

AVIFAUNA OF SON TRA PENINSULA: RECENT ORNITHOLOGICAL SURVEYS WITH NOTABLE MIGRATORY BIRD RECORDS

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Abstract - The Son Tra Peninsula supports a rich avifauna, particularly migratory birds. However, few in-depth studies have been conducted in the area. Between 2016 and 2018, a series of ornithological surveys were conducted across 14 sites using playback, mist-netting, and opportunistic observations along existing roads and transects. A total of 215 bird species were recorded, including 131 resident species, 11 passage migrants, 64 winter visitors, four vagrants, and five breeding visitors. Notably, 105 species were new records for the peninsula, raising the up-to-date checklist of birds to 256 species. The surveys also provided updated data on five globally threatened species and three species with recently extended ranges in Central Vietnam, along with notes on unconfirmed birds and occurrences. There was no robust evidence for the existence of Germain's Peacock-Pheasant (*Polyplectron germaini*), which was last recorded two decades ago without specific locality information.

Key words - Son Tra Peninsula; avifauna; migratory bird; Germain's Peacock-Pheasant

1. Introduction

Located in the northeast of Da Nang City, the Son Tra Peninsula (STP) is an isolated mountain block, with a length of 13 km, and about 5 km at the widest part. The STP is a part of the Greater Annamites Ecoregion, a globally important region with general biodiversity and a well-known bird hotspot [1], [2]. The peninsula occupies part of a unique biogeographic transition zone between northern and southern Vietnam. In 1977, most of the forest area of the STP was designated as a Special-use Forest, the Son Tra Nature Reserve. Previous bird surveys indicate the relatively high diversity and abundance of avifauna in the STP, with at least 161 species recorded [3].

Even though the STP is an important area for biodiversity, its avifauna is still poorly known. Historical ornithological studies can be traced back to the 1990s, with the initial result of an avifauna report published in 1997 [4]. Several bird surveys conducted in 2013 - 2014 reported many new national and regional records, including migratory birds; notable for these surveys was a new country record for Vietnam in 2017, the Yellow-throated Bunting (*Emberiza elegans*) [5]. Despite these efforts, no recent thorough bird survey has been carried out to provide

comprehensive information on the avifauna of the STP, especially for threatened and migratory birds.

This paper aims to provide an overview of the species diversity and distribution of birds in the STP based on intensive surveys conducted over a three-year period from 2016 to 2018, supplemented by opportunistic observation data on birds from our birdwatching group from 2013 to 2020 periods. We also discuss the status and distribution of threatened and migratory birds, as well as species of doubtful occurrences.

2. Materials and Methods

2.1. Study areas

We conducted bird surveys at 14 sites in STP. Surveys at 13 of these sites were carried out during both the winter and summer seasons from 2016 to 2018. An additional site (site 14) was surveyed for 2 to 4 days in October-December and March of 2017 and 2018 (Table 1, Figure 1). The study area covers approximately 4,000 ha, with elevations ranging from 5 m to 696 m (Oc Cao - the highest peak of STP). The climate in this area is characterized by dry and hot summers from March to August, and mild and rainy winters from September to January. The land cover is divided into seven types, dominated by degraded evergreen broadleaf forests and regenerating evergreen broadleaf forests [6].

2.2. Avian surveys

At each site, we conducted four field surveys yearly, averaging 10 days per field trip, divided into two field trips per season. Bird surveys were primarily carried out using opportunistic observations along existing roads and transects across various elevations and habitat types through daylight, beginning from dawn (6:00) and continuing until dusk (18:00). Night surveys focusing on nocturnal birds were carried out from 19:00 to 22:30 at each site and along existing roads. To investigate understory birds, we used three mist-nets measuring 2.6 m × 6 m at each site. For all bird records, we documented the number of individuals, habitat, altitude, date, sex, and age where possible. Birds were identified visually using binoculars and by their calls. The birds were identified

based on [7 - 10]. Taxonomy and nomenclature followed [9], [10]. The distribution ranges of bird species within Vietnam were guided by [9], [10]. The occurrence status is

categorized into five types: resident, winter visitor, passage migrant, vagrant, and breeding visitor, with definitions based on [8], [9].

