by accretion of coral rubble and shingles, especially after the impact of a storm, also provide extended habitat to waders and passerines.

Methodology

Based on all the previous observation data available in various domains such as published works, websites, and social media platforms, etc., we compiled a primary list of birds that were marked as 'possible' records without any screening. Then, we filtered this list based on the criteria set for confirmed occurrences. We included 'specimens' as one of the criteria for the final inclusion of a species in the checklist**.** Observations submitted to the eBird database along with associated media like photographs or sound recordings were taken as 'other criteria' for the final inclusion of a species. This is important as many of the recent records, spanning the past six years or so, are present only on eBird. Finally, the observations of tourists/birders who visited the islands, and made available their photographs on social media platforms, were also scrutinized for inclusion in the final checklist. Further, observations that needed explanations were separated and are discussed below.

Our own observations, conducted on the islands of Kavaratti, Chetlat, Kalpeni, and Pitti were also subjected to the same criteria. For maritime records, we included species reported from the Exclusive Economic Zone (EEZ) of the Lakshadweep Islands, and our surveys also covered the seas around these islands.

Specimens

The number of specimens collected from Lakshadweep, is meagre. We did not access any of them directly for examination. Hume's (1876) visit in the nineteenth century was rich with the specimens he collected. We traced many of them in Sharpe (1896), Saunders & Salvin (1896), and Sharpe & Ogilvie-Grant (1898). Betts (1938) also collected some specimens but they remained untraced.

Photographs

Identifiable photographs turned out to be the most easily accessible and reliable evidence in finalizing this checklist. The photographic evidence was grouped into two: those uploaded to the Macaulay Library (www.macaulaylibrary.org), and those that were not uploaded there, but onto other platforms. We also obtained photographic records from Facebook forums such as *Birdwatchers of Kerala* and *Indian Birds*. Gent (2007) also provides some photographic evidence.

Sight records with field notes

Most of the works on the ornithology of Lakshadweep, published in the last two centuries, described species sufficiently for identification, and also presented the number of birds seen. These data were found to be helpful in arriving at a decision about the veracity of such observations. Lately, the observations are mostly inclined towards just recording the name and number of the species. We tried to compare the status of most of the birds we recorded with that of those in the Maldives and the British Indian Ocean Territory, to discern any resemblances in the occurrences.

There are many records that are confusing, either because of a seemingly unusual sight record for the islands, when considering its native or usual migratory range, or due to inadequate supporting data for verifying the occurrence of a species or its identity. Most of the historical observations from the islands were created either as a checklist by the observer, or an updated one based on previous studies. In addition, there have been works that recorded the occurrence of new species on the islands.

Results

We arrived at a checklist consisting of 145 species that can be considered as possible sightings/records from Lakshadweep. But, after screening these per our criteria mentioned above, our final list of birds for Lakshadweep stands at 115 species. Of these, 56 were observed from four islands on our recent surveys. Thus, 31 species from our original list had to be left out of the final list due to inadequate documentation. We traced the evidence of 20 specimens that Hume (1876) had collected, in Sharpe (1896), Saunders & Salvin (1896), and Sharpe & Ogilvie-Grant (1898). Out of the total 83 pieces of photographic media we obtained, 56 were found in the Macaulay Library, while the remaining 27 were on other online platforms of ornithologists/birders and photographers.

Notes on species confirmed during field observations

Ruddy Shelduck *Tadorna ferruginea*

A single record from Kavaratti where Kurup & Zacharias (1995) observed a bird in captivity during 1985–1986. They said that a number of species, including the Ruddy Shelduck, were snared and pinioned by the islanders. So we can assume that they are not introduced or traded from mainland India. Although this species is widespread in the Indian Subcontinent (Grimmett et al. 2011), there are only a few records from the south-western part of India, from where it may have flown to the islands. There are no records of it from the Maldives to date. From this sole record of the species, it can be considered as a vagrant, and is thus included in the checklist.

Common Teal *Anas crecca*
The first records go back to the early twentieth century (Ellis 1924). Betts (1938) was told that they were regular winter visitors, usually seen on lagoons and mosque ponds, but he only saw a dried head. Kurup & Zacharia (1995) saw captive individuals in the islands. The species is included based on the above records.

Oriental Turtle Dove *Streptopelia orientalis*
Mathew & Ambedkar (1964) recorded a single captive bird that was 'trapped for the pot' in Agatti Island in October 1963. They were informed that it was a regular post-monsoon visitor. Lal Mohan (1989) observed them in Kalpeni and Suheli islands between January and April. Daniels (1992) considered his sightings as stragglers. There are no recent records of this species from Lakshadweep. It was observed as an irregular visitor in the Maldives (Ash & Shafeeg 1995), but a regular visitor, though scarce, to coastal Kerala (eBird 2021). We added this species to the checklist based on the above sightings.

Pied Cuckoo *Clamator jacobinus*
For the first time, Subiah (1978) recorded it from Lakshadweep. Gent (2007) also recorded it as a rare visitor to Bangaram. Based on these records we include this unmistakable species in the checklist.

White-breasted Waterhen *Amaurornis phoenicurus*
There are multiple records from different islands. Gadow & Gardiner (1903) sighted a young bird in a nest in Minicoy in July 1899. Almost after a century in 1988, Daniels (1992) saw one in Minicoy again. Though Ellis (1924) listed it as a resident, his source is unknown. Burton (1940) spotted an 'unidentified Water Rail' in Bitra in 1939 but was not sure whether it was a waterhen or not. Daniels (1992) has clearly stated that this species was not found in the archipelago other than on Minicoy, and in the nearby Maldives. In recent years it has been sighted in most of the islands such as Kavaratti, Kadamat, Kiltan, Bitra, Agatti and Amini (eBird 2020). How the founder population of this species, which is apparently less volant, first arrived on the islands can be variously hypothesised upon. Daniels (1992) was of the opinion that the Lakshadweep Islands served as a stepping-stone used by this mainland species to enter the Maldives, and evolve into a distinct race there. In this regard, whether all the islands of Lakshadweep have the mainland race is also questionable. At least in the southern atolls such as Minicoy, Suheli, etc., the presence of the widespread Maldivian race, ***A. p. maldivus*** can be suspected. We have included this easily distinguishable bird in the checklist.

White-faced Storm-petrel *Pelagodroma marina*
There are two records of this species from the Lakshadweep Islands; the first from May 1960, 18 km south-west of Minicoy Island, and then in September 1961, 330 km north-north-west of Suheli Par (Bourne 1960; Bailey & Bourne 1963; Praveen et al. 2013). Based on these records, we accept this species in the checklist.

