

## Project Title

# Sustainable management of shorebird habitat for the Critically Endangered Spoon-billed Sandpiper in the Inner Gulf of Thailand



## **Report provider**

Bird Conservation Society of Thailand (BCST)

2022

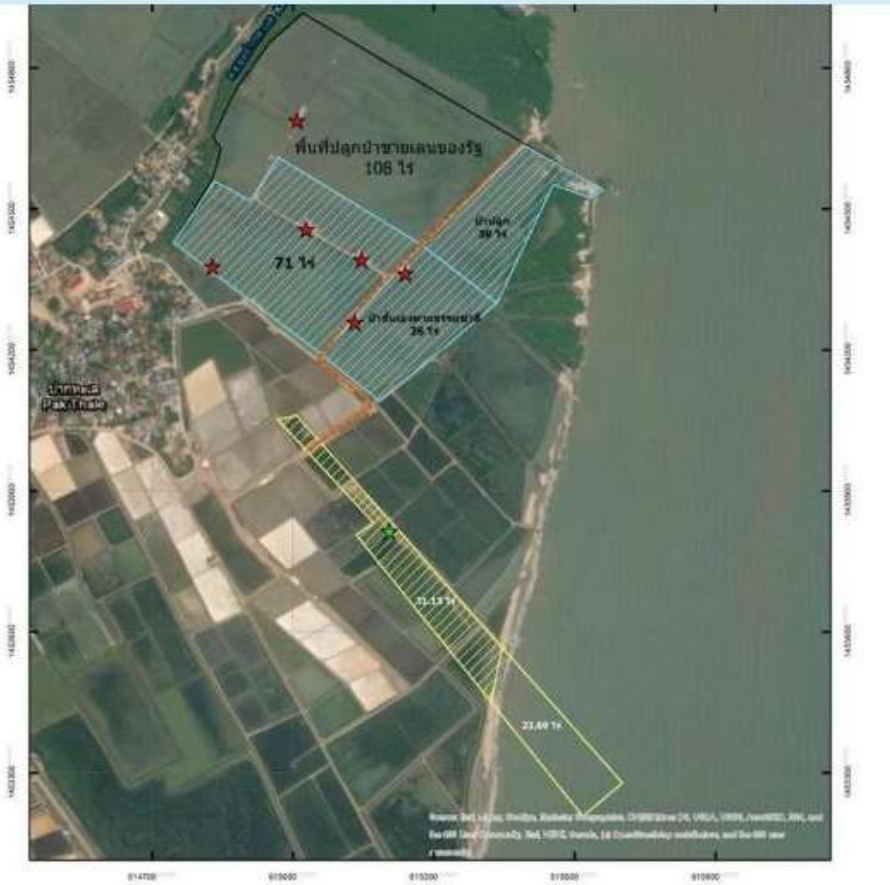
## **Report to the Oriental Bird Club**

Project No. P1328

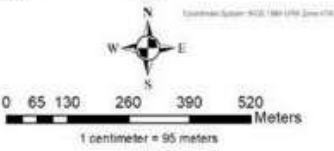
# 1. Introduction to Pak Thale Nature Reserve

Pak Thale Nature Reserve, Thailand, is the first privately-owned and managed, protected area created for the long-term conservation of migratory shorebird wintering habitat in Southeast Asia. The reserve was established in 2020 by the Bird Conservation Society of Thailand (BCST) through the acquisition of an area of coastal salt pans in Phetchaburi province with funding provided by The Rainforest Trust. Pak Thale is a definite milestone and model for the conservation and (wetlands) habitat management for migratory species in all of Southeast Asia as there are no similar protected areas elsewhere in the region.

**Map shows the areas of BCST and DMCR In Pak Thale**



**Yellow- BCST area 7 ha**  
**Blue- DMCR area 21 ha**



While the Pak Thale Nature Reserve and adjacent areas co-managed by BCST is relatively compact (<100 hectares), the site is used by more than 10,000 migratory waterbirds annually representing nearly 50 species. Of these, 10 species are on the IUCN Red List, including the Spoon-billed Sandpiper *Calidris pygmaea* (CR), and the Great Knot *C. tenuirostris* (EN) and Spotted Greenshank *Tringa guttifer* (EN), as are small numbers of Far Eastern Curlew *Numenius madagascariensis* (EN) annually. A further eight species are considered as Near Threatened.

The Spoon-billed Sandpiper is a flagship species for Pak Thale. It is one of the world's most threatened migratory species, with an estimated world population of about 490 mature individuals which is still declining. Regular shorebird monitoring activities show that small numbers of Spoon-billed Sandpiper (up to three individuals in the winter of 2022) continue to visit the site every winter, and the site is probably among the best places to observe this species in its wintering grounds. Pak Thale is well known to birdwatchers locally and internationally, and attracts tourists from around the world. Birdwatching tourism generates income for the local community as a result of its global reputation as a birding hotspot with an unparalleled diversity of shorebirds including threatened species.

This report reviews the progress of our work over the period of funding by the Oriental Bird Club (November 2020 - November 2021) and provides updates with respect to the specific objectives and deliverables set out for this project.

### **1.1. Specific project objectives**

This project has the following objectives for the Pak Thale project area:

- Objective 1: Better water management and landscaping to improve the habitat conditions
- Objective 2: Improving the facilities for nature-based tourism
- Objective 3: Strengthening engagement with the local communities and local government units

## **2. Management of wetlands: Water and landscape management**

### **2.1. Updates on water and landscape management activities**

Landscape management activities were implemented at Pak Thale Nature Reserve (PTNR) over an area of 12 ha including both BCST land (about 2.5 ha is in the sea) and community area and a larger area immediately abutting PTNR that is co-managed by BCST (c. 50 ha) under a newly signed memorandum of understanding (MOU) between Department of Marine and Coastal Resources (DMCR) and BCST in September 2021. The area of salt pans in the Pak Thale Nature Reserve was privately acquired by BCST in January 2020 through generous funding from the Rainforest Trust, and donations from the Thai public.

