GULF OF MOTTAMA PROJECT (GOMP)

MONITORING OF MIGRATORY SHOREBIRDS AT GULF OF MOTTAMA

Pyae Phyo Aung, Saw Moses, Shane Thu Lwin, Gideon
Nyan Lin, Christoph Zöckler

ArcCona Consulting and Nature Conservation Society (NCS)
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2. SURVEY METHODS

Study Area

Before conducting the ground survey, previous survey results were reviewed particularly for the same survey area in 2020, to monitor the shorebird population with the suitability habitat assessment with Landsat 8 from USGS. Apart from Koe Tae Su, all other mudflat areas visited last year were revisited this year again, Areas near the main channel changed considerably within the last year (see Figure 1). The survey was carried out at the same core area in eastern Gulf of Mottama as in 2020 from 24-31 January 2021. This year survey team was forced to depart from the Aung Thar Dan village located at the Yangon Region, due to COVID-19 restrictions and crossed the channel first into Mon State by bigger boat on the 24th January 2021. There was not enough water to move the big boat at first and the survey team investigated the shorebirds nearby. On the second day on the 25th January 2021, the water level was high enough during the afternoon high tide and the boat started to move closer to the channel. The survey at the west coast was carried out for one day on 26th January 2021. The survey area was very muddy and small mangrove stands were found near the boat anchor point. Due to boat anchor and water level problems of the big boat, the survey team spent two days at the west coast. In mean time, small boats from eastern Gulf of Mottama departed on the 26th January 2021 for meeting the survey team at the assembly point at the survey point on 27th January 2021. On the 27th January evening, all the boats from east and west are gathering at the east coast and transferred the field gears to the small boats for the survey at the east coast, the big boat was anchored at a safe area to wait for the survey members to return back. The survey was timed to cover the highest spring tide because the boats could access all of the intertidal sandflats only during the high spring tide period and because shorebirds are likely to be concentrated at spring tides and gather in large flocks. This way we were less likely missing large flocks and counted the total numbers of small shorebirds (Aung *et al.* 2016, 2017, 2018, 2019, 2020)

Field surveys

The survey team was transported to as many parts of the study area as possible in shallow-draft fishing boats, which were grounded on the mud in the intertidal zone at low tide to allow observation of birds from the boat and on foot. In this way, the observers were able to conduct scan surveys throughout the daylight period of tidal cycles and at a wide range of elevations relative to the high and low water marks. Following a protocol outlined in Aung *et al.* (2018), the surveyors were separated into 5-7 directions. Surveyors walked across the mudflat during low tide, diverging from the place where the boat was grounded, and also viewed birds from the boats, especially when the tide was high. Surveyors used spotting scopes and binoculars to record number of waterbirds during each scan and also estimated total number of shorebirds, especially during high tide.

Spoon-billed Sandpiper counts

Counting Spoon-billed Sandpipers at any wintering site is challenging, because they are rare and usually dispersed within large flocks of other small shorebirds, especially the similarly coloured and sized Red-necked Stint *Calidris ruficollis*. In the Upper Gulf of Mottama, complete direct counts of Spoon-billed sandpipers are not possible because of the large numbers of other small shorebirds that must be checked, the large size of the intertidal area, day-to-day variation in the extent and location of foraging habitats exposed at low tide and frequent changes in the location of high tide roosts. Roosts are often on very soft substrates making it impossible to approach them before the birds leave on the falling tide. Therefore, in order to estimate the total number of Spoon-billed Sandpiper the flock-count method (described below) was applied along with exact counts of true observations.

Flock-counts

Each group of observers included surveyors experienced in shorebird identification, scanned flocks of resting and foraging small shorebirds using a telescope. A flock can vary between 30 and 1000 birds. A scan consisted of a search by one observer through a group of small shorebirds, at the end of which the numbers of small shorebirds of each species were recorded, together with the date and time of the record and the

location, with a GPS. An individual Spoon-billed Sandpiper was only included in the scan record if it was seen well enough to be sure whether it was a Spoon-billed Sandpiper or not and observers were trained to spend enough time observing each bird do this accurately. Training was given by the experienced observers to achieve consistency. Some scans were conducted by inexperienced observers for training purposes and checked by a repeat survey of the same flock by an experienced observer.
Shorebird species present, in addition to Spoon-billed Sandpipers, mostly comprised *Calidrid* sandpipers (Curlew Sandpiper *Calidris ferruginea*, Broad-billed Sandpiper *Calidris falcinellus* and Red-necked Stint) and plovers (Greater Sandplover *Charadrius leschenaultia*, Lesser Sandplover *Charadrius mongolus*, Kentish Plover *Charadrius alexandrinus* and Little Ringed Plover *Charadrius dubius*). These species tended to feed and roost in mixed species flocks and were readily distinguished at a distance on the ground and in flight.