Black-bellied Storm-petrel *Fregetta tropica*
There are two records of this species from around the islands, one was caught south-west of Minicoy in 1960, and a second record 'of three birds, 250 km west-south-west of the north island, Lakshadweep' (Bailey & Bourne 1963; van den Berg et al. 1991; Praveen et al. 2013). Based on these records, we accept this species in the checklist.

Barau's Petrel *Pterodroma baraui*
The only record of this species from Lakshadweep waters, as well as for India, was made in June 1985, as two independent records, from the Nine Degree Channel (between Kavaratti and Minicoy) by a Dutch research ship (van den Berg et al. 1991). Based on these two independent and well-documented sightings we include this species in the checklist.

Western Reef Egret *Egretta gularis*
Hume's (1876) was the first record of this species, the "blue" morph, in 1875 at Bitra. Almost after a century, Lal Mohan (1989) had multiple records from eight islands, and Santharam (eBird 2021) recorded it from Agatti and Bangaram—but neither of them mentioned the morph. However, Santharam's Agatti record could possibly be a blue morph, as his description of the sighting was as 'seen from the flight while landing'. Gent (2007) recorded them regularly with photographs, all of which are white morphs, however, it is not clear whether they are reef egrets or other white egret species. There are recent eBird (Karkarey 2017; Hirash 2019) records from Kavaratti and Kadamat respectively without any description about morph. The blue morph of this species is identifiable beyond doubt and based on these records, we include the species in the list.

Masked Booby *Sula dactylatra*
Daniels (1992) assigned a resident status to it, though he did not have any observation of his own. There are a few infrequent records from the Lakshadweep Sea and nearby Indian coasts, which number over sixty observations (Kasambe 2010; eBird 2020), which are mostly windblown individuals. This species is known to breed in the Chagos Islands (Carr 2015). Ash & Shafeeg (1995) mentioned an unconfirmed breeding status based on a juvenile from Maldives. There is a January 2019 record from the Lakshadweep Sea, 87 km north-east of Cherbaniani Reef (Beleapani Reef), without supporting data to confirm the species. Very recently we found a bird at Kavaratti, which fishermen had rescued from the sea near the island, and 'tamed'. Thus we include the species on the basis of this sighting.

Black-winged Stilt *Himantopus himantopus*
Daniels (1992) sighted the Black-winged Stilt first, in 1988. He suspected that it was a resident, but surely it was a vagrant. There were no previous records before his. A further two observations, in 2002 and 2017, were uploaded to eBird (Raman 2002; Vel 2017). It is uncommon in the Maldives (Ash & Shafeed 1995). Since there is no confusion in its identification, and based on the above records we confirm the sightings and include it in the checklist.

Kentish Plover *Charadrius alexandrinus*
First record by Hume (1876). Mathew & Ambedkar (1964) recorded ten birds at Chetlat, and Bitra. Kurup & Zacharia (1995) saw it only on Suheli Cheriyakara. Raman (2002) observed two

individuals at Kadamat with supporting notes of their features, establishing their identity beyond doubt. Gent (2007) noted them as infrequent in the Bangaram group. We include the species in the list based on the above records.

Green Sandpiper *Tringa ochropus*
The first record was made by Kurup & Zacharia (1995) at Kavaratti and Bangaram. Gent (2007) had a single sighting in Bangaram. However, there are no recent records from any of the islands. We include this species based on the above records.

Wood Sandpiper *Tringa glareola*
Kurup & Zacharia (1995) recorded it for the first time at Kavaratti and Suheli Cheriyakara. Gent (2007) noted it as infrequent at Bangaram. No recent records; we include it based on the above records.

Marsh Sandpiper *Tringa stagnatilis*
First noted by Gent (2007) at Bangaram. This and the above two sandpipers were observed in the Maldives, the Green Sandpiper being a vagrant, and the other two, uncommon (Anderson & Shimal 2020). Carr (2015) also noted the Marsh Sandpiper and Green Sandpiper as vagrants and the Wood Sandpiper as a northern winter visitor. We include this species into the checklist.

Crab Plover *Dromas ardeola*
Records from Perumal Par (Hume 1876), a pair on Bitra (Mathew & Ambedkar 1964), and ten at Suheli (Kurup & Zacharia 1995). Gent (2007) observed them occasionally on Tinnakara spit and sand bank, but not on Bangaram. Pande et al. (2007) also observed six of them on Cherbaniani. Hence, included in the checklist.

Pomarine Skua *Stercorarius pomarinus*
The first available record was made by Pocklington (RNBWS 2021) in April 1965, between Amini and Kavaratti, north-east of Pitti (10.88ºN; 72.75ºE) (. Another two records were made by Chilman (RNBWS 2021): one in December 1967 (11.83ºN; 73ºE) north of Kiltan, and the other in November 1969 (12.75°N; 72°E) north of Cherbaniani Reef (Beleapani Reef). Pande et al. (2007) sighted one in Kavaratti Island's offshore waters. In 1988 Daniels (1992) also sighted it but failed to give its location. This species, like the Arctic Skua, is a common winter visitor in the waters off the western Indian coast (Karuthedathu 2019). The geographical position at which the bird was sighted confirms its place in the checklist.

Gull-billed tern *Gelochelidon nilotica*
First reported by Santharam et al. (1996) from Agatti and Bangaram in the early 1990s. Shimal & Anderson (2020) listed it as 'rare' in the Maldives, however lacking any recent records. We include this possible vagrant to Lakshadweep in the checklist.

Shikra *Accipiter badius*
In 1988, Kurup & Zacharias's (1995) saw it first, in Kavaratti. Gent (2007) included it as an infrequent visitor in his Bangaram checklist. The Shikra has a year-round occurrence in India (Grimmett et al. 2011). Based on these records we consider the chances of occasional birds visiting some islands fairly good, and hence the species is added in the checklist.

White-bellied Sea Eagle *Haliaeetus leucogaster*
Since the first sighting by Hume (1876), in 1875 at Amini, no other observations of this species have been made in the islands. Whether it was an adult bird or not is not known; we presume it was, otherwise he would have mentioned it. He thought it was 'a chance visitor'. This must be true as no further records of it, as a regular seasonal migrant or resident of the islands, are available. White-bellied Sea Eagles inhabit the coastal stretches and near-shore islands of western India (Pande et al. 2011). They are known to exhibit regional migration usually across the coast (eBird 2021). Based on the Hume's record, which cannot be erroneous for such an unmistakable species, we retain it in the checklist.

