Hunting in Myanmar is probably the main cause of the decline of the Spoon-billed Sandpiper *Calidris pygmeus*

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A Spoon-billed Sandpiper *Calidris pygmeus* caught by a hunter in the Bay of Martaban, Maynmar, is released by local children after intervention by the Spoonbilled Sandpiper Expedition, January 2010. (Photo: Rob Robinson/BTO.)

Reprinted from the *Wader Study Group Bulletin* (2010) 117(1): 1–8

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Zöckler, C., Htin Hla, T., Clark, N., Syroechkovskiy, E., Yakushev, N., Daengphayon, S. & Robinson, R. 2010. Hunting in Myanmar is probably the main cause of the decline of the Spoon-billed Sandpiper *Calidris pygmeus*. *Wader Study Group Bull.* 117(1): 1–8.

Keywords: Spoon-billed Sandpiper, *Calidris pygmeus*, Myanmar, hunting, conservation

The rapid decline of the Spoon-billed Sandpiper population has led to a series of expeditions to locate the species' main wintering areas. Surveys conducted in Myanmar during 2008–2010 showed an estimated wintering population of over 200, which is probably more than half the world population. Within Myanmar, the key estuary is the Bay of Martaban. We found extensive evidence of the hunting of waders in all sites visited, mostly by the poorest people in each village. The majority of 26 bird-hunters questioned in 15 villages on the east side of the Bay of Martaban knew of Spoon-billed Sandpipers and most probably catch the species every year. Spoon-billed Sandpipers are not the hunters' primary target but, along with other calidrids tend to be caught more frequently in the mist nets they use for other target species, such as Pacific Golden Plover *Pluvialis fulva* and Eurasian Curlew *Numenius arquata*. It is likely that hunting in the wintering area is the major cause of the species' decline, which may have been exacerbated by the fact that the Spoon-billed Sandpiper's core wintering area happens to be an area of high hunting pressure. Urgent action is needed to find ways to give the local hunters economic alternatives to hunting. An awareness campaign will also help to persuade hunters to release Spoon-billed Sandpipers they catch. It is also vitally important to protect the habitats of the Bay of Martaban for its large waterbird populations. Without urgent conservation action we believe that the Spoon-billed Sandpiper will become extinct within 10–20 years.

INTRODUCTION

The Spoon-billed Sandpiper *Calidris pygmeus* has never been common, but its population was estimated at about 6,000 in the 1970s (Flint & Kondratiev 1977). By 2000, there was increasing concern that it was in decline, so the Russian Academy of Sciences started a survey of Spoon-billed Sandpipers on the breeding grounds in E Siberia (Tomkovich *et al.* 2002). This revealed that by 2004 the population had dropped to less than 1,000 (Syroechkovskiy 2005). More recent surveys suggest a continued rapid decline, and by 2009 the total population was estimated at only 120–220 pairs only (Zöckler & Syroechkovskiy subm.).

Even as recently as 2005, little was known of the winter distribution or of threats in the non-breeding areas. Surveys of potential wintering grounds started in 2005 led by the newly-formed Spoon-billed Sandpiper Recovery Team (Zöckler *et al.* 2005). These surveys have shown that the species has disappeared from the west of its range in Sri Lanka and India and from the east where it formerly occurred in Vietnam.

In 2008, the opportunity arose to undertake surveys in Myanmar, which was considered a possible wintering area because of three skins collected in the 1800s and the proximity of recent winter records close to the Bangladesh/Myanmar border. The skins came from Sittwe, from the mouth of the Yangon River and from the Bay of Martaban (Fig. 1). All these sites were visited in 2008 and 2009. In Jan 2010, an international survey team conducted further studies of Spoon-billed Sandpipers in Myanmar. This time, with increasing concern at the rate of decline of the Spoon-billed Sandpiper, estimated at over 20% per year (Zöckler & Syroechkovskiy subm.), the focus was establishing a better understanding of the causes of the decline and the likely impact of hunting. The surveys were conducted under the auspices of the Spoon-billed Sandpiper Recovery Team with participants from ArcCona Consulting, Cambridge, British Trust for Ornithology (BTO), Birds Russia, and from Germany, Canada and the United States, teamed with the local BirdLife partner, the Biodiversity and Nature Conservation Association (BANCA). BANCA also undertook a socio-economic hunting survey in villages, organised all the logistics (which were considerable) and had participants in all the teams.