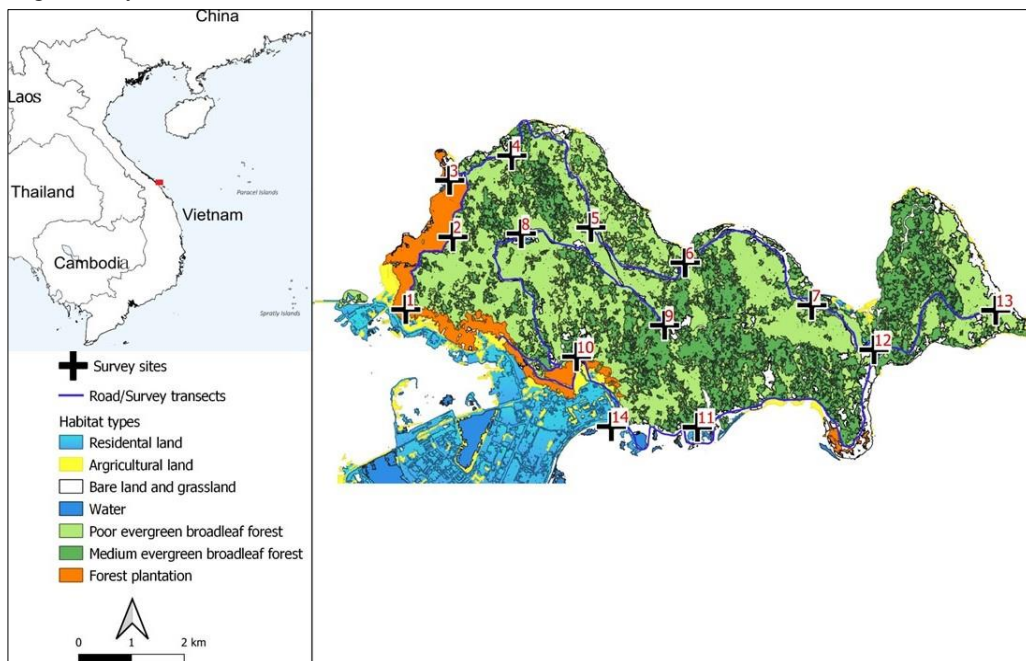


Figure 1. Map of Son Tra Peninsula showing sites for bird surveys, in which, 1 = Gac Bo Doi, 2 = Xoai Kho, 3 = Bai Cat Vang - Le Hai Son; 4 = Suoi Om, 5 = Cau Can So 3, 6 = Ho Sau, 7 = Bai Bac, 8 = Vong Canh hill, 9 = Ban Co peak, 10 = Bamboo Garden, 11 = Linh Ung Pagoda, 12 = InterContinental Resort, 13 = Son Tra Banyan, and 14 = Son Tra beach

Table 1. Major sites were selected to bird surveys in Son Tra Peninsula

No.	Site	Coordinates	Altitudinal range (m)	Habitat
1	Gac Bo Doi	N16°07'17.1" E108°13'31.5"	27 - 156	Planted trees, mainly <i>Acacia</i> , <i>Eucalyptus</i> ; Poor evergreen broadleaf forest; grassland; residential land; agricultural land
2	Xoai Kho	N16°08'03.4" E108°14'01.4"	152 - 197	Poor evergreen broadleaf forest; planted forest; bare land or grassland
3	Bai Cat Vang - Le Hai Son	N16°08'39.3" E108°13'58.8"	27 - 128	Poor evergreen broadleaf forest; planted forest; bare land and grassland; residential land
4	Suoi Om	N16°08'55.5" E108°14'38.8"	109 - 198	Medium evergreen broadleaf forest; poor evergreen broadleaf forest; grassland; residential land
5	Cau Can So 3	N16°08'10.6" E108°15'30.6"	216 - 370	Medium evergreen broadleaf forest; poor evergreen broadleaf forest; grassland
6	Ho Sau	N16°07'49.0" E108°16'32.1"	67 - 372	Medium evergreen broadleaf forest; poor evergreen broadleaf forest; grassland
7	Bai Bac	N16°07'23.2" E108°17'54.4"	67 - 252	Medium evergreen broadleaf forest; poor evergreen broadleaf forest; planted trees; grassland; residential land
8	Vong Canh hill	N16°08'06.1" E108°14'45.6"	402 - 576	Poor evergreen broadleaf forest; medium evergreen broadleaf forest; bare land and grassland; residential land
9	Ban Co peak	N16°07'09.3" E108°16'19.3"	445-620	Medium evergreen broadleaf forest; poor evergreen broadleaf forest; grassland; residential land
10	Bamboo Garden	N16°06'48.6" E108°15'22.5"	16 - 118	Planted trees, mainly <i>Acacia</i> , <i>Eucalyptus</i> ; medium evergreen broadleaf forest; poor evergreen broadleaf forest; residential land; agricultural land
11	Linh Ung Pagoda	N16°06'04.9" E108°16'41.4"	39 - 61	Residential land; poor evergreen broadleaf forest; medium evergreen broadleaf forest; bare land and grassland.
12	InterContinental Resort	N16°06'55.5" E108°18'35.1"	75 - 215	Medium evergreen broadleaf forest; poor evergreen broadleaf forest; grassland; residential land; agricultural land
13	Son Tra Banyan	N16°07'21.4" E108°19'53.5"	54 - 183	Planted trees, mainly <i>Acacia</i> , <i>Eucalyptus</i> ; Poor evergreen broadleaf forest; grassland; residential land
14	Son Tra beach	N16°06'4.61" E108°15'45.65"	5	Sand beach; residential land

To provide a comprehensive annotated checklist of birds, we clarified and revised all historical bird records based on concrete evidence such as photographs,

specimens, audio recordings, and well-detailed observations if possible. Additionally, we utilized long-term observation data on birds in STP obtained by our

birdwatching group during the 2013 - 2020 period. This group consists of ornithologists, birding guides, experienced birders, and freelancers involved in wildlife research and conservation. The group has conducted annual bird observations in and around STP since 2013.

Additionally, we surveyed the occurrence of Germain's Peacock-Pheasant in STP. Germain's Peacock-Pheasant was first reported on the peninsula 20 years ago [4], but no additional records have been recorded. Due to its secretive and cryptic behavior [10], [11], we used mainly playback techniques across 13 sites to record their vocal responses, working primarily at dawn and dusk when the species is most active. Following the suggestion by [12], at each site, we positioned points approximately every 250 m apart along existing roads, and at each point a playback consisting of a 30-second of an entire song of males (download from Xeno-canto.org) was played at a 2-min interval in a total of 10 min by using a speaker.

3. Results

In total, 215 bird species were recorded in the area, of which 105 species were new to the peninsula (see new species recorded for STP, marked with an asterisk in the notes column of Table 2), including eighty-three migratory birds (11 passage migrants, 64 winter visitors, four vagrants, and five breeding visitors). Together with literature reviews, we obtained a final annotated checklist of 256 bird species (Table 2).

Accounts are given to nine bird species in STP comprising two groups: globally threatened species and species that extend their known range, e.g., new for Central Vietnam (Annam).

3.1. Germain's Peacock-Pheasant *Polyplectron germaini*

Vulnerable. Reported first in 1997 with no detailed information [4], but no later confirmed records, including our extensive survey.