Black Kite *Milvus migrans*
Surprisingly, this species has only been recorded from Kavaratti Island by Kurup & Zacharias (1995), who described it as a winter migrant to Kavaratti. They probably observed it several times between September and March, as they have included it in a list of birds that they met once or several times during their visit. Considering the type of food or prey available in the islands the absence of this opportunistic feeder, which is a well-known migrant as well, is 'unusual'. The same is the situation when it comes to the Brahminy Kite *Haliastur indus*, which has not been recorded from the islands. The Black Kite has no records from Maldives also. There are no at-sea records of this bird from the Lakshadweep Sea. It is possible that the Kavaratti bird was accidentally introduced, however no evidence to prove it exists. We include it in our checklist based on the Kavaratti record.

Indian Roller *Coracias benghalensis*
The historical record of this species includes Burton's (1940) from Chetlat and Bitra in November 1935. Kurup & Zacharias (1995) had observed it several times between August 1986 and July 1987 in Kavaratti. There is a May 2019 record from Agatti (eBird 2020). Ash & Shafeeg (1995) recorded it as a rare winter visitor to the Maldives. As this bird is easily identifiable, we accepted the above sightings and included the species in the checklist.

White-throated Kingfisher *Halcyon smyrnensis*
The first record from Lakshadweep is by Kurup & Zacharias (1995) from Bitra Island in March 1986. In 2017 one bird was observed in Kalpeni, and in 2018, one each in Tinnakara and Kavaratti (eBird 2020). Populations are known to exhibit partial short-distance and altitudinal migration in some parts of the world (Woodall & Kirwan 2020). These Lakshadweep records could be an instance of occasional vagrancy of these otherwise mainland residents of South Asia. There are no records from the Maldives. We include this easily distinguishable bird in the checklist based on the current records from various islands.

Common Kestrel *Falco tinnunculus*
Hume (1876), in his February 1875 survey, observed it on all the islands he visited. Later, Betts (1938) in February 1938 observed a hover of three in Amini and one in Kadamat. Kurup & Zacharias

(1995) sighted one during the winter of 1985–1986, and Prince (2011), two in February 2008 in Kavaratti. Gent (2007) noted them as frequent visitors to Bangaram. There are also recent eBird records from Bangaram (eBird 2020). It is an annual visitor in the Maldives (Ash & Shafeeg 1995). It is a regular winter visitor to Kerala, with approximately one thousand eBird (2021) records till now, though a resident population *F. t. objurgatus* also occurs there. Based on these several records we include it in the checklist.

Peregrine Falcon *Falco peregrinus*

The Peregrine Falcon is widely distributed in the Indian Subcontinent and Sri Lanka (Döttlinger & Hoffmann 1999). Since Hume's (1876) historic record from February 1875, no one else has sighted it in Lakshadweep. Hume described it as a common visitor, as the islanders were quite familiar with it, as it was present in the islands in almost every season. He saw four birds: a pair in Kavaratti, and one female each in Amini and Bangaram. In the Maldives, it is an infrequent visitor (Ash & Shafeeg 1995). Based on the historic records of Hume, which we assume to be the migratory race *F. p. calidus*, this species is added to the checklist.

Indian Pitta *Pitta brachyura*

There is only one record of this elegant bird from Lakshadweep: Santharam et al. (1996) from Kavaratti in October 1990. The Indian Pitta usually spends the non-breeding season in peninsular India and Sri Lanka (Erritzöe 2020). The records from Lakshadweep could be cases of extreme vagrancy for these small birds. Supportive to this view, Smith (1983) photographed an Indian Pitta on the decks of H.M.S. Invincible, 70 nautical miles [= 130 km] off the southern tip of India. We include this easily identifiable bird in the checklist based on the Kavaratti record.

Blyth's Reed Warbler *Acrocephalus dumetorum*

A widespread winter visitor in the Indian Subcontinent (Ali & Ripley 1987). Recorded for the first time in Lakshadweep by Santharam et al. (1996) from Kavaratti in February 1991, where they sighted and heard three birds. In 2017 there were sightings of one or two birds from various islands (eBird 2021). We assume that most observers probably overlooked this migratory species, although a few might be present on the islands. We accept this species based on the available records from the islands.

Notes on unconfirmed species

These are species that have been reported in various published works, or online forums, but their occurrence is not beyond doubt.

Anatidae

From Bangaram alone, Gent (2007) recorded nine species of *Anas* and *Aythya* ducks, some of them sighted only once and others infrequently. Ash & Shafeeg (1995) list seven duck species from the Maldives from which five are considered infrequent or vagrant, while the Northern Shoveler *Spatula clypeata* and Garganey *Anas querquedula* were noted as regular visitors. We saw a flock of five Garganeys on Chetlat Lagoon in September 2019. From this, we can infer that some migratory ducks stray onto the islands from the Indian mainland, mostly as vagrants.

Common Pochard *Aythya ferina*

Gent (2007) found it rare in Bangaram . There are no sightings from the Maldives. eBird (2021) data show that there are only a few records from the nearby western coast of India. There have been only three records from southwards of Goa on the western flank of the Western Ghats, two from Karnataka, and one from northern Kerala (eBird 2021). As the Bangaram record of the species seems doubtful in the absence of enough data, we have eliminated it from the final list.

Baer's Pochard *Aythya baeri*

Gent (2007) saw a flock of six in 1996 at Bangaram, but failed to provide supporting evidence for his identification. So, when considering its actual breeding and migrating range, which is confined to parts of East Asia, and with a critically endangered population (Carboneras & Kirwan 2020), this sighting from Bangaram is doubtful and not accepted here.

Ferruginous Duck *Aythya nyroca*

Daniels (1992) did not provide details of his 1988 sighting. Gent (2007) noted it as infrequent in Bangaram. In the Maldives, it was considered a vagrant (Ash & Shafeeg 1995). As none of these sightings have a strong provenance, this species is excluded from the checklist.

Northern Shoveler *Spatula clypeata*

This species is another rare visitor to Bangaram (Gent 2007). No previous or further sightings exist from Lakshadweep. Ash & Shafeeg (1995) reported it as a regular winter visitor to the Maldives. There are reports of sightings in 2017 from the Maldives (eBird 2021). Although Gent's record from Bangaram is a possibility, lack of supportive evidence places the species out of the checklist.