METHODS

All of the surveys were undertaken in January to coincide with the International Waterfowl Census. In most cases the counts of Spoon-billed Sandpipers were the sum of the daily counts after discussion between the counting teams to minimise the risk of double counting. Where it was felt possible that double counting could have occurred a conservative approach was used. The only place where this approach was not possible due

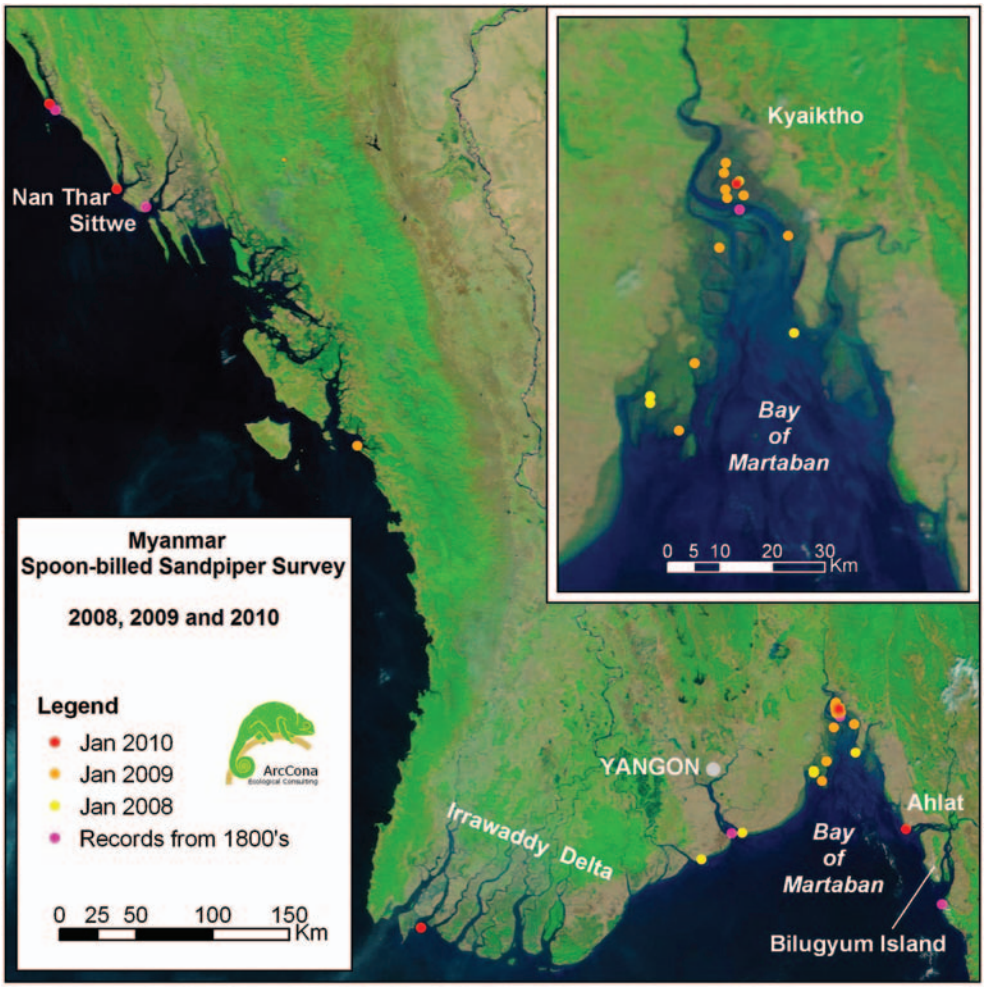

Fig. 1. Locations where Spoon-billed Sandpipers were recorded in Myanmar during 2008–2010 and where skins were collected in the 1800s. (Map prepared by Gillian Bunting, ArcCona.)

to the very large flocks spread over several square kilometres of mudflat was just south of Kyaiktho in the upper part of the Bay of Martaban. There observers scanned individual flocks, counting the numbers of all small wader species encountered (stints and small plovers) until a Spoon-billed Sandpiper was found or the end of the flock was reached. The number of Spoon-billed Sandpipers was estimated by multiplying the average proportion of Spoon-billed Sandpipers observed in the small wader flocks by an estimate of the total number of small waders using the mudflats. To calculate the average proportion of Spoon-billed Sandpipers seen, we fitted a generalised linear mixed model (with logit link and binomial errors) with flock identity as a random effect to account for repeated sampling of the same birds. We also included a term for observer as a check for consistency; if each observed similar proportions of Spoon-billed Sandpipers then we can have greater confidence in the robustness of the results.

At every opportunity, local villagers were interviewed informally to determine the level of hunting and their knowledge of Spoon-billed Sandpipers. In addition a socioeconomic survey was carried out in 15 villages on the east side of the Bay of Martaban. This survey took the form of interviews with local hunters and senior villagers from which a questionnaire was completed. During the interviews, hunters were shown drawings of a selection of waders including Spoon-billed Sandpiper. Full details of survey methods can be found in Nyunt *et al.* (2010).