3.2. Brown Noddy *Anous stolidus*

Breeding visitor. New record for STP and Annam. Only one adult was photographed on Son Tra beach in October 2019. Given that the breeding season of this species is from May to August [9] and is the only breeding visitor in Cochinchina [7], [9], [10], this record suggests that the Brown Noddy is a non-breeding visitor to the central coastal of Vietnam. The migration and non-breeding range of this species is still poorly known.

3.3. Grey-headed Parakeet *Psittacula finschii*

Rare resident. Near threatened. First record for STP. Eleven individuals were counted and photographed in Bamboo Garden in April 2013. Found throughout Vietnam [10].

3.4. Red-breasted Parakeet *Psittacula alexandri*

Rare resident. Near threatened. A large flock of 25 birds was first observed flying over Linh Ung in April 2015. A small flock of five birds was found in Ho Sau in April 2017. The species was first recorded at STP in 1997 [4]. It is one of the most popular birds in the pet trade and for cage birds in Vietnam [13], and it is experiencing a

moderately rapid decline due to exploitation and ongoing habitat destruction [14].

3.5. Black-capped Kingfisher *Halcyon pileata*

Vulnerable. Rare winter visitor. The population is rapidly declining due to ongoing habitat destruction [15]. First record for STP. One individual was first observed near the Bamboo Garden in November 2013. The last records were from October to December during the period of 2018-2020 at InterContinental Resort and Son Tra beach, with a total of four birds. Considered a winter visitor throughout Vietnam and a passage migrant to East Tonkin [10]. The species is mainly found in coastal and mangrove habitats but can sometimes be found in gardens [7], [8], [9].

3.6. Fairy Pitta *Pitta nympha*

Vulnerable. Rare passage migrant. Only one bird was photographed near Xoai Kho in September 2014. The species is a migratory passerine that mostly migrates southward along coastal areas on their flight routes during winter [9], but its population is rapidly decreasing due to habitat loss and conversion [16]. Most passages occur between April and October in East Tonkin, North and Central Annam and Cochinchina [9].

3.7. Brambling *Fringilla montifringilla*

Vagrant. New record for STP and Annam. Two individuals, including a breeding female, were photographed at InterContinental Resort in November 2019, making a new record for Central Vietnam. Previously recorded as a vagrant in Tonkin, Vietnam [7], [10].

3.8. Yellow-breasted Bunting *Emberiza aureola*

Uncommon winter visitor. Critically Endangered. First record for STP. The earliest record was in December 2019 at InterContinental Resort, with a pair was photographed. Small numbers (1-2 individuals) were regularly observed between November and May of 2020 and 2021 at three sites: near Doc Bo Doi, InterContinental Resort, and Son Tra Banyan. Considered uncommon winter visitors to Tonkin, Cochinchina, and Central Annam, and passage migrants to East Tonkin [7], [10].

3.9. Pale Thrush *Turdus pallidus*

Vagrant. New record for STP and Annam. Previous records have been confirmed as vagrants in East Tonkin only [10]. Rare, first observed along the forest edge at Linh Ung Pagoda in December 2019. Regularly counted in small numbers (1-2 individuals) between December and January from 2019 to 2021, making a new record for Annam.

Table 2. An annotated checklist of birds recorded in Son Tra Peninsula

No.	Species	Site	References	Notes
1	Blue-breasted Quail <i>Coturnix chinensis</i>	2	a,b,c,d	r
2	Scaly-breasted Partridge <i>Arborophila chloropus</i>	n/a	a,c	r
3	Red Junglefowl <i>Gallus gallus</i>	1,2,3,4	a,b,c,d	r
	Germain's Peacock-Pheasant <i>Polyplectron germaini</i> **	n/a	a,c	r

No.	Species	Site	References	Notes
4	Cinnamon Bittern <i>Ixobrychus cinnamomeus</i>	4,8,9,11	a,b,c,d	r
5	Yellow Bittern <i>Ixobrychus sinensis</i>	10,11	d	r,*
6	Striated Heron <i>Butorides striata</i>	10,11,14	a,b,c,d	w
7	Chinese Pond Heron <i>Ardeola bacchus</i>	1,2,3,4,7,10,11,12,13,14	a,b,c,d	w
8	Eastern Cattle Egret <i>Bubulcus coromandus</i>	1,2,4,10,11,12	b,d	w
9	Grey Heron <i>Ardea cinerea</i>	1,14	d	w,*
10	Intermediate Egret <i>Mesophoyx intermedia</i>	1,12,14	a,b,c,d	w
11	Little Egret <i>Egretta garzetta</i>	4,8,9,10,11	a,b,c,d	r
12	Pacific Reef-Egret <i>Egretta sacra</i>	10,11	d	r,*
13	Amur Falcon <i>Falco amurensis</i>	3,6,7,11	d	p,*
14	Oriental Hobby <i>Falco severus</i>	n/a	a,b,c	r
15	Peregrine Falcon <i>Falco peregrinus</i>	2,5	b,d	w
16	Osprey <i>Pandion haliaetus</i>	6,7,12	b,d	w
17	Oriental Honey Buzzard <i>Pernis ptilorhynchus</i>	3,10,11	b,d	r
18	Black Kite <i>Milvus migrans</i>	n/a	a,b,c	w
19	White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>	8,9,12,13	b,d	r
20	Crested Serpent Eagle <i>Spilornis cheela</i>	3,6,9,10,11	b,d	r
21	Mountain Hawk-Eagle <i>Nisaetus nipalensis</i>	3,6,9	d	r,*
22	Pied Harrier <i>Circus melanoleucos</i>	3	d	w,*
23	Crested Goshawk <i>Accipiter trivirgatus</i>	2,3,8,13	d	r,*
24	Shikra <i>Accipiter badius</i>	2,3,6	a,b,c,d	r
25	Besra <i>Accipiter virgatus</i>	1,2,3,6,7,8,9,13	d	r,*
26	Black Eagle <i>Ictinaetus malayensis</i>	2,3,4,6,13	b,d	r
27	Slaty-legged Crake <i>Rallina eurizonoides</i>	2,3,9,11	d	p,*
28	White-breasted WaterHen <i>Amaurornis phoenicurus</i>	10,11	d	r,*
29	Ruddy-breasted Crake <i>Porzana fusca</i>	3,5	d	r,*
30	White-browed Crake <i>Porzana cinerea</i>	11	d	r,*
31	Slaty-breasted Rail <i>Rallus striatus</i>	12	a,b,c,d	r
32	Baillon's Crake <i>Porzana pusilla</i>	n/a	a,b,c	w
33	Barred Buttonquail <i>Turnix suscitator</i>	n/a	a,c	r
34	Pacific Golden Plover <i>Pluvialis fulva</i>	14	d	w,*
35	Long-billed Plover <i>Charadrius placidus</i>	n/a	a	w
36	Little Ringed Plover <i>Charadrius dubius</i>	14	a,b,c,d	w
37	Lesser Sand Plover <i>Charadrius mongolus</i>	14	a,b,c,d	w
38	Greater Sand Plover <i>Charadrius leschenaultii</i>	n/a	c	w
39	Eurasian Woodcock <i>Scolopax rusticola</i>	3	d	w,*
40	Red-necked Phalarope <i>Phalaropus lobatus</i>	14	d	p,*
41	Common Redshank <i>Tringa totanus</i>	14	d	w,*
42	Pintail Snipe <i>Gallinago stenura</i>	n/a	a,b,c	w
43	Whimbrel <i>Numenius phaeopus</i>	14	d	w,*
44	Common Sandpiper <i>Actitis</i>	10	a,c,d	w