Gadwall *Mareca strepera*

A rare visitor to Bangaram (Gent 2007). There are no sightings from the Maldives (Ash & Shafeeg 1995). From the south-western coastal stretches of India there were only a few sightings (eBird 2021). We think the Bangaram record is most probably an error, thus not included in the list.

Mallard *Anas platyrhynchos*

Gent (2007) lists a single record of this species from Bangaram. No previous, or later, observations exist from the islands. No records exist from the Maldives (Ash & Shafeeg 1995). In fact, in peninsular India, south of River Godavari, it has less than ten sight records on eBird (2021). We have not included this species due to insufficient data of occurrence.

Northern Pintail *Anas acuta*

Gent's 2007) record from Bangaram is the only sighting from Lakshadweep, but, like all his other duck observations, without any supporting evidence. In the Maldives too, it is a rare visitor with only three or four records (Ash & Shafeeg 1995). Recent sightings of this species from Maldives, in 2017, are reported in eBird (2021). For want of definitive evidence, we excluded this species also from the list.

Lesser Flamingo *Phoeniconaias minor*
There is only one 2007 record from Kavaratii (eBird, 2021). The observer saw it flying overhead, giving no details to distinguish it from a Greater Flamingo *P. roseus*. Thus we have kept the species out of this checklist.

Indian House Swift *Apus affinis*
Only a single anonymous record from 1991 listed in Kurup & Zacharias (1995), lacking evidence to warrant inclusion in the checklist.

Plaintive Cuckoo *Cacomantis merulinus*
Though Santharam et al. (1996) listed this species from Kavaratti, it was clarified that the species was Grey-bellied Cuckoo, which was at that point treated as a subspecies of Plaintive Cuckoo. Hence, this species may be deleted from Lakshadweep checklist.

Wedge-tailed Shearwater *Ardenna pacifica*
Bourne (1984) reported sighting 51 Wedge-tailed Shearwaters at 7.55°N, 75.53°E off Cape Comorin in July 1973 (i.e., 285 km from Minicoy). Two other records lack evidence to confirm as this species (Praveen et al. 2013). We declined this species due to the inconclusiveness of the sightings, including those in Bourne (1984).

Intermediate Egret *Ardea intermedia*
Th Gent (2007) noted them frequently on Bangaram Island, but did not provide supporting photographs. A few recent records have been submitted to eBird, from Agatti and Bangaram, without any identification notes. Because this species is very similar to the white morph of the Western Reef Egret, whose occurrence could be more possible in these oceanic regions, the existing records of Intermediate Egret are doubtful and hence not included in the checklist.

Great Frigatebird *Fregata minor*
This species is a widespread breeder in a number of islands in the Western and Eastern Indian Ocean (James 2004). Kurup & Zacharias (1995) included it in their checklist based on an anonymous sighting from 1991. There are no other records from the islands or from their immediate waters. It has been sighted multiple times across the western coast of India (eBird 2021). A satellite telemetry study found that one Great Frigatebird roosted in Maldives for a few months (Weimerskirch 2006). Different species of frigatebirds are difficult to identify, and the records in eBird (2021) do show that they are found occasionally in this region. We saw a Lesser Frigatebird *F. ariel* in captivity at Kavaratti during our visit. Since the identification of frigatebirds is not easy, single reports are not independently verifiable for accuracy. So we exclude this bird from this checklist.

Red-footed Booby *Sula sula*
Hume (1876) wrote that he saw a flock near Perumal Par, but not able to identify them properly, however, he was sure enough to rule them out as Masked Boobies *S. dactylatra*. Praveen et al. (2013) did not include this record as valid though there were possibilities of them occurring in these regions because of their breeding colonies in the nearby Chagos Islands. There are no further records of this species from the Islands to date. However, Daniels (1992) included it as a resident in his checklist, probably because of its breeding in the neighbouring Maldives, and Chagos groups. Thus, due to the lack of confirmed sightings, this species is not included in the checklist.

Great Cormorant *Phalacrocorax carbo*
The only record of this bird on the island is by Santharam et al. (1996). They observed two birds flying over Kavaratti Island in October 1991. They could not confirm whether it was a Great Cormorant or not, as the sighting was brief, although they were able to note the white throat, hooked bill, and overall dark plumage. There are no other records from the islands. We found this sighting of the species not conclusive.

Pied Avocet *Recurvirostra avosetta*
There is only a vague mention about the 'avocets', among other groups of birds seen by Burton (1940) at Bitra. From his narrative it was clear that birds are just another topic to mention along with all other things he observed in the islands. There are no other records to date. Thus, it is not included in the checklist.

Great Knot *Calidris tenuirostris*
This species is known to winter in southern India (Van Gils et al. 2020). However, no observations have been reported from the Lakshadweep Islands since Hume (1876: 433) in 1875 at Bitra. He saw 'a pair of thick billed Sandpipers (*T. crassirostris*)' but could not get any specimens as they flew away. There are no records of this species from the Maldives (Ash & Shafeeg 1995). Ali & Ripley (1987) included Lakshadweep in its wintering range, probably based on the sole sighting by Hume. We exclude this species in the absence of substantial evidence.

Arctic Skua *Stercorarius parasiticus*
Daniels (1992) included it as a suspected migrant in his checklist, but without the exact location of the sighting. This species has the most records among the wintering jaegers in the Indian seas, which occur between the waters of Lakshadweep and the western Indian coast (Karuthedathu 2019; eBird 2021). However, there are no confirmed sightings of the species from the immediate waters of any of the islands of the Lakshadweep group. Thus the species is not included in this checklist.

South Polar Skua *Stercorarius maccormicki*
Praveen et al. (2013) discussed the records of *Catharacta* skuas in South Asia, dealing with seven records from India and the Indian seas. One of those was by Daniels (1992), but without any details of confirmation and hence not considered definitive here.

Common Barn Owl *Tyto alba*
This species was recently introduced to tackle the rat menace in the islands, where coconut is a major commercial crop. Three pairs of adult Barn Owls were introduced to Kavaratti in 2019 (Rajkumar et al. 2019). There are sightings recorded in eBird (2021) of these introduced pairs. Yet, whether they have established a viable population there is not clear. In order to add a species to the checklist of a region, the presence of a viable population of the introduced species is set as a criterion (Praveen

et al. 2019). Thus, in the absence of such data, we opt to keep this species out of the checklist.