Analysis

The total proportion of small waders is based on the average mean of each species within all submitted flocks across all observers. The total number of small shorebird species is than extrapolated based on the estimates of the overall flock size of small waders. As the latter varies between counters and is likely more inaccurate than the actual flock counts, the total number of SBS and other species varies widely according to the range of overall flock size estimates. In 2021 there was pretty much agreement on the size of the flock of small waders.

Further analysis is based on the proportion of the flagged birds across all winter survey sites. This could provide another indicator on the overall population size.

Survey Team Members in 2021

Two members from BANCA joined this year **NCS and ArcCona** 2021 survey. The team was also accompanied by the film company "Tagu" films team members. Christoph Zöckler of ArcCona & The Spoon-billed Sandpiper Task Force could not take part and advised the team remotely.

Sl. #	Name	Organization
1	Pyae Phyo Aung	Nature Conservation Society
2	Saw Moses	Nature Conservation Society
3	Gideon @ Sa Myo Zaw	Nature Conservation Society
4	Nyan Linn	Nature Conservation Society
5	Shane Thu Lwin	Nature Conservation Society
6	Arkar Chan Nyi	Nature Conservation Society
7	Min Thiha Zaw	Biodiversity and Nature Conservation Association
8	Lay Win	Biodiversity and Nature Conservation Association

3. RESULTS & DISCUSSION

A total of 56,681 waterbirds of 48 species in total were recorded in the Gulf of Mottama between 24 January and 1 February 2021. Of these, the large majority of over 46,600 shorebirds of 27 different species were identified. The estimated number of small waders was about 56,000 in the survey areas. This is again much lower than observed in previous years and can only partly explained by a marginally smaller coverage of the survey area. About 8,000 birds comprise of gulls, terns herons and egrets.

The most abundant species in 2021 were Black-tailed Godwit (NT), Kentish Plover and Lesser Sand Plover, Whiskered and White-winged Terns and, but again the latter two terns in smaller numbers than in 2019 and previous (see Table 1). Both, Black-tailed Godwit and Kentish Plover have increased but the latter not yet to its previous maximum total of 10,000-20,000 in 2009-2012 (Zöckler et al 2014). The Black-tailed Godwit though has increased considerably also to levels that have not been observed at any time previously (e.g. Zöckler et al 2014, Aung et al. 2016, 2019 and 2020). However Red-necked and Little Stint were in lower numbers again and also Curlew and Broad-billed Sandpiper continued to decline (highlighted in red in Table 1). Highest concentration of shorebirds (estimated 15,000 on 26. Jan compared to 42,000 on the same day in 2019, Aung et al 2019) were seen during high tide. (see also map for dates).

Table 1: Summary results of the key common shorebird species during the 2020 mid-winter count period in the Gulf of Mottama in comparison with 2019 and 2020 (Aung et al 2019, 2020), increasing species marked in green , declining in red.

Species	Scientific name	No in 2021	No. in 2020	No. in 2019
Lesser Sandplover	*Charadrius mongolicus*	6,340	14,508	16,385
Red-necked/Little Stint	*Calidris ruficollis/minuta*	3,884	4,760	7,690
Curlew Sandpiper	*Calidris ferruginea*	2,235	4,512	3,003
Kentish Plover	*Charadrius alexandrinus*	7,107	3,727	10,997
Pallas' Gull	*Larus ichthyaetus*	2,988	2,835	84
Whiskered/White-winged tern	*Chlidonias hybrida /leucoptera*	5,925	2,435	8,088
Black-tailed Godwit	*Limosa limosa*	14,392	2,310	5,625
Broad-billed Sandpiper	*Calidris falcinellus*	856	2,138	1,909
Redshank	*Tringa totanus*	5,378		

Also, 16 raptors (birds of prey) of 4 species were recorded during the survey. But the globally threatened Spotted Eagle wasn't observed this year.

