The Slaty Egret *Egretta vinaceigula* – A review, with special reference to Botswana

Stephanie J. Tyler

Yew Tree Cottage, Lone Lane, Penallt, Monmouthshire, Wales, UK;
steph_tyler2001@hotmail.com

Introduction

This paper updates a review prepared for the Department of Wildlife and National Parks in Botswana and published in 2005 (Tyler 2005a) and also updates information provided in the International Single Species Action Plan compiled by Tyler (2012). Information on diet is not included here as it has been published elsewhere (e.g., Milewski 1976, Mathews and McQuaid 1983, Tyler 2005a, 2012).

The Slaty Egret *Egretta vinaceigula* (Fig. 1), also previously known as the Brown-throated or Red-throated Egret, first became known to science on the basis of two specimens obtained in the 1870s by Thomas Ayres at Potchefstrom, Transvaal and housed in the collections of the British Museum (Natural History) (Benson *et al*. 1971). Originally wrongly identified as juvenile Black Herons *E. ardesiaca*, in 1895, they were shown by Sharpe to represent an unnamed species *Melanophoyx vinaceigula* (Sharpe 1895). In 1958, a third specimen was obtained, by Smithers (1964), in the Caprivi Strip. The work by Benson *et al.* (1971) showed on morphological and ecological grounds that the Slaty Egret was a separate species, as supported by Vernon (1971) and not a colour phase of the Black Heron. Benson *et al*. believed that the Slaty Egret was found chiefly in the Chobe River system of northern Botswana although it is now known that the Okavango Delta holds a much larger population. The Slaty Egret is monotypic, birds being similar morphologically throughout the range of the species.

Population and status

Collar *et al*. (1994) put the population at 5,000-10,000 but were unsure whether this may have been the estimate before the disclosure of its occurrence in unstated numbers in the Zambezi Delta, Mozambique (Ginn *et al*. 1989) – but see below under Mozambique. BirdLife International (2000) gave a revised estimate of 3,000-5,000 birds, with Wetlands International (2002) using the figure of 4,000 individuals, taking 40 birds as the 1% threshold level. BirdLife International (2024) revised the population as 2,500 to 3,300 birds which may still be too high. Ornithologists who know the Okavango Delta feel that a popu-

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Figure 1. Slaty Egret adult in full breeding plumage. Photo: Mark Muller.

lation of 3,000 is too high and that the population may only be in the order of + 2,000 birds. Because of its limited distribution and the threats to its populations in some parts of its range, the Slaty Egret is considered to be a 'Vulnerable' species and is included in the list of globally threatened birds (Collar and Stuart 1985, BirdLife International 2000, 2016). Penry (1986) included it in a list of birds that he considered under threat in Botswana.

Distribution

The distribution of the Slaty Egret ranges from northern Botswana, notably the Okavango Delta and Linyanti/Chobe system in Botswana, the Caprivi Strip area of northern Namibia, through northwest Zimbabwe to wetlands in Zambia, such as the Kafue Flats and the Bangweulu Swamp (Brown *et al.* 1982, del Hoyo *et al*. 1992, Harrison *et al*. 1997) (Fig. 2). It is now known to occur in Angola (Mills *et al.* 2010, 2020) and there has been a record from Katanga (formerly) Shaba Province of the Democratic Republic of Congo (Louette and Hasson 2011). In South Africa, it is now a regular vagrant and a very occasional breeder (Tyler 2012). The estimated range of the species covers 67,000 km^2 (BirdLife International 2000). Collar *et al*. (1994) noted that it was nowhere common. However, in some areas of the Okavango Delta it is locally frequent and at times