No.	Species	Site	References	Notes
	<i>hypoleucos</i>			
45	Grey-tailed Tattler <i>Tringa brevipes</i>	14	d	p,*
46	Common Greenshank <i>Tringa nebularia</i>	14	d	w,*
47	Sanderling <i>Calidris alba</i>	14	d	w,*
48	Long-toed Stint <i>Calidris subminuta</i>	14	d	w,*
49	Red-necked Stint <i>Calidris ruficollis</i>	14	d	w,*
50	Ruddy Turnstone <i>Arenaria interpres</i>	14	d	w,*
51	Brown Noddy <i>Anous stolidus</i>	14	d	v,*
52	Little Tern <i>Sternula albifrons</i>	n/a	a,c	r
53	White-winged Tern <i>Chlidonias leucopterus</i>	14	d	p,*
54	Whiskered Tern <i>Chlidonias hybrida</i>	14	d	w,*
55	Roseate Tern <i>Sterna dougallii</i>	14	d	b,*
56	Common Tern <i>Sterna hirundo</i>	14	d	b,*
57	Rock Pigeon <i>Columba livia</i>	8,9,10,11	b,d	r
58	Oriental Turtle Dove <i>Streptopelia orientalis</i>	10,11	d	w,*
59	Red-collared Dove <i>Streptopelia tranquebarica</i>	1,3,6,7,8,9,10,11	a,b,c,d	r
60	Spotted Dove <i>Streptopelia chinensis</i>	all sites	a,b,c,d	r
61	Zebra Dove <i>Geopelia striata</i>	11	b,d	r
62	Emerald Dove <i>Chalcophaps indica</i>	1,2,3,7	a,b,c,d	r
63	Pink-necked Green Pigeon <i>Treron vernans</i>	n/a	a,b,c	r
64	Orange-breasted Green Pigeon <i>Treron bicincta</i>	2,3,4,6,11	b,d	r
65	Thick-billed Green Pigeon <i>Treron curvirostra</i>	2,3,4,6,7,11,13	a,b,c,d	r
66	Green Imperial Pigeon <i>Ducula aenea</i>	2	d	r,*
67	Red-breasted Parakeet <i>Psittacula alexandri</i>	4,11	a,c,d	r
68	Grey-headed Parakeet <i>Psittacula finschii</i>	10	d	r,*
69	Chestnut-winged Cuckoo <i>Clamator coromandus</i>	9	d	b,*
70	Large Hawk Cuckoo <i>Hierococcyx sparverioides</i>	n/a	a,b,c	r
71	Plaintive Cuckoo <i>Cacomantis merulinus</i>	all sites	b,d	r
72	Asian Emerald Cuckoo <i>Chrysococcyx maculatus</i>	3,4	d	r,*
73	Drongo Cuckoo <i>Surniculus lugubris</i>	2	d	r,*
74	Asian Koel <i>Eudynamis scolopacea</i>	2,3,10,12	d	r,*
75	Green-billed Malkoha <i>Rhopodytes tristis</i>	all sites	a,b,c,d	r
76	Greater Coucal <i>Centropus sinensis</i>	all sites	a,b,c,d	r
77	Lesser Coucal <i>Centropus bengalensis</i>	11	a,b,c,d	r
78	Barn Owl <i>Tyto alba</i>	11	d	r,*
79	Collared Scops Owl <i>Otus lettia</i>	3,4,6,7,8,12,13	a,c,d	r
80	Brown Boobook <i>Ninox scutulata</i>	7,8	b,d	r
81	Large-tailed Nightjar <i>Caprimulgus macrurus</i>	2,6,13	b,d	r
82	Savanna Nightjar <i>Caprimulgus affinis</i>	n/a	a,c	r
83	Himalayan Swiftlet <i>Aerodramus brevirostris</i>	10	d	w,*
84	Germain's Swiftlet <i>Aerodramus germani</i>	9,13	b,d	r