4.1 Red-listed Species

A total of three globally threatened and eight globally near-threatened (NT) species have been recorded (see table 2). The red-listed include the globally critically endangered Spoon-billed Sandpiper (CR), which is more discussed in detail as well as the globally endangered Great Knot (EN) and the globally vulnerable Greater Spotted Eagle. This is similar to last year's records but Red Knot has been recorded in previously unknown high triple figures and it could indicate a shift of this species from Australian wintering grounds to more northern sites. While the species has not been recorded in the previous two years it was known from 2008-2012 period when on average 20-40 birds were observed (Zöckler et al. 2014). However feeding habitat is not ideal for this species mainly feeding on small bivalves. Black-headed Ibis declined but were still present. Equal numbers could be still present further south where the survey was not undertaken in 2021.

The numbers of Black-tailed godwits are very high and not recorded at this level in any survey year before, reflecting a possible increase or shift of the species. The current flyway population is estimated at 140,000 birds and the population found wintering in the GoM represents 10% of the flyway population.

Table 2: Globally threatened species recorded in the 2020 survey period in the Gulf of Mottama. Figures in brackets refer to 2019 values (Aung et al. 2019) *For Spoon-billed Sandpiper a separate more extensive analysis is below. Species marked in green were increasing and in red declining.

Species		IUCN	Total No. 2021	Total No. 2019	Total No. 2020
Spoon-billed Sandpiper*	*Calidris pygmeus*	CR	42	112	114
Great Knot	*Calidris tenuirostris*	EN	84	153	32
Greater Spotted Eagle	*Aquila clanga*	VU	-	-	1
Black-tailed Godwit	*Limosa limosa*	NT	14,392	2310	5,625
Bar-tailed Godwit	*Limosa lapponica*	NT	24	21	4
Eurasian Curlew	*Numenius arquata*	NT	1264	280	597
Asiatic Dowitcher	*Limnodromus semipalmatus*	NT	2	49	-
Red Knot	*Calidris canutus*	NT	478	-	-
Red-necked Stint/Little Stint	*Calidris ruficollis/minuta*	NT	3,884	7,690	4760
Curlew Sandpiper	*Calidris ferruginea*	NT	2,235	4512	3,003
Painted Stork	*Mycteria leucocephala*	NT	55	-	1
Black-headed Ibis	*Threskiornis melanocephalus*	NT	13	-	32

4.2 Spoon-billed Sandpiper (SBS)

The survey team observed only a total of 17 SBS from 3 different locations in the survey period from 24 Jan- 2 Feb (see Fig 2). From 1-2 February previous locations of this survey were revisited and hence their numbers of six additional sightings were not added. There is still some possible overlap in numbers, but observations of time and observer during the day were exchanged on return to the camp so that double counting was minimised.