Brown Wood Owl *Strix leptogrammica*

It was introduced to check the rat infestation of the coconut trees in the nineteenth century (Hume 1876). He noted a pair at Bitra. No other sightings thereafter. As it failed to establish a population in the islands we excluded it from the checklist.

House Sparrow *Passer domesticus*

This species has only a single sighting of two birds from Bangaram Island in 2018 (eBird, 2021). Islanders (*pers. comm*.) have not seen a House Sparrow there or in the nearby well-populated island of Agatti. Populations show varying degrees of seasonal movements in which juveniles tend to exhibit autumnal dispersal (Lowther & Cink 2020). However, cases of migration across the ocean have not been reported hitherto. Sighting from Bangaram also rules out the chances of a purposeful introduction as it could have been more possibly done in other populated islands. Gent (2007) made around ten visits to Bangaram, but did not spot the House Sparrow there. Anderson & Baldock (2001) mentioned a small feral population in Male till 1998, however, their origin is unknown. Then, in recent years there are multiple records from Hulhumale, Maldives (eBird 2021). We are doubtful about the record of this species in Lakshadweep and hence have not included it in the checklist.

Grey Wagtail *Montacilla cinerea*

Only a single record, by Gent (2007) from Bangaram, however not substantiated and, hence, excluded from the checklist.

Citrine Wagtail *Montacilla citreola*

Only a single record, by Gent (2007) from Bangaram. We exclude it from the checklist as it lacks enough evidence of the occurrence.

Discussion

Resident and migrant birds

It is explicit that these Islands possess a meager diversity and abundance of permanent resident birds. Even the scanty resident land birds are not distributed in all the islands as is the case with Indian White-eye, House Crow, Asian Koel, White-breasted Waterhen, or Rock Pigeon. The immigration of these species, except the Indian White-eye, appears to solely depend on colonizing humans, as they are closely associated with the latter. We have only limited information about the past vegetation of these islands. When humans arrived, coconut became the dominant as it was commercially exploited. The lack of habitat diversity in terms of flora, geography, and topography, along with very poor terrestrial faunal diversity, which would form a prey base, could be one of the constraints for the birds to colonize and flourish here. Fresh water is a major limiting factor for many of the common terrestrial birds from the mainland. Except for a freshwater lake in Bangaram, not even a single natural stream is present here. This exceptional feature made Bangaram and the surrounding regions an abode for the most number of birds in the entire archipelago. Gent (2007) spotted a number of species of birds in Bangaram and the nearby three islets of Thinakara, Parli I, and Parli II.

All the inhabited islands of this group have been completely modified by humans. Virtually no large terrestrial fauna is present here that would have, otherwise, undergone a course of insular evolution over time. That is because the land area is too small and the pressure of the increasing human population has altered the topography of the islands. In such circumstances, the chances of any colonizing species to acquire adaptations and evolve over time are almost nil. Here the avian diversity consisted mainly of species migrating from Eurasia and a few from the Indian Subcontinent. Among them, waders can be seen continuously, though in negligible numbers, throughout the post-monsoon months up to the end of the summer season. Some passerines recorded here are clearly passage migrants. The status of resident birds, like the House Crow, often changes, when compared with previous studies (Daniels 1992), in that they become locally extinct on some islands only to be reintroduced or immigrated later. Daniels (1992) assumed the total number of resident land birds and inland water birds to be about 15. However, based on our current knowledge, this number is less than ten.

A recent review of the birds of the Maldives (Anderson & Shimal 2020) listed 203 species, the majority of which are migrants either following the Central Asian Flyway or East Asia–East Africa Flyway (across the Arabian Sea). Lakshadweep too serves as either a halting station, or the destination of the migrants taking these routes, which is explicit from a number of species commonly recorded from both of these atoll groups. With respect to the regular breeders, the Maldives is also impoverished like Lakshadweep, with just about ten species. However, there is some apparent disparity in the species breeding in the two regions. For example, the two important pelagic terns—Sooty Tern and Brown Noddy—which breed regularly in Lakshadweep, have just one or few breeding records in the Maldives. Likewise, there are differences in the breeding land birds also.

With respect to seabirds, their only remaining breeding ground seems to be 'Pakshipitti', a protected islet. Four species of oceanic terns breed on this tiny sandbar. Analysis of historical observations made it clear that species such as Bridled Terns ceased to breed in the Lakshadweep. Pande et al. (2007) reported that Cherbaniani hosted breeding colonies of some tern species a decade ago. However, an analysis of satellite pictures from recent years revealed that Cherbaniani now lacks a sandbar that is well above the tidal line at least throughout the year that can reliably be used by the birds for breeding. Over centuries wind and water have shaped the islands' fauna, and human colonizers severely modified the environment to their requirements. Rising sea levels wiped off sandbars and islets, obliterating breeding seabird colonies. Human inhabitants poached eggs and juveniles, and disturbed breeding colonies when they collected guano, directly contributing to the decline of populations, and abandonment of breeding sites. And finally, the inadvertent introduction of domestic rats early in the periods of human settlements, might have devastated breeding bird colonies on inhabited islands of Lakshadweep. Stringent management measures are the need of the hour to protect the remaining vulnerable habitat for oceanic terns in this Indian Territory.

White-eyes (Zosteropidae): *A subject for biogeography studies in Lakshadweep*

A species of particular importance is the Indian White-eye (earlier Oriental White-eye) that has been observed and is known to breed in some of the islands of Lakshadweep (Hume 1876; Betts 1938; eBird 2021). Biogeographical and phylogenetic studies have addressed the colonization by this species of various Indo-Pacific islands (O'Connell et al. 2019; Moyle et al. 2009; Wickramasinghe et al. 2017; Martins et al. 2020). The species occurring in Lakshadweep is *Z. p. egregius* (Mees 1957), but Mees had noted the very long tails, like that of *Z. p. nilgiriensis*, in the four specimens he studied. Still, he retained them as *Z. p. egregius*, since a large number of specimens would have to be examined to clarify whether that difference is consistent in order to confirm the identity of a separate race in Lakshadweep. It is important to study the degree of intra-archipelago variation in White-eyes on the various islands of Lakshadweep, which ought to be higher owing to their reduced dispersal ability, a trait acquired by insular bird species due to reduced predation pressure from raptors and mammals (Wright et al. 2016). Daniels (1992) opined that they had colonized the islands after humans, but we think that they arrived before humans and later got adapted to the modified habitats. However, it is intriguing that they are not found in Minicoy, Maldives, and Chagos, which points towards the fact that they are yet to colonize the more southern islands of the Lakshadweep-Maldives-Chagos (hereinafter, LMC) region, rather than treating their Lakshadweep population as relictual in the LMC chain.