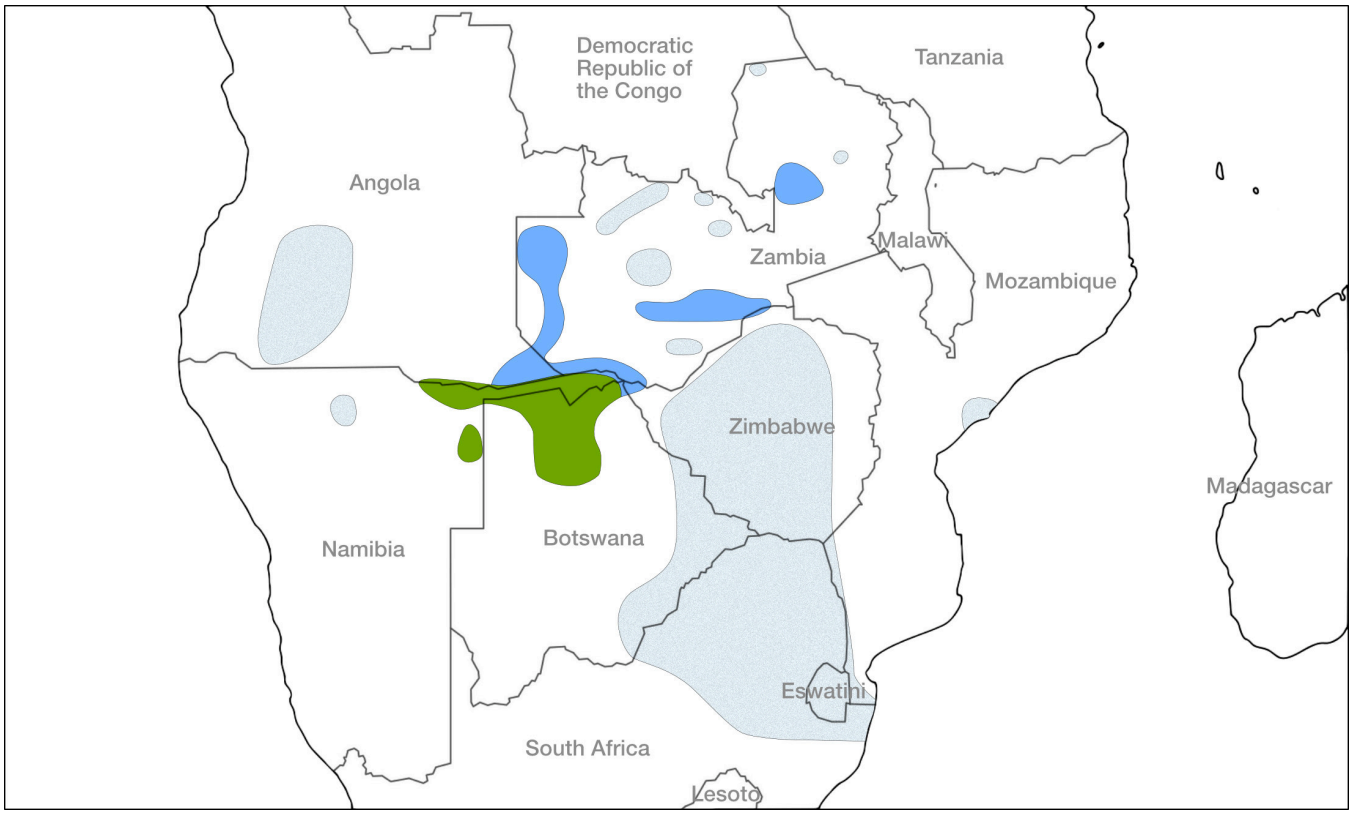

Figure 2. Distribution of Slaty Egret in southern Africa, up to 2021. Green is the main breeding range; dark blue – areas where regularly seen but not breeding; pale blue – wandering birds in South Africa, Zimbabwe and eastern Botswana.

common (Tyler 2003). Birds usually occur singly or in small groups, occasionally in larger groups of 30 to 60. Fothergill (1982) reported a group of 15 on open grassy plains in the Jao Flats in September 1981 and Brewster and Tyler (2002) noted a group of about 20 on these flats in April 2002. Other large groups included ten feeding at a drying pool along the Boro floodplain near Xaxaba in November 1999, 22 along the Gomoti River in July 2000 (Tyler 2001), 24 at a lagoon near Eretsha in December 2004 and 120 Slaty Egrets including a very large loose aggregation of 63 feeding in shallow 'flats' on the floodplain between Mohembo and Ngarange in November 2004 (SJT, pers. obs.). At Lake Ngami in August 2004, groups of seven and 12 were found at the leading edge of the floodwater (SJT, pers. obs.).