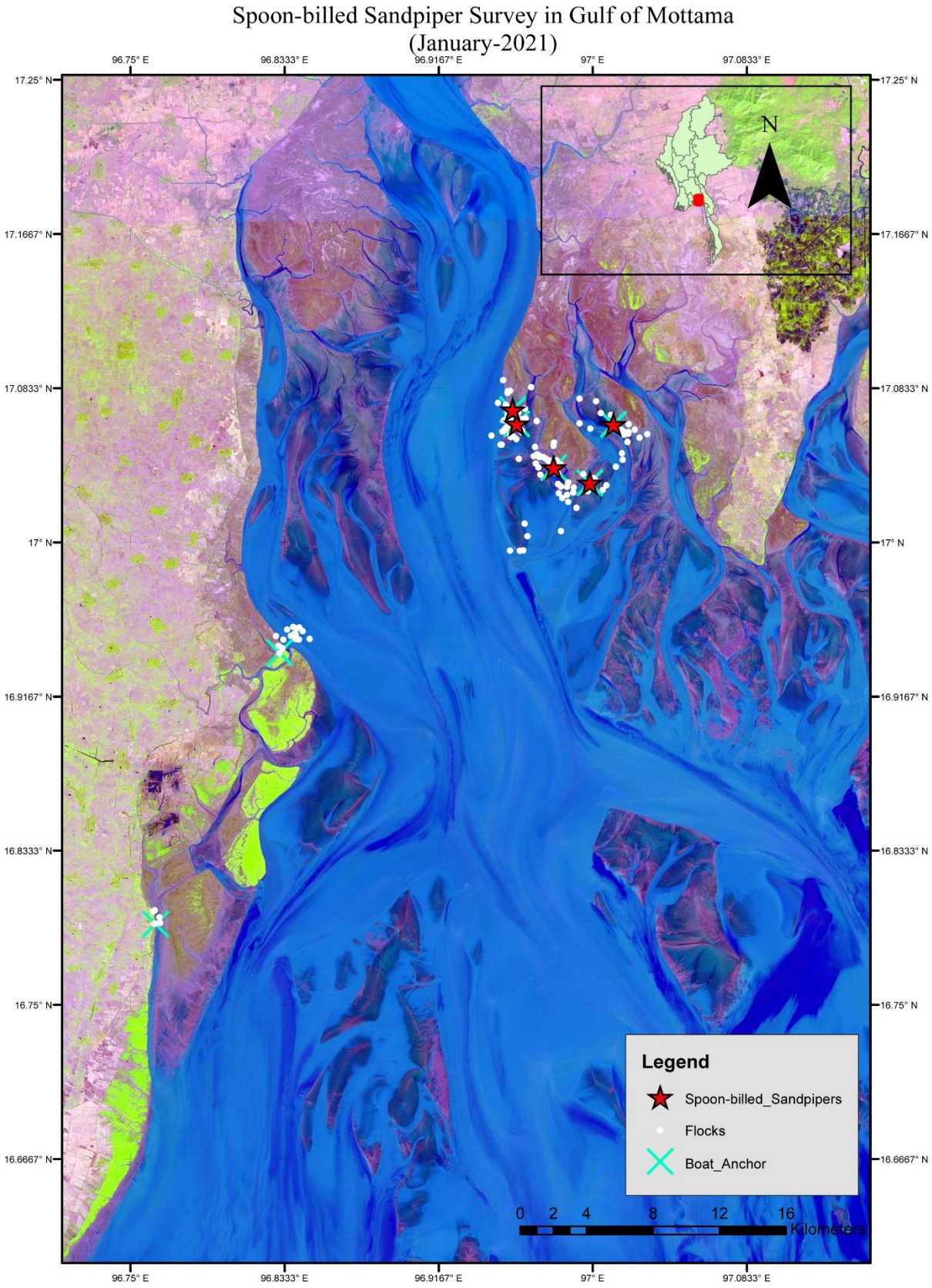

Figure 1: Distribution of Spoon-billed Sandpiper sightings in Jan 2021. Light Green cross are depict camp sites or boat anchor points from where surveys have been undertaken on foot. White points represent flock count sites and red stars sites with SBS observations.

4.3 Estimated total number of SBS and other small wader species in the Gulf of Mottama

Table 3 shows the average proportion of small waders in small wader flocks in the Gulf of Mottama during the survey period based on 166 flocks by six different observers totaling over 28,000 small waders of eight or nine species (Red-necked Stint and Little Stint were summarized to one species group for this estimation). Other small waders only occurring in very few samples were not included.

Table 3: Average flock proportions of small waders in the Gulf of Mottama in January 2021 (n= 166)* = figures in brackets refer to 2019 and 2020 (Aung et al 2019, 2020)

English Name	Scientific Name	Flock count total*	Mean Proportion in % 2021	2020	2019
Greater Sandplover	*Charadrius leschenaultii*	796	2.77	0.69	1.63
Lesser Sandplover	*Charadrius mongolus*	11811	42.0	44.17	32.20
Kentish Plover	*Charadrius alexandrinus*	5177	18.41	12.53	31.41
Little Ringed Plover	*Charadrius dubius*	82	2.83	0.39	0.34
Broad-billed Sandpiper	*Calidris falcinellus*	1490	5.30	7.66	5.32
Curlew Sandpiper	*Calidris ferruginea*	4991	17.75	16.32	6.55
Red-necked/Little Stint	*Calidris ruficollis/minuta*	4385	15.59	18.06	22.37
Spoon-billed Sandpiper	*Calidris pygmaea*	21	0.0746	0.19	0.18
Total of all flocks		**28,123 (38,178)**	**(2019)**		
Total of SBS calculated in flock @56,000		**42 (90)**	**(2019)**		

Applying the flock count-generated proportion of 0.07% for 2021 which is much lower to 0.19 in 2020 and 0.18 in 2019, we can extrapolate the total population in the Gulf of Mottama in the winter 2021 of only 42 of Spoon-billed Sandpiper among the total flock of small waders was about at about 56,000. The LCGs were checking the wider survey areas for small wader flocks and enabled a complete coverage and estimation of small wader flocks.