Under these arrangements, BCST has worked with the local community to undertake work on habitat management, with a particular focus on the water management regime. This includes activities to, (i) clean and create new waterways in the area to enable proper drainage and flushing of the salt pans by the tides, and work to (ii) repair and construct soil bunds and mounds along key salt pans and adjacent areas of mangrove forests. Our observations show that careful management of the inundation regimes in the salt pans is essential in creating the conditions that are favoured by feeding shorebirds, particularly the Spoon-billed Sandpiper. For instance, we note that the depth of water in the salt pans is a key factor

for attracting Spoon-billed Sandpiper, and so we have undertaken work to regularly manage the water depth to be less than 10 cm.

Working on water management; sea water from the ocean was directed via manual water gates through canals to various salt pans during the migratory season from September 2021 by members of the local communities, including salt farmers. Different water levels (from 30 cm to 1 m depth) in different ponds have been maintained both in BCST area and DMCR lands, to provide a variety of habitat for different shorebird species. Next step, BCST would like to study how water levels affect bird species and food resources.

The abundance of shorebird species at Pak Thale Nature Reserve in response to our site management regimes was carefully monitored once per month by BCST staff at six sampling sites from January to February 2021. Since March 2021, an additional 13 sites have been added to our monthly surveys, to a total 19 spots per month.

## ***2.2. Updates on coastal erosion control***

Sea levels in the Gulf of Thailand are rising gradually, and marine transgression combined with subsidence is expected to accelerate the erosion of the Phetchaburi coastline. DMCR has worked with BCST staff to erect bamboo fences as coastal protection to manage and control erosion along the Pak Thale coast. In total a stretch of 4 km of bamboo fences have been installed and maintained along the coast of Pak Thale, including the coast at Pak Thale Nature Reserve (about 0.5 km). The impacts of erosion after the erection of the fences are being monitored.

## ***2.3. Outcomes***

To observe the results of water management and land management work to maintain and improve habitat conditions for shorebirds within the Pak Thale Nature Reserve, we carried out regular monitoring of shorebird both species and numbers as an indicator of proper management for maintaining shorebird habitats. In summary during November 2020-October 2021, a total of 67 bird species were recorded (Supplementary Table 1). Globally threatened and near threatened species such as Spoon-billed Sandpiper, Great Knot and Spotted Greenshank were regularly recorded to roost and/or forage in the managed habitat.

During bird monitoring, we recorded 2 flagged Spoon-billed Sandpipers (Lime-green 77 and White P7 winter of 2020-2021), and a single unflagged Spoon-billed Sandpiper at Laem Phak Bia. This adds to a total of 6 birds since 2019 for this flyway network site. White P7 returned to Pak Thale for the 6th consecutive winter, while Lime-green 77 returned to Pak Thale for the 3rd consecutive winter; 2019, 2020 and October 2021. The team continued monitoring and results will be shared to promote this area.

However, the use of bamboo fences to manage coastal erosion did not appear to have adequately addressed the high rate of coastal erosions faced. BCST, DMCR and local community groups convened a few meetings to discuss how best to address the problem of coastal erosion on 15 March 2021, 26 August 2021 and September 2021. In 2022, some new techniques will be applied, currently this discussion has been undergoing discussion. In addition, discussions and meeting convened to review solutions in

managing coastal erosion in Pak Thale have strengthened bonds and collaboration across the different stakeholders at this critical time, while enabling the local action plan by local engagement to be implemented. More details can be found in the next section on local engagement.

However, coastal erosion has continued since 2019 when BCST purchased the 8ha lands. By the end of 2021 about 20% was lost (1.6 ha ) under water, depending on the tide. But this is not only a problem for BCST land, the local salt farmers and government areas are also in the same situation. Therefore the action plan with local stakeholders proposes provincial and national actions.



*Figure 1. Bamboo fences erected along the shoreline for managing coastal erosion at Pak Thale.*





*Figure 2. Habitat and water management for shorebirds. Works to create soil bunds and mounds and the construction of a water drainage system in Pak Thale's salt pans.*

### **3. Establishment of infrastructure for nature-based tourism**

#### ***3.1. Updates on establishment of new infrastructure***

Over the project period, we established new infrastructure at Pak Thale Nature Reserve to cater to the needs of visiting birdwatchers and ecotourists. By December 2020, a proposed birdwatching hide (dug into the ground) at the reserve was completed and now fully equipped with signage and information about birds and instructions for birdwatchers. Visitors now are able to observe shorebirds at eye-level. Spoon-billed Sandpipers, along with other shorebirds, were in fact observed from the hide throughout the reporting period. A visitor shelter at the entrance of Pak Thale Nature Reserve was renovated and installed with new information boards for visitors.

Presently, there are a few abandoned salt storage depots in the DMCR area that have potential for development for additional bird hides, information facilities and trails. The trails will pass the salt pan showing shorebird habitat and local salt farming practices, mangrove forest as nurseries for marine life and carbon storage, and the coastal line. We are planning for these salt storage depots to be managed and repaired to be used as resting points and repurposed as bird hides. Next step, we plan to develop the salt storage depots with informative and interactive signages to connect the stories of mud flats, mangrove forest and salt pan to shorebird and marine life conservation.

Alongside the development and improvement of these new facilities and infrastructure at Pak Thale, an administrative and promotion strategy is also being developed, with the view that BCST works towards a co-management system that involves the participation of community groups, especially with women. However due to COVID situation, the social events; on-site meetings and focal group discussion which were planned have been temporarily suspended and are planned for continuation in 2022.