Egrets, Herons (Ardeidae): *Their distribution and local movements*

It is interesting to look at the occurrence of certain species of Ardeidae across the LMC chain. The Cattle Egret *Bubulcus ibis* had only one record from Lakshadweep prior to the 1980s (Daniels 1992). Since then there are multiple records from various islands, but its breeding status from there is unknown. In the Maldives, the first sighting was in the 1980s and then it was noted as a regular visitor and possible breeder (Ash & Shafeeg 1995). In Chagos, the first record goes back to 1885 and now they breed (after the introduction of a group from Seychelles) in Diego Garcia (Carr 2015). In Kavaratti, a bird in breeding plumage was photographed in April 2018 (eBird 2021). The latest sighting (in October 2020) of a flock of Cattle Egrets on Kavaratti (*pers. comm*.) points to their arrival, probably from the south across the atolls rather than from the mainland. This needs to be investigated to detect the inter-archipelago movements of other related species like the Grey Heron *Ardea cinerea* and the Purple Heron *A. purpurea*. The Grey Heron is a vagrant (Carr 2015) to Chagos, but a common resident in the Maldives (Ash & Shafeeg 1995). In Lakshadweep, it was noted as breeding in Viringilli Islet (Minicoy), Suheli, Parli, and possibly Agatti (Kurup & Zacharias 1995). However, its recent status in Lakshadweep is obscure. We met a tamed bird at Kavaratti, probably taken from Suheli by the islanders. The Purple Heron is rarer in all these islands than other species of Ardeidae. In Chagos it is a vagrant (Carr 2015); a probable frequent visitor in Maldives (Ash & Shafeeg 1995), while only five records exist from Lakshadweep (Kurup & Zacharias 1995; eBird 2021). The Indian Pond Heron *Ardeola grayii* has been recorded in Lakshadweep post Hume (1876), but is not known to breed here, though there are sightings of birds in breeding plumage in 1991 (eBird, 2021). In Chagos, Carr (2015) identified it as a northern winter visitor. In addition to the records of vagrant *grayii* (Ash & Shafeeg 1995), the southern atolls of the Maldives support a population of the resident race *phillipsi*. Although some authors have not recognised it (Anderson & Shimal 2020), Rasmussen & Anderton (2012) wrote that birds (*A. grayii*) from the mainland move to Lakshadweep during winter.

As for all the Ardeidae species mentioned above, we can see that their breeding status in Lakshadweep needs further inquiries to delineate the patterns of their movement in the LMC region. The remaining possible breeding locations for them in Lakshadweep would be the uninhabited vegetated islands and islets such as the Bangaram group and Suheli. No one has recorded, hitherto, their breeding in any inhabited islands of Lakshadweep, which could be due to the complete absence of such events rather than a case of oversight.

Raptors: Migration, breeding, and introduction

The occurrence of raptors in Lakshadweep is more interesting than any other group. Their sightings have become infrequent over the years. Before 1950, there were records of two species of harriers (*Circus* sp.), and the Peregrine Falcon from different islands, and a White-bellied Sea Eagle from Amini (Kurup & Zacharias 1995). Ospreys were also recorded infrequently as were Brahminy Kite, Black Kite, and Shikra (Kurup & Zacharias 1995; eBird 2021). Now, it seems that Black-winged Kite *Elanus caeruleus* and Common Kestrel are the main raptors, the former more in number, visiting the islands in winter. In June this year, a pair of Black-winged Kites bred successfully on Kavaratti Island (Yasmin & Aju 2021). This is the first recorded instance of a raptor breeding in the Lakshadweep archipelago. For Black-winged Kites, domestic rats could be easy prey in these islands, as there are no observations of these small raptors, including Common Kestrel, attempting to fish. Common Kestrel can be considered a supertramp species, adaptable to various habitats and food (Orta et al. 2020). In Lakshadweep, it can be presumed that their major prey resource is the domestic rat and the *Calotes* sp., lizard. On the other hand, the occasionally visiting Osprey feeds regularly on fishes from lagoons in the islands; we noted it hovering twice over the lagoon at Chetlat. There exist a few records of Ospreys resorting to offshore locations for hunting (Bierregaard et al. 2020). Those species that scavenge on fishery resources, such as Black Kite and Brahminy Kite, as is the case on the mainland, are surprisingly absent in Lakshadweep as residents. The absence of a resident population of these two species in the islands can be directly correlated to the small island area which is a prominent factor in determining the establishment of a population in islands (McArthur & Wilson 1963). The absence of such natural predators, which could efficiently check the population of domestic rats in the islands, resulted in a serious problem over the years. The severe damage caused by the rats to coconut palms, and the decline in their productivity and yield, lead to the introduction of a few pairs of Barn Owls from Kerala for tackling the menace (Rajkumar et al. 2019).

Seabirds: Breeders and migrants

Like the neighbouring low-lying islands in the western Indian

Ocean, some atolls or islets of Lakshadweep are a hotspot for some of the common pantropical oceanic terns (Sternidae). However, it lacks a breeding population of other pelagics like frigatebirds, shearwaters, tropicbirds, etc. It can be assumed that the very limited land area is a major factor that hinders the species richness and abundance in Lakshadweep of both seabirds and terrestrial ones. However, the neighbouring Maldives, and the British Indian Ocean Territory further southwards are known to support breeding populations of some important seabirds from the Procellariidae, Fregatidae, and Phaethontidae (Phillips 1964; Carr et al. 2020). This difference is presumably due to a large number of uninhabited islets with varying degrees and types of natural vegetation present in these archipelagos. In the case of Lakshadweep, now there is only one islet (Pitti), and the large Cherbaniani Reef with small sandbars, are known to support the breeding colonies of terns (Pande et al. 2007. The large atoll of Suheli, with two uninhabited islands, is a possible candidate for a breeding colony, but, other than the evidence provided by fishermen, no observations were carried out in Suheli after Kurup & Zacharias (1995) who learned from the fisherfolk about the breeding of terns a few years before their visit to Suheli.