SURVEY RESULTS: 2008 AND 2009

Each of the 18th century skin collection sites was visited in Jan 2008 and 35 Spoon-billed Sandpipers were located at Nan Thar near Sittwe, one near the mouth of the Yangon River and 48 in the Bay of Martaban. During the expedition, evidence was collected that Spoon-billed Sandpipers were caught regularly by hunters in the Bay of Martaban with a record of four being caught by one hunter in Dec 2007.

In Jan 2009, expeditions to Nan Thar and the Bay of Martaban were repeated. At Nan Thar, only 14 birds were located and interviews with local people revealed that local hunters were catching Spoon-billed Sandpipers regularly. After discussions with the local community, an agreement was secured to stop the trapping of waders in exchange for supporting their livelihoods. In the Bay of Martaban, the survey focused on estimating the waterbird populations of the estuary. Some 78,000 waterbirds were counted, including a minimum of 48 Spoon-billed Sandpipers. However, an analysis of their frequency within flocks suggested that a population of 73 (35–168) was a more realistic figure in the 25–40% of the estuary that was surveyed (so by extrapolation the total population might have been around 200). In 2009, little time was spent in the local villages, but there was evidence of regular bird catching at a number of sites.

Fig. 2. Trapped waders held in cages before being eaten or delivered to market at Nan Thar, Myanmar, Jan 2009. The species cover a spectrum of those present at the site: Redshank *Tringa totanus*, Lesser Sandplover *Charadrius mongolus*, Greater Sandplover *Ch. leschenaultii*, Curlew Sandpiper *Calidris ferruginea*, Red-necked Stint *C. ruficollis*, Broad-billed Sandpiper *Limicola falcinellus* and unidentified small terns. (Photos: Ren Nou Sou.)

SURVEY RESULTS: 2010

Nan Thar

Nan Thar is a small sandy island in the mouth of the Kaladan River in the Arakhan region of Myanmar (Fig. 1). It is surrounded by a substantial area of mudflats that support up to 5,000 waders and is inhabited during the dry season by about 150 people, whose main livelihood is fishing and shellfish collecting. After the discovery of substantial trapping activities in 2009 (Fig. 2), conservation agreements were negotiated with the local community to stop the trapping, support the livelihoods of the community and develop the area for nature tourism. In 2010, the area was visited by a survey team for the third consecutive year; this time in company with a small tourist group that helped to provide finance for the conservation agreement. The income from tourists is lodged in a bank account for the benefit of the entire community. This new income is demonstrating to the local population that keeping the waders alive can provide substantial income from tourists. The conservation agreement has been supported through the purchase from the local authority of the hunting rights for the island by a local conservation group. For most of coastal Myanmar it does not appear to be possible to purchase hunting rights in this way; i.e. there is no legal way to control hunting.

There was as expected no more hunting of waterbirds at Nan Thar in Jan 2010 and 12–14 Spoon-billed Sandpipers were seen, similar to numbers counted the previous year. Ties have been developed between a local conservation group in Sittwe (the nearest large town and regional capital) and the island population and it is hoped that these will lead to lasting conservation action.

The Irrawaddy Delta

This area proved to be logistically difficult. However the survey located a single Spoon-billed Sandpiper among about 10,000 small waders. We believe that it is unlikely that the Irrawaddy Delta now supports many Spoon-billed Sandpipers, as the Delta affords little suitable habitat (sand spits and adjacent mudflats), although it is possible that parts of the Delta were more important before the devastation caused by cyclone Nargis in 2008. Local people said that hunting waders was an important livelihood for a significant portion of the local population before the cyclone. There are now comparatively small intertidal areas and there was evidence that intertidal mud and sand was washed inland by the cyclone. Therefore it may be many years before the area is suitable to support large numbers of waders again.

The Bay of Martaban

Three survey teams covered the eastern shore of this immense estuary. It is funnel-shaped with intertidal flats exposed at low water over most of the estuary from the point where it is 1 km wide to where it 50 km wide, 60 km downstream (Fig. 1). The estuary has extensive intertidal flats in excess of 5 km wide for a further 10 km on the west and 80 km on the east side of the estuary. The funnel shape results in a highly dynamic system with a >1-m bore on spring tides in the upper estuary. The power of the bore leads to a high sediment-load in the water column and the main channel, which meanders down the estuary and is very unstable. For instance, areas that had been covered by the tide for at least 2 hours after high water in Jan 2009 had saltmarsh with more than 90% vegetation cover in Jan 2010 and other areas that were 2 km inland on satellite images four years ago are now right on the coast and exposed to continuing erosion. This dynamic system makes it very difficult to estimate changes in bird numbers over a small number of survey years with limited survey effort, as the birds move around the upper estuary in response to the changing locations of suitable habitat.