BCST has promoted Pak Thale Nature Reserve via our online platform;

- 1) Websites: <https://www.bcst.or.th/th/>
- 2) Facebook pages:
  - BCST: <https://web.facebook.com/bcst.or.th>

- Pak Thale Nature Reserve: <https://web.facebook.com/PakThaleNR>



Figure 3 Flyer to promote about Spoon-Billed Sandpiper landing in Thailand

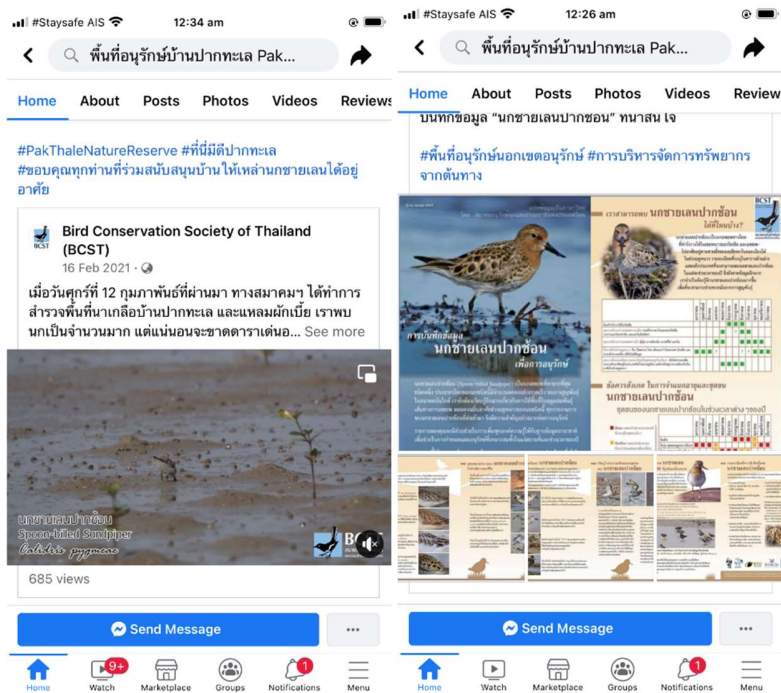


Figure 4 Pak Thale Nature Reserve promoting on our social media pages on Facebook

### 3.2. Summary of key outcomes

In summary, our work at Pak Thale has led to the establishment of a planned birdwatching hide and the installations of three sets of sign boards targeted at visitors. These include signage on dos and don'ts at

the site, and introductions to the area's bird diversity and conservation value. The installation of the new infrastructure was all done in close collaboration with the communities onsite.

In addition, we have made steady progress to promote our work at Pak Thale on social media platforms. For instance,

- 1) The setting up of a Pak Thale Nature Reserve page on social media, for 2020-2021, there were 779 followers and about 35 people checked in at Pak Thale (only domestic traveling permitted over 5 months).
- 2) Bird Conservation Society of Thailand Facebook page, for 2020-2021 there were 72585 followers, and there were at least 15,000 engagements per one post.

Going forward into 2022, we are now working to compile several years of shorebird monitoring data, which we plan to publish in bird conservation magazines and research journals. At least one paper is now in preparation by our staff team.







*Figure 5 Bird hide and information signs have been establishment in nature-based tourism by working with community*

## **4. Local engagement with the communities and local government units**

### **4.1. Overview of involvement with local communities**

Pak Thale Nature Reserve and the surrounding area of wetlands are used by local communities for salt farming. Here, a mosaic of natural and working wetlands are being managed for migratory species, and where local people continue to benefit from the value of the site for ecotourism and salt production. Currently, the local government has identified Pak Thale as one of the key tourist attractions in Phetchaburi province. Strong local engagement and participation of local communities in site management and conservation of the Pak Thale coastal landscape is critical for the long-term protection of this site.

### **4.2. Summary of key outcomes of local engagement**

#### **4.2.1. Local communities and local government units engagement and local committee of wetland management at Pak Thale Nature Reserve**

On 15 March 2021, BCST organized a stakeholder meeting at the Pak Thale Sub-district Municipal Office. The purpose of the meeting was to present the management plan for Pak Thale Nature Reserve and seek feedback and collaborations with the local stakeholders. Participants in the meeting included the Department of Marine and Coastal Resources (DMCR), the Tourism Authority of Thailand (Phetchaburi Office), Rajabhat University Phetchaburi and representatives of Pak Thale Sub-district Municipal Office. The meeting was then followed by a tour around Pak Thale Nature Reserve to emphasize the importance of the site and provide more ideas for future collaboration. Alongside this development, a local shorebird conservation committee, a stakeholder participation group, was established to promote birdwatching activities for tourism and engage local communities to ensure benefit sharing.

A key highlight following the meeting in March 2021 is the establishment of new collaboration frameworks to expand the reserve area for shorebirds between the local government, local community groups and BCST to strengthen shorebird conservation under the Urban Forest Project lead by local government agents; the Department of Marine and Coastal Resources, Subdistrict Administration Office. The area includes abandoned salt pans, mangrove forest and forest regeneration areas for a total area of 50 ha, located next to the BCST Pak Thale Nature Reserve. A memorandum of understanding was signed in early

of September 2021 between BCST, the Pak Thale subdistrict office, and DMCR. Under this new collaboration, a new nature education center will be developed to highlight information on migratory shorebirds.



*Figure 6 The overview of 50 ha of DMCR site for habitat management*



*Figure 7. The local conservation committee meeting organized before MOU was approved in Sept. 2021*

## 4.2.2. Capacity-building workshop to promote product-development to local community at Pak Thale

### 4.2.2.1 Community-based enterprises and product development

After a learning trip to Khok Kham, we organized a training workshop for the local conservation group which consisted of 10 participants at Pak Thale (Pak Thale Bird and Nature Conservation Club) for training on online marketing. BCST facilitated the process by producing Spoon-billed Sandpiper t-shirts for the local conservation group to sell. Presently, a community-based enterprise has been established at Pak Thale to encourage the local production of soap spa and artisanal salt at local shops. All profits from the sales of local products are expected to support the local conservation group's fund and community activities.



Figure 8 Community shop to sell local products related to shorebird conservation projects. This is also the bird center of the community.

### 4.2.2.2 Empowerment of youth groups – communicating shorebird conservation and Pak Thale Nature Reserve

We had initially planned to organize a capacity-building workshop on bird identification and local bird guide for local schools and the Pak Thale community, but had to cancel it due to COVID restrictions. Fortunately, the bird conservation club at Ratchapat Petchburi University, led by Dr. Narong Wongpanit and University students has reached out to BCST on collaborating on conservation activities to promote Pak Thale nature reserve.