This region could be considered as the dispersal or nomadic range of the large pelagic birds that breed in the Western Indian Ocean islands south of the equator. However, we hardly have any regular observation data from the islands to substantiate this. The waters around the islands are noted for their large primary, and secondary productivity facilitated by the influence of marine topography and oceanic circulation patterns (Nair et al. 1986). Despite the overall poor productivity of the tropical Indian Ocean, the existence of breeding colonies around Lakshadweep might be attributed to this exceptional productivity, where the birds can avail the extravagant marine resources. But, the limited land area in the islands could be the reason that only around four species of terns are able to breed here (Pande et al. 2007) compared to the nine species of terns breeding in the British Indian Ocean Territory (Carr et al. 2020).

Passage migrants

It is obvious from the various bird observations over the years that the small islands of Lakshadweep serve as temporary staging grounds for a handful of migrants from the northern higher latitudes. All of the passerines included in this checklist exploit the limited terrestrial resources of the islands during their onward journey to the islands in the south-western Indian Ocean, and return journeys to the northern breeding grounds. Although their number seems substantial, per the current observation data, they comprise a variety of groups such as wagtails, swallows, swifts, rollers, shrikes, flycatchers, bee-eaters, pipits, warblers, etc. Protecting the available shrub and thicket patches, which are the prime habitat used by most of these passage migrants, is vital for these populations of birds. The same situation might exist with respect to the migrating shorebirds that are utilizing the narrow shorelines of the islands seasonally.

Conclusion

A checklist of the birds of Lakshadweep Islands, comprising 145 possible species was pared down to 115 definite species based on various evidences such as specimens, photographs, and field descriptions. These islands are important in terms of valuable habitats, though small, that serve as a halting site for migratory species, and breeding sites for pelagic birds. They often host stragglers or nomadic birds, and exhausted migrants. A definitive checklist will aid in forming management and conservation plans for vulnerable ecosystems in these small atolls, and their dependent species.

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Table. 1. Checklist of the birds of Lakshadweep. NHM: Natural History Museum (20 specimens); ML: Macaulay Library (Photographs of 56 species). There are 27 photographs collected from various other sources. 26 species are included based on substantial observational evidence. Total eBird records are 84.

No	Species	NHM	ML	Other media	Observations	eBird	Remarks
		20	56	27	26	84	
1	Ruddy Shelduck *Tadorna ferruginea*				X		
2	Garganey *Spatula querquedula*		X			X	
3	Common Teal *Anas crecca*				X		
4	Rock Pigeon *Columba livia*		X			X	
5	Oriental Turtle Dove *Streptopelia orientalis*				X		
6	Red-billed Tropicbird *Phaethon aethereus*			X			Bijoy (2019)
7	White-tailed Tropicbird *Phaethon lepturus*		X			X	
8	European Nightjar *Caprimulgus europaeus*			X			Joshua (2012a)
9	Common Swift *Apus apus*		X			X	
10	Pied Cuckoo *Clamator jacobinus*				X		
11	Asian Koel *Eudynamys scolopaceus*			X		X	Gent (2007); Pillai (2016a)
12	Grey-bellied Cuckoo *Cacomantis passerinus*		X			X	

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No	Species	NHM	ML	Other media	Observations	eBird	Remarks
		20	56	27	26	84	
13	Common Cuckoo *Cuculus canorus*			X		X	Vel (2018)
14	Baillon's Crake *Zapornia pusilla*			X		X	Gent (2007); Manoj (2012a)
15	White-breasted Waterhen *Amaurornis phoenicurus*				X	X	
16	Watercock *Gallicrex cinerea*		X			X	
17	Common Coot *Fulica atra*		X			X	
18	Wilson's Storm-petrel *Oceanites oceanicus*		X			X	
19	White-faced Storm-petrel *Pelagodroma marina*				X	X	
20	Black-bellied Storm-petrel *Fregetta tropica*				X	X	
21	Swinhoe's Storm-petrel *Hydrobates monorhis*		X			X	
22	Barau's Petrel *Pterodroma baraui*				X		
23	Flesh-footed Shearwater *Ardenna carneipes*		X			X	
24	Jouanin's Petrel *Bulweria fallax*		X			X	
25	Eurasian Bittern *Botaurus stellaris*			X			Gent (2007); Pers comm. Photo verified
26	Yellow Bittern *Ixobrychus sinensis*			X		X	Gent (2007); Manoj (2012b)
27	Cinnamon Bittern *Ixobrychus cinnamomeus*			X		X	Gent (2007)
28	Black Bittern *Ixobrychus flavicollis*			X			Gent (2007)
29	Black-crowned Night Heron *Nycticorax nycticorax*			X			Gent (2007)
30	Striated Heron *Butorides striata*	X					
31	Indian Pond Heron *Ardeola grayii*	X	X			X	
32	Cattle Egret *Bubulcus ibis*		X			X	
33	Grey Heron *Ardea cinerea*		X			X	
34	Purple Heron *Ardea purpurea*		X			X	
35	Great Egret *Ardea alba*			X		X	Gent (2007)
36	Little Egret Egretta garzetta		X			X	
37	Western Reef Egret *Egretta gularis*				X	X	
38	Glossy Ibis *Plegadis falcinellus*		X			X	
39	Lesser Frigatebird *Fregata ariel*		X			X	
40	Brown Booby *Sula leucogaster*	X					
41	Masked Booby *Sula dactylatra*				X	X	
42	Black-winged Stilt *Himantopus himantopus*				X	X	
43	Grey Plover *Pluvialis squatarola*		X			X	
44	Pacific Golden Plover *Pluvialis fulva*	X	X			X	
45	Kentish Plover *Charadrius alexandrinus*				X	X	
46	Lesser Sand Plover *Charadrius mongolus*	X	X			X	
47	Greater Sand Plover *Charadrius leschenaultii*	X	X			X	
48	Caspian Plover *Charadrius asiaticus*		X			X	
49	Whimbrel *Numenius phaeopus*	X	X			X	
50	Eurasian Curlew *Numenius arquata*	X				X	
51	Bar-tailed Godwit *Limosa lapponica*		X			X	
52	Black-tailed Godwit *Limosa limosa*			X			Kurup & Zacharias (1994)
53	Ruddy Turnstone *Arenaria interpres*	X	X			X	
54	Curlew Sandpiper *Calidris ferruginea*		X			X	
55	Sanderling *Calidris alba*	X	X			X	
56	Little Stint *Calidris minuta*		X			X	