Two teams surveyed sites along the eastern shore of the estuary before combining for the last two days to survey the area just south of Kyaiktho that held the highest numbers in previous years. These surveys encountered considerable logistical difficulties but we were able to visit about 15 separate areas along the shore. The only three Spoon-billed Sandpipers recorded in the lower estuary (though there could have been more) were located near the village of Ahlat at the mouth of the Salween River (Fig. 1). One of these birds was marked with a light green flag showing that it had been marked as a chick in S Chukotka, Siberia. One morning a local bird hunter brought the team a Spoon-billed Sandpiper

that he had caught the night before along with about 100 Red-necked Stints *Calidris ruficollis*. We marked the bird with a red flag and it was released by a group of local children (see cover photo). This hunter said that he had last caught a Spoon-billed Sandpiper in Aug 2009. According to several local hunters, the species has been trapped regularly further south, especially around the island of Bilugyun (Fig. 1). There is plenty of suitable habitat in that area, but only a few parts of it were surveyed in Jan 2010 due to logistical problems. In general, the survey teams found fewer waders on the eastern shore of the estuary than they expected having regard to densities found on the western shore in 2009. The area was particularly poor for small calidrids.

For the last two days, the two teams split up into four pairs of observers and surveyed an area in the upper part of the estuary south of Kyaiktho (Fig. 1) where good numbers of Spoon-billed Sandpipers had been seen the previous year. This area was used by a large number of small waders. Three experienced observers independently estimated the flock flying to roost to include 35,000 small waders (plovers and calidrids). The flock arrived to feed as soon as mud became exposed and spread out into smaller loose flocks over an area of about 6 km × 10 km of intertidal sand and mud flats. In the course of the two days, 33,562 small waders were identified to species and 191 were Spoon-billed Sandpipers (0.57%). The number of Spoon-billed Sandpipers present in the 35,000 waders was estimated at 200 (with 95% confidence limits of 150 to 270). The proportion of Spoon-billed Sandpipers among the flocks did not differ significantly between observers (0.48%–0.61%, $\chi^2 = 0.39$, N.S.), and the number estimated by the four pairs of observers separately came out at 213, 209, 203 and 167 respectively, indicating that the estimate is quite robust. In the 2008 and 2009 surveys, 8 and 14 Spoon-billed Sandpipers were found along about 25% of the western side of the estuary which was not sampled in 2010. If these birds are considered to be additional to those found in 2010, then it is likely that over 220 Spoon-billed Sandpipers winter in the Bay of Martaban. This is about half the estimated world population (based on data from the breeding grounds) and over twice as many as occurs at all the other known wintering sites put together.

The age of 42 Spoon-billed Sandpipers was determined in the field by NC on the basis of presence or absence of juvenile coverts; of these eight were juveniles (19%). Although the sample is small, it suggests that the population had had a reasonably successful breeding season, although the 2009 season was considered to be poor in nesting areas in Chukotka (P. Tomkovich pers. comm.)

One individually-marked bird was found in the Bay of Martaban that had been ringed in the moraine hills near Meinopylgino, South Chukotka, on 3 July 2003 as a nesting adult, probably a female. The ringing site is remote and had not been visited since the bird was ringed, at which time some feathers had been taken for stable isotope analysis. When the values for the proportions of the stable isotopes of carbon and nitrogen from these feathers are plotted on a graph with those of all the 29 birds that have been sampled from the breeding grounds, this bird falls in the middle of the densest cluster (Clark & Zöckler, in prep.), adding weight to the view that the Bay of Martaban is the species' main wintering area.

The third team undertook a socio-economic survey of local villagers, with the aim of obtaining detailed information about the extent and nature of bird-hunting in the area through a series of questionnaires (Nyunt *et al*. 2010). This revealed that at least 26 hunters are operating in the 15 villages surveyed by the team along the 120-km east coast of the Bay. However, only five of these are professional bird-hunters, with the remainder hunting opportunistically. There are two prime reasons for hunting: providing additional vital food resources for the local community is still the main incentive and it is the poorest proportion of the communities that is involved in bird hunting. But quite a large proportion of the birds are also sold for religious purposes, particularly in the Buddhist communities where releasing animals can be an important way of demonstrating one's piety; a further incentive to catch birds alive. The hunters keep some birds for themselves and sell or exchange the larger proportion for fish and other products within the villages. The bird trade is kept within the local communities and local markets (Fig. 3) and does not reach farther. Birds are kept and sold alive if possible to keep them fresh longer (Fig. 3). There was a high degree of recognition of the Spoon-billed Sandpiper among the hunters which is most likely to have come from regular catching of the species. Obtaining any detail about the frequency of capture proved to be difficult, although one hunter had caught two in the previous month (Dec 2009) and another estimated that he had caught 10–15 in the 2006/2007 season. Others mentioned that a few Spoon-billed Sandpipers were in the catches every year.