No.	Species	Site	References	Notes
85	Asian Palm Swift <i>Cypsiurus balasiensis</i>	all site	d	r,*
86	House Swift <i>Apus affinis</i>	11	a,c,d	r
87	Dollarbird <i>Eurystomus orientalis</i>	1,2,3,4,5,6,8	b,d	r
88	White-throated Kingfisher <i>Halcyon smyrnensis</i>	all sites	a,b,c,d	r
89	Black-capped Kingfisher <i>Halcyon pileata</i>	10,12,14	d	w,*
90	Blue-eared Kingfisher <i>Alcedo meninting</i>	4	b,d	r
91	Common Kingfisher <i>Alcedo atthis</i>	1,10,11	a,b,c,d	w
92	Blue-bearded Bee-eater <i>Nyctormis athertoni</i>	n/a	a,c	r
93	Little Green Bee-eater <i>Merops orientalis</i>	1,3,5,6,8,9,10,12	b,d	r
94	Blue-tailed Bee-eater <i>Merops philippinus</i>	all sites	a,b,c,d	b
95	Blue-throated Bee-eater <i>Merops viridis</i>	n/a	a,c	p
96	Chestnut-headed Bee-eater <i>Merops leschenaulti</i>	11	d	r,*
97	Common Hoopoe <i>Upupa epops</i>	3,6	a,b,c,d	r
98	Oriental Pied Hornbill <i>Anthracoceros albirostris</i>	10,11,12	d	r,*
99	Red-vented Barbet <i>Megalaima lagrandieri</i>	10,11	d	r,*
100	Lineated Barbet <i>Megalaima lineata</i>	n/a	c	r
101	Green-eared Barbet <i>Megalaima faiostricta</i>	all sites	a,b,c,d	r
102	Coppersmith Barbet <i>Megalaima haemacephala</i>	1,10,11	d	r,*
103	Rufous Woodpecker <i>Micropternus brachyurus</i>	10	a,c,d	r
104	Lesser Yellownape <i>Picus chlorolophus</i>	4	d	r,*
105	Laced Woodpecker <i>Picus vittatus</i>	all sites	b,d	r
106	Greater Flameback <i>Chrysocolaptes lucidus</i>	n/a	a,c	r
107	Fairy Pitta <i>Pitta nympha</i>	2	b,d	p
108	Blue-winged Pitta <i>Pitta moluccensis</i>	2	d	b,*
109	Blue-rumped Pitta <i>Pitta soror</i>	4	d	r,*
110	Ashy Minivet <i>Pericrocotus divaricatus</i>	2	d	w,*
111	Bar-winged Flycatcher Shrike <i>Hemipus picatus</i>	2	d	r,*
112	Mangrove Whistler <i>Pachycephala grisola</i>	n/a	a	r
113	Black-naped Oriole <i>Oriolus chinensis</i>	2,11	d	w,*
114	Black-hooded Oriole <i>Oriolus xanthornus</i>	n/a	a,b,c	r
115	Common Iora <i>Aegithina tiphia</i>	all sites	d	r,*
116	Great Iora <i>Aegithina lafresnayei</i>	2,3,10,11	a,c,d	r
117	White-throated Fantail <i>Rhipidura albicollis</i>	11	a,b,c,d	r
118	Black Drongo <i>Dicrurus macrocercus</i>	all sites	a,b,c,d	r
119	Ashy Drongo <i>Dicrurus leucophaeus</i>	all sites	b,d	r
120	Crow-billed Drongo <i>Dicrurus annectans</i>	n/a	a,c	b
121	Lesser Racket-tailed Drongo <i>Dicrurus remifer</i>	all sites	d	r,*
122	Greater Racket-tailed Drongo <i>Dicrurus paradiseus</i>	all sites	a,b,c,d	r
123	Hair-crested Drongo <i>Dicrurus</i>	2,3,4	b,d	r

No.	Species	Site	References	Notes
	<i>hottentottus</i>			
124	Black-naped Monarch <i>Hypothymis azurea</i>	2,3	a,b,c,d	r
125	Japanese Paradise Flycatcher <i>Terpsiphone atrocaudata</i>	6	d	p,*
126	Common Green Magpie <i>Cissa chinensis</i>	10	c,d	r
127	Red-billed Blue Magpie <i>Urocissa erythrorhyncha</i>	n/a	a	r
128	Racket-tailed Treepie <i>Crypsirina temia</i>	all sites	a,b,c,d	r
129	Tiger Shrike <i>Lanius tigrinus</i>	11	d	p,*
130	Brown Shrike <i>Lanius cristatus</i>	all sites	b,d	w
131	Long-tailed Shrike <i>Lanius schach</i>	all sites	d	r,*
132	Burmese Shrike <i>Lanius collurioideis</i>	1,2,3,6,11,12	d	r,*
133	Brown-throated Sunbird <i>Anthreptes malacensis</i>	n/a	b	r
134	Olive-backed Sunbird <i>Cinnyris jugularis</i>	all sites	a,c,d	r
135	Crimson Sunbird <i>Aethopiga siparaja</i>	all sites	b,d	r
136	Ruby-cheeked Sunbird <i>Chalcoparia singalensis</i>	3,11	a,c,d	r
137	Streaked Spiderhunter <i>Arachnothera magna</i>	9,10	d	r,*
138	Yellow-vented Flowerpecker <i>Dicaeum chrysorrheum</i>	n/a	c	r
139	Plain Flowerpecker <i>Dicaeum minullum</i>	12	a,c,d	r
140	Scarlet-backed Flowerpecker <i>Dicaeum cruentatum</i>	all sites	b,d	r
141	Blue-winged Leafbird <i>Chloropsis cochinchinensis</i>	2,3,5,11	a,b,c,d	r
142	Asian Fairy Bluebird <i>Irena puella</i>	10	a,b,c,d	r
143	Baya Weaver <i>Ploceus philippinus</i>	3,11	d	r,*
144	White-rumped Munia <i>Lonchura striata</i>	2,3,8,10,11,12,13	a,b,c,d	r
145	Scaly-breasted Munia <i>Lonchura punctulata</i>	1,2,3,6,9,11	a,c,d	r
146	Chestnut Munia <i>Lonchura atricapilla</i>	1,2,3,5,8	a,c,d	r
147	White-headed Munia <i>Lonchura maja</i>	3	d	r,*
148	Eurasian Tree Sparrow <i>Passer montanus</i>	1,4,6,8,9,12	a,b,c,d	r
149	Red-throated Pipit <i>Anthus cervinus</i>	n/a	a,c	w
150	Olive-backed Pipit <i>Anthus hodgsoni</i>	3,6,9	a,b,c,d	w
151	Richard's Pipit <i>Anthus richardi</i>	n/a	b,c	w
152	Paddyfield Pipit <i>Anthus rufulus</i>	1,5,8,9,11	a,c,d	r
153	White Wagtail <i>Motacilla alba</i>	2,3,5,8,10,11	a,b,c,d	w
154	Grey Wagtail <i>Motacilla cinerea</i>	all sites	b,d	w
155	Green-headed Wagtail <i>Motacilla taivana</i>	all sites	a,c,d	w
156	Grey-capped Greenfinch <i>Chloris sinica</i>	11	d	r,*
157	Yellow-throated bunting <i>Emberiza elegans</i>	3	d	w
158	Chestnut Bunting <i>Emberiza rutila</i>	4,11	d	w,*
159	Yellow-breasted Bunting <i>Emberiza aureola</i>	1,12,13	d	w,*
160	Brambling <i>Fringilla montifringilla</i>	12	d	v,*
161	Black-faced Bunting <i>Emberiza spodocephala</i>	3	d	w,*
162	White-vented Myna <i>Acridotheres</i>	10,11,12	a,b,c,d	r