4.4 Flagged birds

In total only two flagged Spoon-billed Sandpiper were recorded; one was Yellow (flagged on migration most likely in Tiaozini, Jiangsu Province, China) and another one Lime Green (flagged on the breeding grounds in southern Chukotka, Russia). Both flags were not photographed and it was not possible to read the marked combination. In addition, one Red-necked Stint was recorded with two flags (Black on the upper and Yellow on the lower of the left leg) see photo from (Kamchatka, Russia) and one Kentish Plover with blue flag on the left and right have metal ring, most likely from Northern Japan.

Red-necked Stint with colour markings from Kamchatka

4.5 Estimated global Spoon-billed Sandpiper population size in 2021 based on flagged birds

The overall proportion of flagged birds across all winter survey sites is 22.3%. This figure might be slightly higher as not all flagged birds were reported when their combination could not be completely read. This is similar but slightly lower than observed in the wintering area in 2020 (24.5%, Aung et al 2020).

With only two flagged birds the proportion in GoM was very low at 12%. At Nan Thar Island though the proportion climbed to 40%, in Thailand at Pak Thale to 50% and in Sonadia and Bashkali to 50% or 30% respectively.

In order to calculate from the proportion of flagged birds to the overall global population size we would need to know how many of the flagged birds were still alive at the time of the surveys. However, this is not quite known yet in January 2020. This figures is likely to range between 60 and 80, depending on survival and additional flagged birds in 2020 (ca. 30) which would translate at 22.3% flagged birds into a possible global population of **269 – 359** birds. These figures include all birds, including juveniles. This figure is more in line with our estimates from the breeding grounds of 80-120 breeding pairs, taking into account that only 35-40% of the adult birds are actually paired and breeding.

This also means that our wintering survey across the wintering grounds has only captured 30-50% of the birds. It is very likely that some birds have been missed at the wintering grounds including the Gulf of Mottama and more likely in areas in Bangladesh that could not be surveyed this year, but it is unlikely that these figures will amount to higher double figures. The coverage in South China has increased again this year and it is again less likely that larger population have been overlooked. We conclude that the real figure is closer to the lower estimate than to the higher.

Table 4: Proportion of flagged birds at different sites of the flyway compared with those observed in the Gulf of Mottama (bold)

Site	Country	SBS 2021	Flagged	Proportion	SBS 2020	Flagged birds	%	Observers
South China total	CHI	61	16	26%	49	13	27%	MCF
Gulf of Mottama	MYM	17 (42)	2	12%	105	24	23%	NCS
Nan Thar	MYM	5	2	40%	18	2	18%	Ren Nou Soe
Pak Thale	THA	4	2	50%	8	3	38%	BCST
Khok Kham	THA	2			3	1	33%	BCST
Chonburi	THA	1						BCST
Sonadia	BGD	4	2	50%	12	3	25%	SUC
Nijhum Dweep	BGD	2			6	2	33%	SUC
Bashkhali	BGD	3	1	33%	4	1	25%	SUC
Mekong Delta	VTN	5			6	1	17%	Bao Nguyen/Yong Ding Li
Red River Delta	VTN	8						Bao Nguyen/Yong Ding Li
Total counts		137	25	22,3%	204	50	24.5%	

4.6 Comparisons of 2021 results with previous years

The figure of only 17 observed and 42 estimated total Spoon-billed Sandpiper in the Gulf of Mottama in January 2021 is very low and describes a strong decline compared to previous years of about 60% (see table 5 and Figure 3. One could assume that this is a one off event. But it looks like a precipitous decline has occurred of 9% accelerated in 2021 combined with a shift observed in northern wintering areas in Southern China (see Table 5). However the increases in Southern China and Northern Vietnam do not compensate for the losses observed in more southern areas and an overall stronger decline is observed across the entire wintering range.

Table 5: The 2021 total estimated number of SBS in GoM compared with previous years in the period between 2010- 2019.