HUNTING TECHNIQUES

Mist netting with large-mesh monofilament nets is carried out by many hunters (Fig. 4). They focus mainly on high tide roosts where they hope to catch larger species, such as Ruddy Shelduck *Tadorna ferruginea* and egrets *Egretta, Ardea*, but also larger waders such as Pacific Golden Plover *Pluvialis fulva* and Eurasian Curlew *Numenius arquata*; smaller waders are caught in large numbers and are also killed for the pot. Our observations of the inshore fishermen's catches show that most fish caught are tiny, so in comparison even a 20 g Red-necked Stint provides a substantial amount of food. Our experience of mist netting waders in many countries around the world is that catching large numbers of small waders is unavoidable, even if large species are the target. A large-mesh net (e.g. 150 mm) should allow small waders to fly straight through, but in practice many get badly tangled and this, in combination with infrequent net-checking by hunters, means that many stint-sized species do not survive, even if the hunters were willing to release them. Use of fishing nets to catch waders is common among fishermen in Myanmar when the fishing is bad or weather precludes access to the fishing areas. Many of the nets used for fishing can just as easily be used as mist nets.

Another widespread method of bird-trapping in Myanmar involves the use of poison baits. The poison is either an insecticide or a crab poison used in rice fields as crabs can damage crops. Most often potassium cyanide is sprayed on small fish or shrimps which are left in the birds' feeding grounds. Poisoned bait is mainly applied by day and is aimed at catching larger birds, such as herons (particularly Indian Pond Heron *Ardeola grayii*) and egrets (mostly Little Egret *Egretta garzetta* and Great Egret *Ardea alba*). One day we saw a hunter who had caught ten pond herons in one afternoon showing that the method can be very effective. Poisoned baits also catch small waders as observed in 2008 and 2009; for example we met a hunter who had caught two Lesser Sandplovers *Charadrius mongolus* using this technique. In 2008, hunters were confirmed to have poisoned up to 100 waders, mostly large plovers, but at least three Spoon-billed