No.	Species	Site	References	Notes
	<i>grandis</i>			
163	Vinous-breasted Starling <i>Acridotheres burmannicus</i>	1,11	d	r,*
164	Common Myna <i>Acridotheres tristis</i>	8,9,10,11,12	a,b,c,d	r
165	Black-collared Starling <i>Sturnus nigricollis</i>	11	a,c,d	r
166	Chestnut-tailed Starling <i>Sturnus malabaricus</i>	n/a	a,c	r
167	Red-billed Starling <i>Sturnus sericeus</i>	n/a	b	v
168	Golden-crested Myna <i>Ampeliceps coronatus</i>	10,11	d	r,*
169	White-shouldered Starling <i>Sturnus sinensis</i>	11	d	r,*
170	Common Hill Myna <i>Gracula religiosa</i>	n/a	a,b,c	r
171	Orange-headed Thrush <i>Zoothera citrina</i>	all sites	d	r,*
172	Scaly Thrush <i>Zoothera dauma</i>	11	d	r,*
173	Chineses Blackbird <i>Turdus mandarinus</i>	3,6,7	d	w,*
174	Grey-backed Thrush <i>Turdus hortulorum</i>	8,10,11,12	d	w,*
175	Japanese Thrush <i>Turdus cardis</i>	3,5,8	a,b,c,d	w
176	Siberian Thrush <i>Zoothera sibirica</i>	11,8	d	w,*
177	Pale Thrush <i>Turdus pallidus</i>	11	d	v,*
178	Eye-browed Thrush <i>Turdus obscurus</i>	3,7,12	d	w,*
179	Japanese Robin <i>Luscinia akahige</i>	11	d	w,*
180	Brown-headed Thrush <i>Turdus chrysolaus</i>	11	d	w,*
181	Bluethroat <i>Luscinia svecicus</i>	11,12	d	w,*
182	Siberian Rubythroat <i>Luscinia calliope</i>	2,4,8,9,11	d	w,*
183	Siberian Blue Robin <i>Luscinia cyane</i>	3,11	d	w,*
184	Rufous-tailed Robin <i>Luscinia sibilans</i>	3,9,11,12	d	w,*
185	Daurian Redstart <i>Phoenicurus aureoreus</i>	3,4,5,6	d	w,*
186	White-throated Rock Thrush <i>Monticola gularis</i>	3	d	w,*
187	Blue Rock-Thrush <i>Monticola solitarius</i>	all sites	a,b,c,d	w
188	Japanese Stonechat <i>Saxicola stejnegeri</i>	all sites	a,b,c,d	w
189	Pied Bushchat <i>Saxicola caprata</i>	11	d	r,*
190	Red-flanked Bluetail <i>Tarsiger cyanurus</i>	2,3,8,11	d	w,*
191	Slaty-backed Forktail <i>Enicurus schistaceus</i>	4,9	a,b,c,d	r
192	Hainan Blue Flycatcher <i>Cyornis hainanus</i>	2,3,4	d	r,*
193	Hill Blue Flycatcher <i>Cyornis banyumas</i>	n/a	b	r
194	Tickell's Blue Flycatcher <i>Cyornis tickelliae</i>	2,4,5,6,10,11	a,b,c,d	r
195	Blue-throated Flycatcher <i>Cyornis rubeculoides</i>	n/a	b	r
196	Verditer Flycatcher <i>Eumyias thalassinus</i>	3	a,c,d	r
197	Fujian Niltava <i>Niltava davidi</i>	3	d	w,*
198	Large Niltava <i>Niltava grandis</i>	3,11	d	r,*
199	Small Niltava <i>Niltava macgrigoriae</i>	3	d	r,*
200	Narcissus Flycatcher <i>Ficedula narcissina</i>	2,3,11	d	p,*