	2009	2010	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
SBS observed	71	75	100	35			99		8	76	99	17
SBS estimated	240	200				154	125		-	112	86-114	42

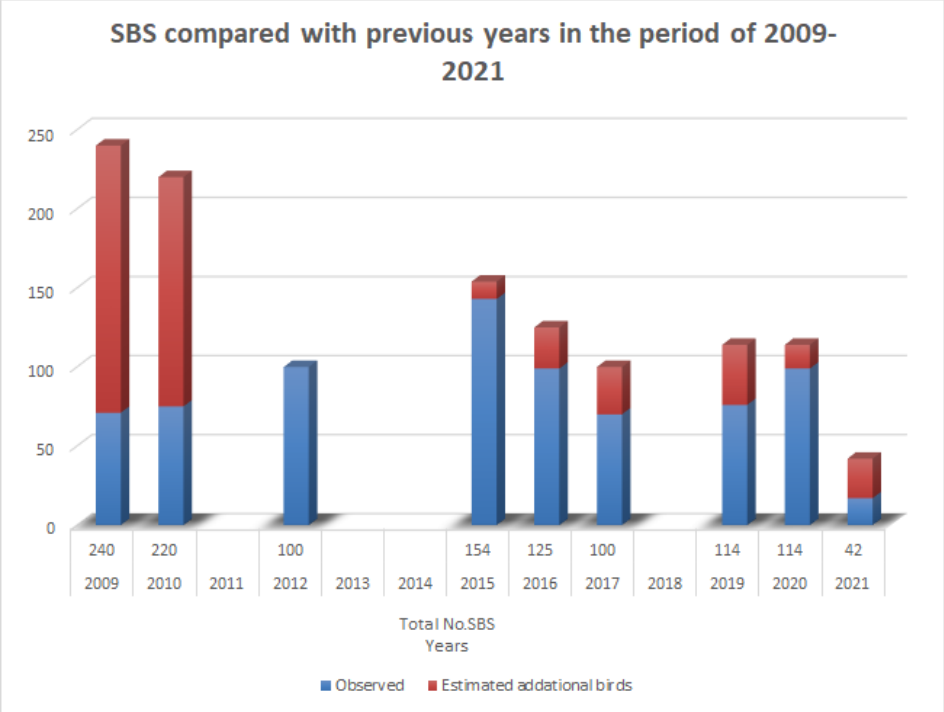

Figure 3: Spoon-billed Sandpiper population estimates in the Gulf of Mottama from 2009-2021, blue reflects the actual observed number and brown the additional estimated number based on flock counts.

4.7 Overall conclusion

In total the number of Spoon-billed sandpiper and shorebirds in general has been much lower compared to previous years. It is not entirely clear if this only relates to a smaller team and less survey activity or reflects a real decline or a shift in distribution within the Gulf. The latter is still possible but less likely as our trained LCGs have been scanning the entire Ramsar site during the winter period and did not find larger flocks that were missed. These lower numbers refer to almost all species, including many small waders such as Curlew and Broad-billed Sandpiper as well as stints. Black-tailed Godwits and Kentish Plover were observed in higher numbers. While the latter increased plover has recovered it still has not reached to levels previously known of over 10,000 (Zöckler et al 2014). The increase of the Black-tailed Godwit is notable and has reached levels not recorded previously, representing now 10% of the flyway population. The Gulf of Mottama has become one of the most important flyway sites for the species!

The number of 42 Spoon-billed Sandpiper is extremely low and very concerning. As this declining trend is also observed in other areas (see Table 4) the decline is not reflecting on the quality of the habitat in the area, even though other species have declined. However Black-tailed Godwits and some plover species fared well. The Gulf of Mottama is still very crucial for the Spoon-billed Sandpiper but with a continuous northward shift in the wintering area the prime position might be shared with more northern sites in Vietnam and China.

Observations of SBS have declined since 2010 (Aung et al 2018) and continued in recent years. This year's records might also point to an accelerated decline, which affects most small waders which have declined from at least 150,000 in 2010 (Zöckler et al 2014, Aung et al 2018) to only 56,000 – 60,000 maximum. The numbers of flagged birds observed in GoM has declined but overall stays roughly at 22.3% similar to 2020, pointing again to a much lower overall global population. It is quite possible that based on the survey results the total global population ranges only between 269-359 individual birds only, which equals 80-120 breeding pairs. This also means that the Gulf of Mottama still hosts about 12-16% of the global Spoon-billed Sandpiper population. The Gulf of Mottama is no longer the most common wintering site for the Spoon- billed Sandpiper and shares its prime position now with more northern sites in South China. Current research is focusing on benthos distribution and species and variation over the year. It might also reveal some potential changes in the habitat. It is also planned to look more closely at the pollutants that potentially threatened feeding shorebirds in the Gulf. It is reassuring that the site is now fully protected as Ramsar site and also has been managed and mitigated from almost all hunting activities. Local conservation groups have been established and trained and have become a stable component in safeguarding the future of the Ramsar site.