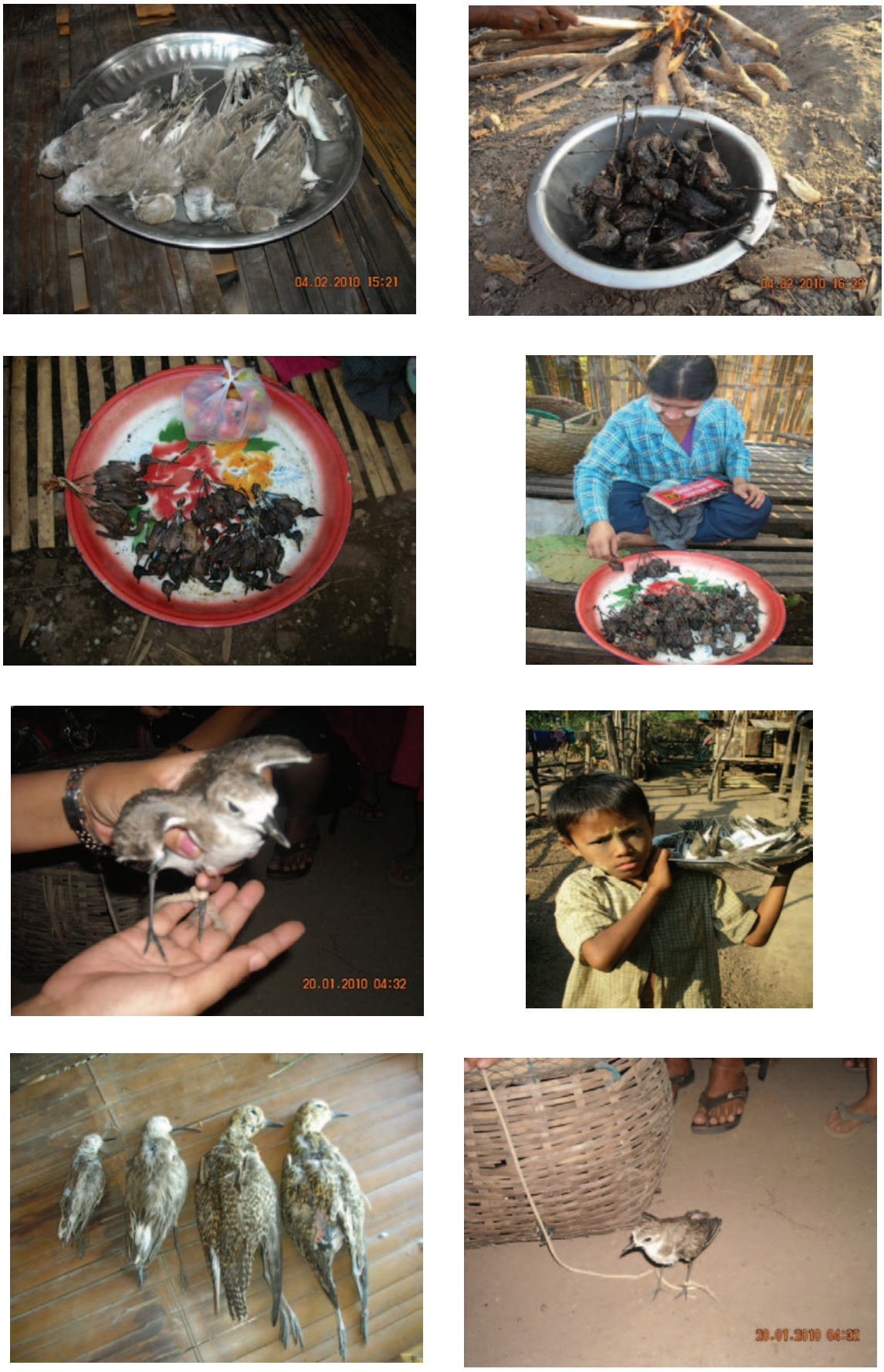

Fig. 3. Pictures from local village markets in the Bay of Martaban, Myanmar, Jan 2010. The birds reflect the range of wader species found in the Bay of Martaban with an emphasis on the smaller species reflecting their greater susceptibility to capture. Note the Greater Sandplover *Charadrius leschenaultii* which may have been bought for release at a religious shrine. (Photos from Nyunt *et al.* 2010.)

Fig. 4. Hunters setting nets to catch waders in the Bay of Martaban, Myanmar, Jan 2010. (Photos from Nyunt *et al.* 2010.)

Sandpipers were among them.

Another way in which birds may be caught is when fish nets are set on stakes (*c.*1 m high) to catch fish when the tide comes in (Fig. 5). Some fishermen put small monofilament nets (*c.*0.5 m high) across bays and creek mouths to catch fish swimming up the channels. These look just like mist nets set very low and can be very effective at catching small waders on the rising tide as the mudflats cover (Fig. 6). Although most fishermen deny that such nets catch many waders, we have good reason to think that they do, as has been observed in Bangladesh (Zöckler & Bunting 2006). However, while small waders are often released in Bangladesh and Nan Thar, this is much less likely among the poor communities in the Bay of Martaban.

HOW IMPORTANT IS HUNTING AS A CAUSE OF THE SPOON-BILLED SANDPIPER'S DECLINE?

The importance of hunting waders in the Bay of Martaban, including Spoon-billed Sandpipers, was identified during the first survey in 2008, when local hunters showed an intimate knowledge of the species and confirmed the trapping of at least four individual Spoon-billed Sandpipers in Dec 2007 alone. The species is caught regularly, not on purpose, but together with other small waders, as an incidental by-catch among larger species. The effectiveness of bird catching varies and depends on technique, how many nets are set and on flock-size. In 2008, we received reports of seven catches in the previous two years with the following catch totals: 500, 50, 120, 100, 30, 250 and 20; in these there were 0, 2, 1, 0, 1, 0 and 0 Spoon-billed Sandpipers. In Nan Thar in 2009, several hundred birds were caught regularly in catches over the new moon. About 15 hunters from three villages were operating on Nan Thar Island, most of them occasionally but focusing on bird-rich periods. According to one hunter with over twelve years' experience, more than two-thirds of the birds caught die in the nets overnight or are so badly affected that survival is unlikely. In 2009, the Martaban survey team found evidence of hunting in several locations, while the 2010 survey confirmed large-scale hunting and trapping across the entire Bay. Hunters who were interviewed confirmed the trapping of 50–350 birds in a single night. The survey teams were able to obtain additional information and evidence (e.g. in form of a trapped Spoon-billed Sandpiper) to conclude that trapping is a major threat to Spoon-billed Sandpipers and other waders in the Bay. Surveys in the Irrawaddy Delta also indicated high hunting levels. Professional hunters hunt waders using nets (similar to mist nets) on dark nights around the new moon and consider that it is normally possible to catch during 10–15 nights per month. Hunting was said to be best in March when there are misty nights and when hunters can regularly catch "more birds than can be carried by one person".

Fig. 5. Fishing nets set on *c.*1 m stakes on mudflats in the Bay of Martaban, Myanmar, Jan 2010. (Photo: Nigel Clark / BTO.)