No.	Species	Site	References	Notes
201	Taiga Flycatcher <i>Ficedula albicilla</i>	7,11	d	w,*
202	Ferruginous Flycatcher <i>Muscicapa ferruginea</i>	n/a	b	p
203	Grey-streaked Flycatcher <i>Muscicapa griseisticta</i>	2,3,4,5,6,7	d	v,*
204	Mugimaki Flycatcher <i>Ficedula mugimaki</i>	3,11	d	w,*
205	Little Pied Flycatcher <i>Ficedula westermanni</i>	11	d	r,*
206	Dark-sided Flycatcher <i>Muscicapa sibirica</i>	all sites	b,d	w
207	Asian Brown Flycatcher <i>Muscicapa dauurica</i>	all sites	b,d	w
208	Blue and White Flycatcher <i>Cyanoptila cyanomelana</i>	2,3,6	a,b,c,d	p
209	Oriental Magpie Robin <i>Copsychus saularis</i>	2,4,8,10,11,12	a,b,c,d	r
210	White-rumped Shama <i>Copsychus malabaricus</i>	7,10,11,13	a,b,c,d	r
211	Japanese Tit <i>Parus minor</i>	10,11	d	r,*
212	Grey-headed Canary Flycatcher <i>Culicicapa ceylonensis</i>	2,6,11,13	d	r,*
213	Oriental Skylark <i>Alauda gulgula</i>	11	a,b,c,d	r
214	Black-crested Bulbul <i>Pycnonotus melanicterus</i>	11	d	r,*
215	Black-headed Bulbul <i>Pycnonotus atriceps</i>	n/a	b	r
216	Stripe-throated Bulbul <i>Pycnonotus finlaysoni</i>	all sites	a,b,c,d	r
217	Streak-eared Bulbul <i>Pycnonotus blanfordi</i>	all sites	a,c,d	r
218	Red-whiskered Bulbul <i>Pycnonotus jocosus</i>	all sites	a,b,c,d	r
219	Sooty-headed Bulbul <i>Pycnonotus aurigaster</i>	all sites	a,b,c,d	r
220	Grey-eyed Bulbul <i>Iole propinqua</i>	n/a	a,b,c	r
221	Puff-throated Bulbul <i>Alophoixus pallidus</i>	8	b,d	r
222	Black Bulbul <i>Hypsipetes leucocephalus</i>	3,8,10,11,12	d	r,*
223	Northern House Martin <i>Delichon urbicum</i>	n/a	c	w
224	Asian House Martin <i>Delichon dasypus</i>	all sites	b,d	w
225	Barn Swallow <i>Hirundo rustica</i>	all sites	a,b,d	w
226	Red-rumped Swallow <i>Cecropis daurica</i>	n/a	a,c	w
227	Asian Stubtail <i>Urosphena squameiceps</i>	3	d	w,*
228	Two-barred Warbler <i>Phylloscopus plumbeitarsus</i>	2,3	d	w,*
229	Yellow-browed Warbler <i>Phylloscopus inornatus</i>	all sites	b,c,d	w
230	Kloss's Leaf Warbler <i>Phylloscopus ogilviegranti</i>	2	d	r,*
231	Dusky Warbler <i>Phylloscopus fuscatus</i>	2,3,5,6	a,c,d	r
232	Pallas's Leaf Warbler <i>Phylloscopus proregulus</i>	n/a	a	w
233	Radde's Warbler <i>Phylloscopus schwarzi</i>	2	d	w,*
234	Arctic Warbler <i>Phylloscopus borealis</i>	2,3,6	a,c,d	p
235	Chestnut-flanked White-eye <i>Zosterops erythropleurus</i>	11	d	w,*
236	Oriental White-eye <i>Zosterops palpebrosa</i>	all sites	a,b,c,d	r
237	Puff-throated Babbler <i>Pellorneum ruficeps</i>	3	d	r,*

No.	Species	Site	References	Notes
238	Scaly-crowned Babbler <i>Malacopteron cinereum</i>	2,3,6	a,c,d	r
239	Abbott's Babbler <i>Malacocincla abbotti</i>	3	d	r,*
240	Buff-breasted Babbler <i>Pellorneum tickelli</i>	2,3,5,6	a,b,c,d	r
241	Rufous-throated Fulvetta <i>Schoeniparus rufogularis</i>	n/a	a,c	r
242	Pin-Striped Tit Babbler <i>Macronus gularis</i>	all sites	a,b,c,d	r
243	Grey-faced Tit Babbler <i>Macronus kelleyi</i>	n/a	a,c	r
244	Large Scimitar Babbler <i>Pomatorhinus hypoleucos</i>	n/a	a,c	r
245	Chinese Hwamei <i>Leucodioptron canorum</i>	n/a	b	r
246	Silver-eared Mesia <i>Mesia argenteauris</i>	n/a	b	r
247	White-crested Laughingthrush <i>Garrulax leucolophus</i>	all sites	a,c,d	r
248	Lesser Necklaced Laughingthrush <i>G. monileger</i>	2,3,13	b,d	r
249	Black-throated Laughingthrush <i>Dryonastes chinensis</i>	1,2	a,b,c,d	r
250	Dark-necked Tailorbird <i>Orthotomus atrogularis</i>	all sites	b,d	r
251	Common Tailorbird <i>Orthotomus sutorius</i>	all sites	b,d	r
252	Zitting Cisticola <i>Cisticola juncidis</i>	11	d	r,*
253	Rufescent Prinia <i>Prinia rufescens</i>	4,8,9	d	r,*
254	Yellow-bellied Prinia <i>Prinia flaviventris</i>	5,10,11	a,c,d	r
255	Plain Prinia <i>Prinia inornata</i>	1,7,10,11,12	b,d	r
256	Brown Prinia <i>Prinia polychroa</i>	n/a	a,c	r

Note: 1 = Gac Do Doi; 2 = Xoai Kho; 3 = Bai Cat Vang - Le Hai Son; 4 = Suoi Om; 5 = Cau Can So 3; 6 = Ho Sau; 7 = Bai Bac; 8 = Vong Canh hill; 9 = Ban Co peak; 10 = Bamboo Garden; 11 = Linh Ung Pagoda; 12 = Inter-Continental Resort; 13 = Son Tra Banyan; 14 = Son Tra beach; a = [4]; b = [17] and [18]; c = [19]; d = our survey; r = resident; w = winter visitor; p = passage migrant; v = vagrant; b = breeding visitor; * = new record for STP; ** = species' unconfirmed occurrences; n/a = not available.