We proceeded to share information on Pak Thale and organized a meeting with Dr. Narong Wongpanit on the Pak Thale project; shorebird and Pak Thale habitat, and then his students decided to organise a site visit to Pak Thale and promote it on social media platforms. Following this, about 100 students visited Pak Thale and collected numerous footages and photographs of the Pak Thale landscape, designed posters and made captions. Some of this new content created by students have since been shared on social media and the Pak Thale facebook site to promote shorebird conservation and Pak Thale nature reserve.



Figure 9. Working with local universities; Rachapat Petchburi University students visited the Pak Thale nature reserve and posted on social media to promote Spoon-billed sandpiper and the nature reserve.

## Supplementary

### Supplementary 1

Bird list and maximum count of the season. The table shows species were recorded in Pak Thale and Lam Pak Bia November 2020-October 2021

## Supplementary 1

Supplementary 1.1 Bird list and maximum numbers per season by species were recorded in Pak Thale and Lam Pak Bia November 2020-October 2021

Common name	IUCN status	Max count per month
Little Cormorant		647 (Sep)
Indian Cormorant		55 (Jan)
Painted Stork	NT	1059 (Sep)
Grey Heron		12 (Jan)
Javan Pond-heron		6 (Feb)
Little Egret		219 (Apr)
Great Egret		426 (Mar)
Intermediate Egret		72 (Nov)
Pacific Reef Egret		3 (Sep)
Striated Heron		35 (Sep)
Pacific Golden Plover		275 (Jan)
Grey Plover		460 (Jan)
Kentish Plover		1831 (Oct)
Lesser Sand Plover		5466 (Nov)
Greater Sand Plover		2878 (Oct)
Little Ringed Plover		6 (Oct)
Black-tailed Godwit	NT	1748 (Feb)
Common Redshank		311 (Oct)
Common Greenshank		115 (Jan)
Marsh Sandpiper		1675 (Nov)
Wood Sandpiper		3 (Oct)
Spoon-billed Sandpiper	CR	2 (Nov)
Curlew Sandpiper	NT	2050 (Nov)
Broad-billed Sandpiper		1318 (Nov)
Common Sandpiper		5 (Oct)
Ruddy Turnstone		26 (Dec)
Red-necked Stint	NT	2908 (Oct)
Long-toed Stint		46 (Feb)
Red Knot	NT	300 (Nov)
Great Knot	EN	2912 (Sep)

Black-winged Stilt		685 (Nov)
Brown-headed Gull		240 (Mar)
Common Tern		646 (Aug)
Gull-billed Tern		301 (Nov0)
White-winged Black Tern		432 (Dec)
Whiskered Tern		696 (Nov)
Little Tern	NT	1093 (Aug)
Caspian Tern		537 (Jan)
Sanderling		69 (Dec)
Whimbrel		920 (Aug)
Eurasian Curlew	NT	911 (Oct)
Asian Dowitcher	NT	46 (Nov)
Bar-tailed Godwit	NT	385 (Jan)
Ruff		24 (Nov)
Terek Sandpiper		370 (Dec)
Dunlin		1 (Dec)
Red-necked Phalarope		74 (Dec)
Lesser Whistling-duck		2 (Jun)
Spot-billed Pelican	NT	178 (Sep)
Pied Avocet		2 (Oct)
Spotted Redshank		417 (Oct)
Nordmann's Greenshank	EN	46 (Jan)
Temminck's Stint		3 (Nov)
Great Crested Tern		8 (Feb)
Grey-headed Lapwing		2 (Feb)
Slender-billed Gull		1 (Feb)
Black-tailed Gull		1 (Feb)
Northern Shoveler		5 (Feb)
Grey Heron		24 (Apr)
Striated Heron		1 (Mar)
Indian Pond-heron		1(May)
Black-crowned Night-Heron		2 (May)
Black Bittern		1 (Jun)
<b>Total</b>		34993

Supplementary 1.2 Monthly Bird survey of 14 spots in Pak Thale and Laem Pak Bia January-October 2021. The data were collected once per month by field staff of BCST. The location is presented under the table by the map and details.

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
<b>Asian Dowitcher</b>	7					1		45	1	20				1	75
Aug 2021								45						0	45
Feb 2021										7				0	7
Jan 2021	7									12				0	19
Oct 2021									1					0	1
Sept 2021						1				1				1	3
<b>Bar-tailed Godwit</b>						19		199	213	349	70			0	850
Aug 2021								33						0	33
Feb 2021									12	22	70			0	104
Jan 2021								120	135	130				0	385
Mar 2021								3	1	197				0	201
Oct 2021						19		43	65					0	127
<b>Black Bittern</b>	1													0	1
Jun 2021	1													0	1
<b>Black-crowned Night Heron</b>											1			0	1
Jun 2021											1			0	1
<b>Black-crowned Night-Heron</b>	2													0	2
May 2021	2													0	2
<b>Black-tailed Godwit</b>	553						340	125	320	520	1090			0	2948
Feb 2021	13						340	35	160	280	920			0	1748
Jan 2021	540							90	160	240	170			0	1200
<b>Black-tailed Gull</b>									1		1			0	2
Feb 2021											1			0	1
Oct 2021									1					0	1
<b>Black-winged Stilt</b>	411		6	6	3	68	189	261	211	133	322	76	55	36	1777
April 2021	13						7	21	13	14	17			0	85
Aug 2021	4						14	9	14		8			0	49

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Feb 2021	68						70	40	30	12	50			0	270
Jan 2021	240						30	70	28	22	70			0	460
July 2021	16						13	14	16	10	29			0	98
Jun 2021	6						12	13	18	7	24			0	80
Mar 2021	18						15	15	20	30	67			0	165
May 2021	39						28	28	22	14	14			0	145
Oct 2021						53		37	27	15	31	76	37	32	308
Sept 2021	7		6	6	3	15		14	23	9	12		18	4	117
<b>Broad-billed Sandpiper</b>				9		151	220	247	815	771	957	64	51	43	3328
April 2021								33	13		37			0	83
Aug 2021								25	11					0	36
Feb 2021							20		40	310	760			0	1130
Jan 2021								80	170	185				0	435
Mar 2021							200		55	270				0	525
Oct 2021						97		109	379		124	38	32	27	806
Sept 2021				9		54			147	6	36	26	19	16	313
<b>Brown-headed Gull</b>	78						73	91	48		187			0	477
April 2021	17						3	1			13			0	34
Feb 2021	55						40				30			0	125
Jan 2021							30							0	30
Mar 2021	6							90			144			0	240
Oct 2021									48					0	48
<b>Caspian Tern</b>	12						240	587	26	10	27			0	902
April 2021	11								13		7			0	31
Feb 2021	1						30	94	7	7	5			0	144
Jan 2021							210	320	4	3				0	537
Mar 2021								170	2		15			0	187
May 2021								3						0	3
<b>Common Greenshank</b>	29			2	6	20	20	59	60	73	150	4	14	13	450
April 2021	4						3	21		3	14			0	45



Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Aug 2021	2						1	2	2		2			0	9
Feb 2021	2						15		16	27	34			0	94
Jan 2021	16							18	32	26	23			0	115
July 2021									1		2			0	3
Jun 2021	1							2						0	3
Mar 2021	1							6			60			0	67
May 2021	1						1	1						0	3
Oct 2021						7		4	3	4	4	4	7	10	43
Sept 2021	2			2	6	13		5	6	13	11		7	3	68
<b>Common Redshank</b>	16		3	11		61	119	52	155	112	162	161	40	44	936
April 2021								7	4	3	19			0	33
Aug 2021							3	21	7	7	17			0	55
Feb 2021							65		20	36	10			0	131
Jan 2021	16							15	29	42	27			0	129
July 2021								1			3			0	4
Jun 2021								4						0	4
Mar 2021							50		25		17			0	92
May 2021							1		11					0	12
Oct 2021						44			41	9	27	79	21	37	258
Sept 2021			3	11		17		4	18	15	42	82	19	7	218
<b>Common Sandpiper</b>	4			1				2	1		1	1	1	0	11
April 2021	1													0	1
Feb 2021	1													0	1
Jan 2021								2	1					0	3
Oct 2021											1	1	1	0	3
Sept 2021	2			1										0	3
<b>Common Tern</b>	136			21		36	7	516	1517		431	24	70	40	2798
April 2021								2	188		6			0	196
Aug 2021	36							210	247		153			0	646
Feb 2021	53							150	110					0	313

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Jan 2021									170					0	170
July 2021	18								12		2			0	32
Jun 2021								47						0	47
Mar 2021									480					0	480
May 2021							7	70	67					0	144
Oct 2021						4					270	24	6	9	313
Sept 2021	29			21		32		37	243				64	31	457
<b>Curlew Sandpiper</b>	266					135	290	417	748	795	287	30	28	64	3060
April 2021	41							105	19		70			0	235
Aug 2021								48	68					0	116
Feb 2021	45						50	20	37	315	45			0	512
Jan 2021	180						40	70	320	230	80			0	920
July 2021									1					0	1
Mar 2021							200		165	250	25			0	640
May 2021								2						0	2
Oct 2021						132		172	134		61	27	28	32	586
Sept 2021						3			4		6	3		32	48
<b>Dunlin</b>									2					0	2
Aug 2021									1					0	1
Oct 2021									1					0	1
<b>Eastern Black-tailed Godwit</b>						245		235	346	93	9	4		36	968
April 2021								9						0	9
Aug 2021								13						0	13
Mar 2021								40	1	93				0	134
Oct 2021						245		173	345		9	4		7	783
Sept 2021														29	29
<b>Eastern Great Egret</b>	229			2	5	14	173	31	11	32	161	12	42	29	741
April 2021	85						27	9	5	7	115			0	248
Aug 2021							47		2	4	12			0	65
July 2021	24						5	3	1		6			0	39

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Jun 2021	14						11	2		4	16			0	47
Mar 2021	48						1	13	2	9	1			0	74
May 2021	52						82				3			0	137
Oct 2021						12		4		4	5	9	6	5	45
Sept 2021	6			2	5	2			1	4	3	3	36	24	86
<b>Eurasian Curlew</b>								2189	557	123				0	2869
April 2021								75	179					0	254
Aug 2021								470	178	43				0	691
Feb 2021								26						0	26
Jan 2021								240	70	80				0	390
July 2021								6						0	6
Jun 2021								1						0	1
Mar 2021								590						0	590
Oct 2021								781	130					0	911
<b>Great Crested Tern</b>								7	1					0	8
Feb 2021								7	1					0	8
<b>Great Egret</b>	35						28	42	10	42	48			0	205
Feb 2021	19						22	20	3	12	25			0	101
Jan 2021	16						6	22	7	30	23			0	104
<b>Great Knot</b>				394			300	1450	427	620	2548	1047	484	848	8118
Aug 2021									37		23			0	60
Feb 2021							300	230	150	430	350			0	1460
Jan 2021								190	240	190	40			0	660
Mar 2021								1030			1200			0	2230
Oct 2021											360	214	49	173	796
Sept 2021				394							575	833	435	675	2912
<b>Greater Sand Plover</b>	32	23		173		581	68	1071	1715	305	1244	158	227	462	6059
April 2021							67	4	62	5	195			0	333
Aug 2021								112	570	12	174			0	868
Feb 2021	7							18	54	160	30			0	269

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Jan 2021								25	122	60	90			0	297
July 2021								13	27		4			0	44
Jun 2021								8	2		4			0	14
Mar 2021	25							100	75	55	28			0	283
May 2021							1	2	2	1				0	6
Oct 2021						374		764	474		638	36	65	214	2565
Sept 2021		23		173		207		25	327	12	81	122	162	248	1380
<b>Grey Heron</b>	8				1		1	4	2	4	3	1		2	26
April 2021	2										2			0	4
Feb 2021	1							1						0	2
Jan 2021	3							3	2	4				0	12
Jun 2021	1													0	1
Mar 2021	1						1				1			0	3
Oct 2021												1		0	1
Sept 2021					1									2	3
<b>Grey Plover</b>	6	3		14		44	70	407	174	189	362	66	28	69	1432
April 2021	1							4			33			0	38
Aug 2021								15		2	4			0	21
Feb 2021	1						50	140	25	55	40			0	311
Jan 2021								90	115	65	190			0	460
July 2021								1			2			0	3
Jun 2021								1						0	1
Mar 2021							20	120	20	67	6			0	233
May 2021								3	2					0	5
Oct 2021						27		24	5		59	47	21	32	215
Sept 2021	4	3		14		17		9	7		28	19	7	37	145
<b>Grey-headed Lapwing</b>	2													0	2
Feb 2021	2													0	2
<b>Gull-billed Tern</b>						43	15	235	311	180	11	6	7	0	808
April 2021								6	19	8				0	33