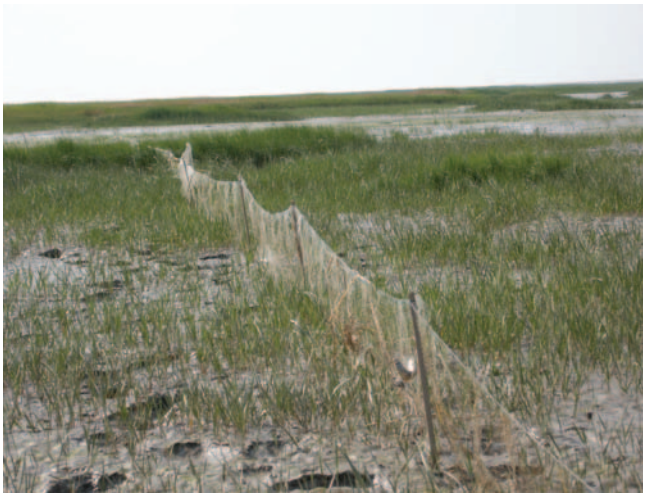

Fig. 6. Fishing nets set on *c.*0.5 m stakes across small creeks on edge of saltmarsh in the Bay of Martaban, Myanmar, Jan 2010. (Photo: Nigel Clark / BTO)

In view of the variety of bird-catching methods used in the Bay of Martaban and the number of people involved, the annual take of waders is likely to be quite large, but difficult to estimate with any precision. One of us (NC) caught about 3% of the local Dunlin *Calidris alpina* wintering population on each night when mist netting on the Severn, England. But it is likely that professional hunters will be more successful than this, and stints are known to be easier to catch than Dunlin. If the five professional hunters averaged 50 small waders per night over ten nights per month in the course of a year, they would take 2,500 per month between them, which could add up to 20,000 per year as birds are present from August to April. If the numbers caught by the 20 opportunistic hunters and those poisoned or caught by the hunters in the villages that were not surveyed are added to this, it is reasonable to expect the total take may exceed 30,000 waders per year. The size of the wintering population of waders in the Bay of Martaban is still unknown but after three winters of surveys, we believe it is likely to be in the region of 100,000 and unlikely to be more than 150,000. We therefore conclude that hunting at this level is unsustainable and it is probable that the local populations of most species are declining.

WHY ARE SPOON-BILLED SANDPIPERS DECLINING MORE RAPIDLY THAN OTHER WADERS IN MYANMAR?

A wide range of wader species winter in the Bay of Martaban, but all except Spoon-billed Sandpiper have broad winter distributions, so for most species hunting on the scale reported here is probably balanced by high levels of immigration or of juvenile settlement. Lower mortality rates on other sites may also compensate for high mortality in the Bay of Martaban.

It is a matter of concern that during our expeditions to Bangladesh and Myanmar in 2006–2009 we found that hunting and trapping occur at all sites known to support >10 wintering Spoon-billed Sandpipers. If more than half of the world population winters in the Bay of Martaban, it is inevitable that hunting there will have a major impact on the species as a whole.

Changes in population size for more dispersed species may be harder to detect given the low level of current survey effort in SE Asia. However, there is concern that many species may be declining in this region, though monitoring is insufficient to detect low annual rates of decline. Studies in Korea show declines in several wader species that are probably attributable to habitat loss in the Yellow Sea (Moores *et al.* 2008), but not all species wintering in Myanmar are likely to migrate through that area.

WHY IS THE DECLINE RELATIVELY RECENT?

The catching of waders by people in poor communities using nets requires the nets to be cheap and durable. The first artificial monofilament nets were produced by the DuPont Company of the United States in the 1930s. Their availability has slowly increased and they have become more affordable. The first mist nets came to Europe in the late 1950s and so it is unlikely that there was major hunting of waders using nets before the 1960s or even later. There may also be increased pressure to catch waders because of a decline in the success of fishing; something that has been reported to us by local fishermen in the Bay of Martaban. This may occur through deliberate catching to provide people with supplementary food and/or additional income, and also indirectly as a result of the greater number of nets that have to be erected at low tide so that the amount of fish caught is similar to that of the past. The status of the Spoon-billed Sandpiper has only been well documented since about 2000; quite possibly it was declining for a decade or more before then.