4. Discussion

Given that the STP is such a key area for avifauna, it is important to have up-to-date knowledge of its bird species. However, the distribution and status of its birds remain incomplete. Based on historical bird surveys and our study, a total of 256 bird species have been archived, including 215 species seen during this survey and 152 species published earlier, accounting ca. 30% of the total number of bird species recently recorded in Vietnam. One Critically Endangered Yellow-breasted Bunting (*Emberiza aureola*), two Vulnerable species of Fairy Pitta (*Pitta nympha*) and Black-capped Kingfisher (*Halcyon pileata*), and two Near Threatened Red-breasted Parakeet (*Psittacula alexandri*) and Grey-headed Parakeet (*Psittacula finschii*), also occur on the peninsula. Importantly, these results indicate that the STP, despite its relatively small area of 4,000 hectares, supports a rich avifauna in Central Vietnam compared to other neighboring protected areas such as Nam Hai Van Protection Forest (124 species [20]; Ba Na Special-use Forest (214 species [21]; and Cu Lao Cham Nature Reserve

(52 species [22]).

Remarkably, our findings show that the avifauna of STP is characterized by a high proportion of winter visitors (74 species) and passage migrants (13 species). These species were recorded between late autumn (October) and late spring (May), including several shorebirds that recorded in a northward migration (March - May) in their annual cycle in the East Asian - Australasian Flyway [23], including Sanderling (*Calidris alba*), Red-necked Stint (*Arenaria interpres*), Ruddy Turnstone (*Arenaria interpres*) and White-winged Tern (*Chlidonias leucopterus*). In addition, while the STP is an isolated mountain block with narrow and short coastal, many migratory shorebirds have been confirmed, including Little Tern (*Sterna albifrons*), Long-billed Plover (*Charadrius placidus*), Little Ringed Plover (*Charadrius dubius*), Lesser Sand Plover (*Charadrius mongolus*), Greater Sand Plover (*Charadrius leschenaultii*), White-winged Tern (*Chlidonias leucopterus*), Whiskered Tern (*Chlidonias hybrida*), Roseate Tern (*Sterna dougallii*), Common Tern (*Sterna hirundo*), Ruddy Turnstone (*Arenaria interpres*), Red-necked Stint (*Calidris ruficollis*), Long-toed Stint (*Calidris subminuta*), Sanderling (*Calidris alba*), Common Greenshank (*Tringa nebularia*), Grey-tailed Tattler (*Tringa brevipes*). These findings suggest that the STP may be a key coastal stopover site for migratory birds during migration periods, especially for shorebirds in Vietnam.

Forty-two previous bird species were not observed during our surveys (Table 2), which may indicate that their status and distribution in STP remain poorly known or unclear. Several are rare species - such as Germain's Peacock-Pheasant (*Polyplectron germaini*) - or long-distance migrants of migratory birds that are vagrants and thus likely easily overlooked. Otherwise, the records of Mangrove Whistler (*Pachycephala grisola*) and Brown-throated Sunbird (*Anthreptes malacensis*), both distributed in Cochinchina, and Pink-necked Green Pigeon (*Treron vernans*) distributed in Cochinchina, South Annam are doubtful. These records are far from their normal range, and if they occur in STP, they are likely due to birds that have escaped from nearby Da Nang City. To enhance bird conservation priorities, it is essential to gain an adequate understanding of the taxonomy, distribution, and biogeographical history of bird species in STP. Therefore, from a conservation standpoint, the priorities should include clarifying the taxonomic status, distribution, abundance, and habitat use of these species. In addition, further survey efforts should focus on shorebirds and bird-caged trade in and around STP to address the current knowledge gaps about their distribution in the region.

The Germain's Peacock-Pheasant, a restricted range species occurring in the South Vietnamese lowlands and Da Lat Plateau Endemic Bird Areas [24], was not recorded during our field surveys and annual observations. In Vietnam, all available information indicates that the species' known distribution extends from south-central Annam to Cochinchina. The northernmost known records of the Germain's Peacock-Pheasant come from Quy Nhon (Binh Dinh Province), the southernmost central Annam [25]. The

first record of this species in STP was based on undefined evidence such as photographs, specimens, and audio recordings. While this information indicates that the record of Germain's Peacock-Pheasant may be one of mistaken identity, it is also possible that the species occurs but with uncertain regional status in Central Annam. Therefore, we recommend that Germain's Peacock-Pheasant should be withdrawn from the checklist of birds of STP, and that additional studies to assess Germain's Peacock-Pheasant distribution throughout Central Annam should be carried out using methods such as systematic camera-trapping.

Currently, the STP is highly accessible to tourists and local people, and would thus benefit from regular migratory bird species monitoring to track their movement, general trends in species abundance, and habitat alterations with the support of local birdwatching groups. However, illegal hunting, and trapping of birds - together with the taking of nestlings and illegal logging of timber trees in some areas, and the conversion of natural forests to agricultural fields - were witnessed during our surveys. These threats need to be mitigated to maintain the diversity of avifauna in STP.

5. Conclusions

Results from ornithological surveys conducted between 2016 and 2018, with 215 bird species observed, highlight the Son Tra Peninsula as an important area for avifauna and a key stopover site for migratory birds in Central Vietnam. Noteworthy records include five globally threatened species and three species with extended ranges in Central Vietnam. A comprehensive checklist of the birds of STP is provided, with a total of 256 species. Conservation issues, including threats to avian communities, key knowledge gaps, and the need for long-term monitoring, are briefly discussed, along with recommendations to preserve the rich avifauna of the peninsula.

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