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Aug 2021									5					0	5
Feb 2021							15		86	35	7			0	143
Jan 2021									60	130				0	190
Mar 2021									20					0	20
Oct 2021						24		174	85				7	0	290
Sept 2021						19		55	36	7	4	6		0	127
<b>Grey Heron</b>	3	0	0	0	0	0	8	6	5	37	12	0	0	0	71
April 2021							6		4	9	6			0	25
Jun 2021										4	3			0	7
July 2021								4		4				0	8
Mar 2021	3						2	2		5				0	12
May 2021									1	5	3			0	9
Oct 2021										10				0	10
<b>Indian Cormorant</b>								13	4	6	32			0	55
Jan 2021								13	4	6	32			0	55
<b>Indian Pond-heron</b>	1								1					0	2
Jun 2021	1													0	1
May 2021									1					0	1
<b>Intermediate Egret</b>	18							15	2	18				0	53
Jan 2021	18							15	2	18				0	53
<b>Javan Pond Heron</b>							2							0	2
May 2021							2							0	2
<b>Javan Pond-heron</b>	6													0	6
Feb 2021	6													0	6
<b>Kentish Plover</b>	45	17		39		318	61	717	1182	388	969	335	112	231	4414
April 2021							34	2	13	6	91			0	146
Aug 2021	9							170	423	16	124			0	742
Feb 2021	15						27	30	115	140	40			0	367
Jan 2021								75	64	56	32			0	227
July 2021								9	13		7			0	29

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Jun 2021								7			5			0	12
Mar 2021	18							70	35	145	97			0	365
May 2021	3							1		1				0	5
Oct 2021						194		324	247		493	161	39	59	1517
Sept 2021		17		39		124		29	272	24	80	174	73	172	1004
<b>Lesser Sand Plover</b>	129	5		12		143	102	863	2544	1028	1067	145	22	37	6097
April 2021							84	15	95	13	364			0	571
Aug 2021	3							220	160	7	63			0	453
Feb 2021	1							25	46	115	27			0	214
Jan 2021	65						18	170	1700	700	170			0	2823
July 2021								3	5					0	8
Mar 2021	30							350	390	189	375			0	1334
May 2021	30													0	30
Oct 2021						130		73	134		58	129	17	19	560
Sept 2021		5		12		13		7	14	4	10	16	5	18	104
<b>Lesser Whistling-duck</b>	2													0	2
Jun 2021	2													0	2
<b>Little Cormorant</b>	224		3	27	37	54	466	263	37	38	540	84	246	319	2338
April 2021	1							4	4	4	69			0	82
Aug 2021							16	3	3	3	7			0	32
Feb 2021	35						320	75		20	50			0	500
Jan 2021								18	7	4	45			0	74
July 2021							20	4	2		19			0	45
Jun 2021	85						50	2	2		56			0	195
Mar 2021							20	133	3	7				0	163
May 2021	71						40		3		7			0	121
Oct 2021						31		24	13		273	72	22	44	479
Sept 2021	32		3	27	37	23					14	12	224	275	647
<b>Little Egret</b>	306			4	4	26	169	127	26	59	155	11	33	49	969
April 2021	65						14	97	7	4	32			0	219

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Aug 2021	3						32	4	1	5	6			0	51
Feb 2021	37						15		6	14	20			0	92
Jan 2021	25						3				40			0	68
July 2021	1						4	5	1	3	10			0	24
Jun 2021	12						7	3		4	24			0	50
Mar 2021	70						1	7	3	7				0	88
May 2021	80						93	1	4	2	11			0	191
Oct 2021						19		7		13	5	6	13	10	73
Sept 2021	13			4	4	7		3	4	7	7	5	20	39	113
<b>Little Ringed Plover</b>							3			1	9	1	1	0	15
Feb 2021											5			0	5
Mar 2021							3				2			0	5
Oct 2021										1	1	1	1	0	4
Sept 2021											1			0	1
<b>Little Stint</b>									1					0	1
Oct 2021									1					0	1
<b>Little Tern</b>	584			15		68	276	907	1842	14	500	65	92	45	4408
April 2021	22						70	25	77		48			0	242
Aug 2021	173						19	348	375		178			0	1093
Feb 2021	135						150	70	320		130			0	805
Jan 2021	42								40		40			0	122
July 2021	87						8	32	28		16			0	171
Jun 2021	14						6	12	18		18			0	68
Mar 2021	20							20	85					0	125
May 2021	23						23	32	25		9			0	112
Oct 2021						31		295	499		23	28	19	14	909
Sept 2021	68			15		37		73	375	14	38	37	73	31	761
<b>Long-toed Stint</b>	7			1			11	4	5	37	11			0	76
Feb 2021	3						7		1	35				0	46
Jan 2021	4										6			0	10

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Mar 2021							4	3	3		3			0	13
Sept 2021				1				1	1	2	2			0	7
<b>Marsh Sandpiper</b>	558		8	16	19	294	437	476	417	636	587	108	77	123	3756
April 2021	47						17	74	36	17	17			0	208
Aug 2021	2							70						0	72
Feb 2021	26						70	28	35	260	55			0	474
Jan 2021	418						150	130	145	170	320			0	1333
Jun 2021								1						0	1
Mar 2021	25						200	3	39	150	45			0	462
May 2021	24								45					0	69
Oct 2021						211		158	78	22	107	62	36	76	750
Sept 2021	16		8	16	19	83		12	39	17	43	46	41	47	387
<b>Nordmann's Greenshank</b>				7	0	0	27	0	31	23	19	0	3	1	111
Mar 2021											18				18
April 2021									8					0	8
Feb 2021							27							0	27
Jan 2021									23	23				0	46
Sept 2021				7									3	0	10
Oct 2021											1			1	2
<b>Northern Shoveler</b>							5							0	5
Feb 2021							5							0	5
<b>Pacific Golden Plover</b>	7			3		7	44	73	99	137	83	22	29	18	522
April 2021	1							3						0	4
Feb 2021	1						40		3	40	25			0	109
Jan 2021	4						4	70	90	70	37			0	275
July 2021									1		2			0	3
Jun 2021	1													0	1
Mar 2021									5	27	2			0	34
Oct 2021						5					14	19	24	14	76
Sept 2021				3		2					3	3	5	4	20



Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
<b>Painted Stork</b>	995		7	13	275		736	81	3		103	21	358	335	2927
April 2021	350						63	64			53			0	530
Aug 2021	5						28							0	33
Feb 2021							10							0	10
July 2021	89						143				6			0	238
Jun 2021	54						220				36			0	310
Mar 2021	250							4						0	254
May 2021	186						272	13	3					0	474
Oct 2021											1	14	4	0	19
Sept 2021	61		7	13	275						7	7	354	335	1059
<b>Pied Avocet</b>											1			1	2
Oct 2021											1			1	2
Red Knot				14			35	110	102	143	546	44	7	31	1032
Aug 2021									4		4			0	8
Feb 2021							35		8	18				0	61
Jan 2021								110	90	125				0	325
Mar 2021											500			0	500
Oct 2021											23	37	4	14	78
Sept 2021				14							19	7	3	17	60
<b>Red-necked Phalarope</b>	16						2	14	51		21			0	104
Feb 2021								14	6		12			0	32
Jan 2021	16								40		1			0	57
May 2021							2							0	2
Oct 2021											8			0	8
Sept 2021									5					0	5
<b>Red-necked Stint</b>	508			79		443	360	877	1916	4172	1411	265	156	167	10354
April 2021	56							12		500	120			0	688
Aug 2021								37	170	278	47			0	532
Feb 2021	16						40	110	120	750	225			0	1261
Jan 2021	240						320	170	450	230	24			0	1434

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
July 2021								32						0	32
Jun 2021	2							2						0	4
Mar 2021	150								150	2300	350			0	2950
May 2021	44							55	25	40				0	164
Oct 2021						375		435	854	37	599	181	124	58	2663
Sept 2021				79		68		24	147	37	46	84	32	109	626
<b>Ruddy turnstone</b>								4	10	3	1			0	18
April 2021									4					0	4
Aug 2021										1	1			0	2
July 2021								1						0	1
Mar 2021									6					0	6
May 2021								1		2				0	3
Oct 2021								2						0	2
<b>Ruddy Turnstone</b>									16		4			0	20
Feb 2021									16					0	16
Jan 2021											4			0	4
<b>Ruff</b>	20						8				9			1	38
April 2021											1			0	1
Feb 2021	7						5				7			0	19
Jan 2021	13													0	13
Mar 2021							3							0	3
Oct 2021											1			1	2
<b>Sanderling</b>	7			3		7	1	19	72		7			4	120
Aug 2021									32					0	32
Feb 2021									1		7			0	8
Jan 2021	7							6	22					0	35
Mar 2021									15					0	15
May 2021							1	13	1					0	15
Sept 2021				3		7			1					4	15
<b>Slender-billed Gull</b>											2			0	2

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
April 2021											1			0	1
Feb 2021											1			0	1
<b>Spoon-billed Sandpiper</b>									1	2	1			0	4
April 2021										1				0	1
Feb 2021										1				0	1
Jan 2021									1		1			0	2
<b>Spot-billed Pelican</b>	21				23		57				43	12	81	73	310
April 2021	3													0	3
July 2021							31							0	31
Jun 2021							26				43			0	69
Mar 2021	18													0	18
Oct 2021												11		0	11
Sept 2021					23							1	81	73	178
<b>Spotted Redshank</b>	115		9	3		21	120	96	210	152	138	191	59	74	1188
April 2021							6	15	7	11	31			0	70
Aug 2021							4	32	16	16	13			0	81
Feb 2021	47						60		18	30				0	155
Jan 2021	65							40	70	65	43			0	283
July 2021								2						0	2
Jun 2021								1						0	1
Mar 2021							50		10		1			0	61
May 2021									2					0	2
Oct 2021						21			74	17	27	137	37	63	376
Sept 2021	3		9	3				6	13	13	23	54	22	11	157
<b>Striated Heron</b>	8	1	1	1			6	8	2	6	4		3	0	40
April 2021	1													0	1
Aug 2021	1						3	1		2				0	7
July 2021	1						1	1	1	2	2			0	8
Jun 2021								3		1	1			0	5
Mar 2021	3							1						0	4

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
May 2021							2	1	1		1			0	5
Oct 2021								1		1			1	0	3
Sept 2021	2	1	1	1									2	0	7
<b>Temminck's Stint</b>											1			0	1
Oct 2021											1			0	1
<b>Temminck's Stint</b>							4							0	4
Feb 2021							2							0	2
Mar 2021							2							0	2
<b>Terek Sandpiper</b>								331	783	11				0	1125
April 2021									24					0	24
Aug 2021									129					0	129
Feb 2021								76	150	4				0	230
Jan 2021								40	250	7				0	297
July 2021								29						0	29
Jun 2021								5						0	5
Mar 2021									80					0	80
May 2021								2						0	2
Oct 2021								179	150					0	329
<b>Whimbrel</b>								582	478	502	1			0	1563
April 2021									76	7				0	83
Aug 2021								225	320	375				0	920
Feb 2021										57				0	57
Jan 2021										27				0	27
July 2021								27						0	27
Jun 2021								17	12	20	1			0	50
Mar 2021								70						0	70
May 2021								3		1				0	4
Oct 2021								240	70	15				0	325
<b>Whiskered Tern</b>	32			4		14	47	43	249	123	97	13	23	3	648
April 2021									31		4			0	35