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No	Species	NHM	ML	Other media	Observations	eBird	Remarks
		20	56	27	26	84	
57	Common Snipe *Gallinago gallinago*			X			Fazeed (2020)
58	Terek Sandpiper *Xenus cinereus*			X		X	Gent (2007)
59	Common Sandpiper *Actitis hypoleucos*	X	X			X	
60	Green sandpiper *Tringa ochropus*				X		
61	Common Greenshank *Tringa nebularia*	X	X			X	
62	Common Redshank *Tringa totanus*			X		X	Gent (2007)
63	Wood Sandpiper *Tringa glareola*				X		
64	Marsh Sandpiper *Tringa stagnatilis*				X		
65	Crab-plover *Dromas ardeola*				X		
66	Collared Pratincole *Glareola pratincola*			X		X	Pers. comm. Photograph verified.
67	Oriental Pratincole *Glareola maldivarum*		X			X	
68	Pomarine Skua *Stercorarius pomarinus*				X		
69	Brown Noddy *Anous stolidus*	X	X			X	
70	Black Noddy *Anous minutus*	X				x	
71	Sooty Tern *Onychoprion fuscatus*	X	X			X	
72	Bridled Tern *Onychoprion anaethetus*	X	X			X	
73	Little Tern *Sternula albifrons*			X		X	Bijoy (2017a)
74	Saunders's Tern *Sternula saundersi*	X	X			X	
75	Common Tern *Sterna hirundo*			X		X	Bijoy (2017b)
76	Gull-billed Tern *Gelochelidon nilotica*				X		
77	White-cheeked Tern *Sterna repressa*	X				X	
78	Lesser Crested Tern *Thalasseus bengalensis*	X	X			X	
79	Greater Crested Tern *Thalasseus bergii*	X	X			X	
80	Osprey *Pandion haliaetus*		X			X	
81	Black-winged Kite *Elanus caeruleus*		X			X	
82	Oriental Honey Buzzard *Pernis ptilorhynchus*			X			Pers. comm. Photo verified.
83	Shikra *Accipiter badius*				X		
84	White-bellied Sea Eagle *Haliaeetus leucogaster*				X		
85	Brahminy Kite *Haliastur indus*			X		X	Yasmin (2020a)
86	Black Kite *Milvus migrans*				X		
87	Common Hoopoe *Upupa epops*			X		X	Pers. comm. Photo verified.
88	European Bee-eater *Merops apiaster*		X			X	
89	Indian Roller *Coracias benghalensis*				X		
90	European Roller *Coracias garrulus*		X			X	
91	Common Kingfisher *Alcedo atthis*			X			Gent (2007)
92	White-throated Kingfisher *Halcyon smyrnensis*				X		
93	Common Kestrel *Falco tinnunculus*				X	X	
94	Peregrine Falcon *Falco peregrinus*				X		
95	Rose-ringed Parakeet *Psittacula krameri*			X		X	Pillai (2016b)
96	Indian Pitta *Pitta brachyura*				X		
97	Indian Golden Oriole *Oriolus kundoo*			X			Joshua (2012b)
98	Ashy Drongo *Dicrurus leucophaeus*		X			X	
99	Brown Shrike *Lanius cristatus*			X		X	Krishnan (2017a)
100	House Crow *Corvus splendens*		X			X	

Table. 1. Checklist of the birds of Lakshadweep. NHM: Natural History Museum (20 specimens); ML: Macaulay Library (Photographs of 56 species). There are 27 photographs collected from various other sources. 26 species are included based on substantial observational evidence. Total eBird records are 84.

No	Species	NHM	ML	Other media	Observations	eBird	Remarks
		20	56	27	26	84	
101	Tree Pipit *Anthus trivialis*		X			X	
102	Paddyfield Pipit *Anthus rufulus*			X		X	Yasmin (2020b)
103	Forest Wagtail *Dendronanthus indicus*		X			X	
104	Western Yellow Wagtail *Motacilla flava*		X			X	
105	White Wagtail *Motacilla alba*			X			Krishnan (2017b)
106	Black-headed Bunting *Emberiza melanocephala*		X			X	
107	Sykes's Short-toed Lark *Calandrella dukhunensis*		X			X	
108	Blyth's Reed Warbler *Acrocephalus dumetorum*				X	X	
109	Barn Swallow *Hirundo rustica*		X			X	
110	Sand Martin *Riparia riparia*		X			X	
111	Greenish Leaf Warbler *Phylloscopus trochiloides*		X			X	
112	Oriental White-eye *Zosterops palpebrosus*		X			X	
113	Rosy Starling *Pastor roseus*		X			X	
114	Asian Brown Flycatcher *Muscicapa dauurica*		X			X	
115	Pied Bushchat *Saxicola caprata*		X			X	

Importance of tiger corridors in conservation of vultures: A case study from the Bandhavgarh–Sanjay Corridor, Madhya Pradesh, India, with new nesting sites

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In the early 1980s, vultures were fairly common and widespread throughout the Indian Subcontinent. An abundant availability of feeding sources, in the form of livestock carcasses, was one of the major reasons for their stable and abundant population. Whilst vulture populations were able to exploit this food source, human society benefited from the rapid and hygienic removal of carcasses (Ali & Ripley 1987). A rapid decline in vulture populations from the Indian Subcontinent was reported over the past two decades (Prakash et al. 2003; Prakash et al. 2019). The populations of White-rumped Vulture *Gyps bengalensis* and Indian Vulture *G. indicus* declined by more than 92% between 1991 and 2000 (Prakash et al. 2003). Several studies remarked that the crucial reason for the decline was the use of the veterinary drug Diclofenac Sodium, a Non-Steroidal Anti Inflammatory Drug (NSAID) (Green et al. 2004; Prakash et al. 2008; Galligan et al. 2020) used to treat cattle, as well as other reasons including food shortages, interspecies competition, poisoning ,and habitat loss (Safford et al. 2019).

The climate, topography and forests of central India offer an excellent habitat for four resident vulture species i.e., White-rumped Vulture, Indian Vulture, Red-headed Vulture *Sarcogyps calvus*, and Egyptian Vulture *Neophron percnopterus*, and also attracts three migratory vulture species: Griffon Vulture *G. fulvus*, Himalayan Vulture *G. himalayensis*, and Cinereous Vulture *Aegypius monachus*. The Madhya Pradesh Forest Department has been conducting state-wide surveys, since 2016, to estimate the vulture populations in summer and winter . Between 2016 and 2019, the population has increased 12% (Ghai 2019).

The forested areas of Shahdol District connects three protected areas: Bandhavgarh Tiger Reserve and Sanjay Tiger Reserve in Madhya Pradesh, and Guru Ghasi Das National Park in Chhattisgarh. The corridor is spread over an area about 2,000