Also, this year one of the famous documentary production companies in Myanmar, "Tagu" films joined the NCS team. "Tagu" films is presenting cultures, human rights, politics and natures of the country to local and international film festivals. Presenting the unique Gulf of Mottama and the annual shorebird monitoring activities through local and international media will promote ecotourism in the near future.

4.8 Capacity Building and training of former hunters

BANCA formed seven Local Conservation Groups (LCGs), five groups at the east coast located at (Koe Tae Su, Kyar Si Aung, Kyan Dine Aung, Aung Kan Thar and Khin Dan villages from Bilin, Thahton and Paung Township) and two groups in west coast located at (Sar Talin and Ma Yan village from Kyauktan Township of Yangon region) in 2013. Total 12 members in each LCG group compose with village heads, fishers, women and villagers who are working as volunteers. But west Mottama LCG members are away each other, because of land erosion problems causes. Since 2013, BANCA provided basic birdwatching and patrolling trainings for LCGs. NCS and if necessary, together with BANCA will continue this work in the coming years to ensure consistency, presence and guidance for local communities and their LCGs. This is particularly important as bird trapping has been observed to have resumed again in some places of this huge Gulf.

The leaders of LCG groups are former ex-hunters in Gulf of Mottama, after received first alternative livelihoods support in 2010-2011, the formers hunters have agreed with BANCA for conservation of birds and refraining from further hunting in the Gulf of Mottama. Regular participation with BANCA and NCS shore bird survey teams as a boat crew and helpers will foster this mutual relationship and significantly reducing the hunting pressure. The former hunters understand the situation of migratory birds the seasonality, feeding and rooting sites and local knowledge of birds and sites. BANCA trained them to become local bird watcher, especially to find Spoon- billed Sandpipers, activities that could generate another income source for LCG in future eco-tourism scenarios in Mottama. NCS is promoting birdwatching trips with Spoonie Travel and Tours company which aims to boost eco-tourism in the region. The cooperation of LGCs and NCS is crucial and is much effective for shore bird annual monitoring, because of the LCGs team have developed a local knowledge where to survey in Mottama. In Jan 2021, Koe Tae Su and Ahlat LCGs members joined the survey team and actively participated in the survey while constantly quizzing the survey team's activities and results. Their intimate local knowledge of where most of the large flocks are located has been most useful.

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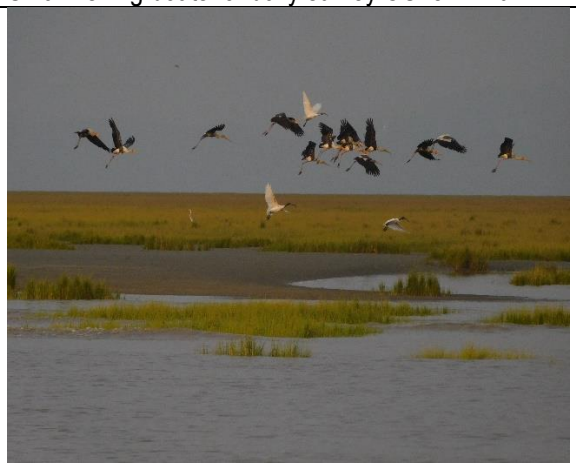
Annex: Photo templates

Small Boat crews, survey team and flim team members © Tagu Film

Departure time pushing big boat when high tide ©PyaePhyo Aung

Investigation where to anchor before low tide©Pyae Phyo Aung

	
Surveyors and camera crews on mudflat ©Pyae Phyo Aung	Small fishing boats for daily survey ©Shein Thu Lwin
	
Shorebird flock during high tide©Pyae Phyo Aung	Ibis and Painted Stock flock ©Pyae Phyo Aung
	
Mixed wader flock waiting to feed ©Pyae Phyo Aung	A flock of Black-tailed Godwit © Gideon

	
Khin Dan village LCG leader U Thaung watching shorebird ©Pyae Phyo Aung	Action of surveyors on mudflat ©Shein Thu Lwin