PROGNOSIS FOR THE SPOON-BILLED SANDPIPER WITHOUT CONSERVATION ACTION

At present, the rate of decline of the global Spoon-billed Sandpiper population is thought to be of the order of 24% per annum (Zöckler & Syroechkovskiy, subm.). At this rate the species is likely to become extinct in about a decade. Apart from hunting, there are other possible contributory causes of the decline, including temperature-mediated habitat change on the breeding grounds, and loss of habitat through land reclamation in other non-breeding and passage sites. These may be as important as hunting, and might even be the ultimate cause of extinction. However, our studies have now established that hunting is a major cause of mortality that must be having a significant negative effect on the global population. Moreover it is a problem that can be directly addressed by conservation action. The survey of hunters found that they would be more than willing to give up bird hunting if an alternative form of income could be found for them. This affords an excellent opportunity to take conservation action that could be decisive in saving the species from extinction. We propose the following actions that taken together will substantially reduce the loss of Spoon-billed Sandpipers to hunting:

a) Urgently contact the village communities in the prime Spoon-billed Sandpiper areas to make agreements under which hunting waders will cease or any Spoon-billed Sandpipers caught alive will be released in return for livelihood support.

b) Engage with local communities to establish a greater understanding of the need to conserve Spoon-billed Sandpipers and garner their support to stop the hunting.

c) Promote the designation of (1) the Gulf of Martaban, (2) the Salween River Mouth and Bilugyun Island, (3) Nan Thar Island and the Kaladan River Mouth in Arakhan region as protected/conservation areas. These sites might also be listed under the Ramsar Convention as they support internationally important numbers of wintering waders; moreover the Bay of Martaban also fulfils several criteria for UNESCO Man & Biosphere site nomination.

The effective conservation of the Spoon-billed Sandpiper in Myanmar will not only require extensive environmental education and awareness-raising, but it will also need to be integrated into the lifestyle of the local people along with sustainable use of fisheries and other marine resources.

Apart from conservation action, it is also necessary to monitor the Spoon-billed Sandpiper population to ensure that conservation actions are being implemented effectively. The international expeditions to date have included the training of several Myanmar ornithologists and scientists in wader survey methods to the point that they can undertake much of the work needed in future themselves. However there will be a continuing need for long term international investment and support to deliver the conservation actions described above.

CONCLUSIONS

With over 220 wintering Spoon-billed Sandpipers, about half the world population, the Bay of Martaban is of paramount importance for the species. It needs urgent protection if the extinction of the species is to be prevented. Moreover management schemes need to be developed that not only achieve full protection for the Spoon-billed Sandpiper and other waders, but also carefully integrate the wishes and needs of the local communities. Fortunately, the socio-economic survey revealed a willingness for collaboration among the local hunters to address the threats posed by trapping and poisoning of birds.

It is important to bear in mind that trapping waders in the Bay of Martaban is for food and a vital source of income in an area where the only other major source of protein is fish which in some seasons are difficult to catch. At such times, small waders may be caught more easily than fish. To some extent, the problem waders face in the Bay of Martaban must be a reflection of the economic status of the local people, which appears to be impoverished due to over-fishing. Several local fishermen, who displayed a profound knowledge and admiration of waterbirds, their plumages, moult and departure for distant breeding areas, catch Spoon-billed Sandpipers in small numbers regularly, something they would probably prefer to avoid.

The conservation measures we propose should be an integral part of a joint strategy developed by the Biodiversity and Nature Conservation Association of Myanmar (BANCA) with support from the Spoon-billed Sandpiper Recovery Team. It is important that a local partner, such as BANCA is able to commit to this task and is adequately supported with finances and international advice.

ACKNOWLEDGEMENTS

We would like to thank BirdLife International and its sponsors through their Species Champion Programme for their generous support of the expedition. We also like to thank the Ken Dan Ren Foundation in Tokyo, the Manfred-Hermsen-Foundation in Bremen and the Lighthouse Foundation in Hamburg and the Royal Society for the Protection of Birds for their generous financial support. Three of the participants were part funded by the British Trust for Ornithology's wader migration research fund. The provision of binoculars and telescopes through the RSPB's second hand scheme has helped to develop the capacity within Myanmar to take much of this work forward. We also thank BANCA and its many collaborators that helped so much to arrange the survey. In particular we thank Zau Lunn, who effortlessly organized the logistics of the expedition, supported by Ren Nou Sou, Nila, Nailin, Manju, Kole and Kole II, Aung Moe, Moses, Thet Zaw Naing, Gopan and the foreign participants, Hartmut Andretzke, Axel Bräunlich, Andrew Keaveney, Steve Klasan, Elena Lappo, Andre Maximov, Maxim Morozov, Vladimir Morozov, Tom Noah, Joachim Schwahn, Vladimir Arkhipov, Nathan Hentze, Simon Gillings, Karin Eberhard and Graham Chisholm. Gillian Bunting provided valuable satellite imagery for the surveys and created the map for this report. Phil Round and Pavel Tomkovich provided valuable comments on an earlier draft.

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