Species and month	P1	P10	P11	P12	P13	P14	P2	P3	P4	P5	P6	P7	P8	P9	Grand Total
Aug 2021	13							21	39		8			0	81
Feb 2021							30		25		60			0	115
Jan 2021									70	120				0	190
July 2021	9								3		5			0	17
Jun 2021								11						0	11
Mar 2021	5								20		5			0	30
May 2021							17	7						0	24
Oct 2021						3			37		3	9	6	3	61
Sept 2021	5			4		11		4	24	3	12	4	17	0	84
<b>White-winged Black Tern</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>34</b>	<b>43</b>	<b>98</b>	<b>8</b>	<b>44</b>	<b>15</b>	<b>4</b>	<b>2</b>	<b>264</b>
Feb 2021											25			0	25
April 2021	4								24		9			0	37
Aug 2021								7	27					0	34
July 2021	7								4					0	11
Mar 2021									3					0	3
May 2021							34	30	7					0	71
Oct 2021									21	6	6	12	4	2	51
Sept 2021	3			2				6	12	2	4	3		0	32
<b>Wood Sandpiper</b>											1			0	1
Oct 2021											1			0	1
<b>Grand Total</b>	<b>5457</b>	<b>49</b>	<b>37</b>	<b>876</b>	<b>373</b>	<b>2813</b>	<b>5174</b>	<b>13947</b>	<b>17859</b>	<b>11915</b>	<b>14485</b>	<b>2986</b>	<b>2353</b>	<b>3201</b>	<b>81525</b>

Map show the survey points of Pak Thale and Laem Pak Bia, Petchburi

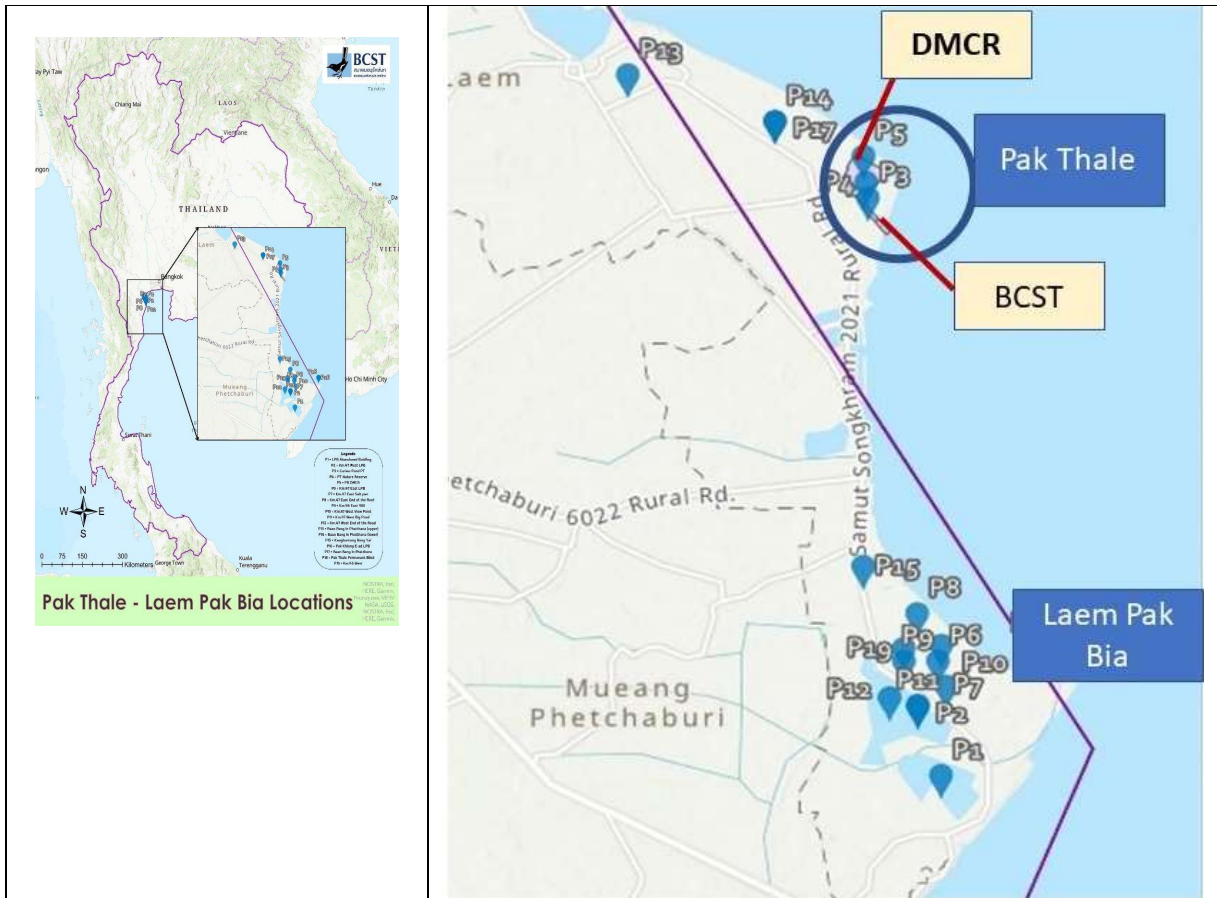


Table 1.3 Code of data collection points with latitude and longitude

Location code	X/Lat	Y/Long
P1 = LPB Abandoned Building	616759.5	1441046
P2 = Km.47 West Liam Pak Bia	616292.8	1442530
P3 = Curlew Pond Pak Thale	615250.6	1453472
P4 = Pak Thale Nature Reserve	615210.7	1453809
P5 = DMCR management area	615157.4	1454372
P6 = Km.47 East Liam Pak Bia	616688.2	1443509
P7 = Km.47 East Salt pan	616754.2	1443850
P8 = Km.47 East End of the Roof	616269.2	1444530
P9 = Km.46 East 400	616010.4	1443502
P10 = Km.47 West View Point	616853.1	1442970
P11 = Km.47 West Big Pond	616290.5	1442560
P12 = Km.47 West End of the Road	615727.8	1442713
P13 = Baan Bang In Phatthana (upper)	610455	1456106
P14 = Baan Bang In Phatthana (lower)	613392.5	1455116