In the Gumare area of north-west Botswana (1824A/B, see Appendix 1 about the codes) it was also found to be fairly common in inundated grassland on seasonal floodplain (Brewster 1991).

Distribution by country

Angola

The Slaty Egret was not definitely known from Angola until recently (Pinto 1983, Dowsett 1993, Dean 2000). Hines (1992) and Penry (1994) noted that it occurred on the floodplains at the Cuíto-Cubango River junction, on the border between Angola and Namibia and on the border between Angola and Botswana. They noted that it may extend along river systems into extreme southern Cuando Cubango. Beel (1992) also found it close to the Angolan border on the Mashi River (= Cuando River) floodplain in Zambia whilst Pedro van Pinto (pers. comm.) noted that "it occurs at least in some years in the Liuwa Plain National Park, only 50 km from the Angolan border, and one can find very similar habitat on the Angolan side."

Pinto in 2004 wrote (pers. comm.) that although there are no records for Angola it is highly likely

to occur in the southeast and east regions where there is suitable habitat. He stressed that it was also important to note that these regions of Angola (east and southeast) are extremely remote, frequently of almost impossible access and virtually unstudied. Even during the colonial days, this region was known as "terras do fim do mundo" (lands of the end of the world)! Given the available data, he wrote that he would be surprised if they were not frequent visitors to this region.

Then, Mills *et al*. (2010) found four specimens in the Lubango Bird Skin Collection in Angola; these, the first definite records from Angola, had been wrongly labelled as Black Herons and had been collected in June 1968 at Quiteve, Huila Province on the banks of the Cunene River.

An unpublished sight and photographic record next came from Daniel Dugmore of a Slaty Egret along the Cuito River, an Okavango tributary on 13 May 2015 (Expedition Okavango 2015, Mills *et al*. 2020). In 2020, Mills *et al.* (2020) reported on a database of 15,939 bird records sighted by the National Geographic Okavango Wilderness Project between May 2015 and August 2018, from land and water, in the provinces of Cuando Cubango, Bié and south-west Moxico. Ten records were provided of Slaty Egrets in June and July 2015, all in the Okavango/Kavango catchment. Mills *et al*. described the species as uncommon in the area. Some 33 records from Steve Boyes' team were unfortunately rejected as there was not enough evidence to show that they were not Black Herons. The latter were considered rare in the area.

It remains to be seen if Slaty Egrets are resident and breeding in Angola.

Botswana

It occurs widely in the Linyanti/Chobe system and throughout the Okavango Delta. At the southern edge of the Okavango Delta, birds often move down onto the Thamalakane and Boteti Rivers when these hold water and have developed emergent vegetation. In January 2003, one was on the Thamalakane River near Sitatunga Camp 10 km downriver of Maun (Brewster and Tyler 2003); in May 1989 one was on the Boteti (in 2023B) and in August 2000 one was at Xhumaga on a pool on the lower Boteti River (R. Raijmakers, in Tyler 2001). Elsewhere, two were seen at Mwaku and Tale Pans north of Lake Ngami in early 2000 and again in January 2021 (Mark Muller, pers. comm.), one at Nxai Pan on 5 December 1988 (Ray and Val Lovett, pers. comm.), in Brewster and Tyler (1999) and one, seen by Angela Lund, south-west of Kuke in 2122A3 outside of the species' expected range on 5 March 2017 (Brewster and Tyler 2017). A vagrant was at Phakalane sewage ponds 15 km north of Gaborone for two months from late October to late December 1999 (Brewster and Tyler 2000a). When Lake Ngami fills, Slaty Egrets turn up there as they did in August 1989 and again in August 2004 when about 20 were noted at the leading edge. Although found throughout the Delta, the pattern of distribution changes according to the season and state of the floodwater (see below).

Democratic Republic of Congo (DRC)

In the DRC, there is still no evidence that Slaty Egrets occur regularly. However, there is an ebird record of one foraging in shallow water at the edge of a lake between Katanga and Bona on 13 October 2018 by Robert Davies (per Tommy Pedersen). Unfortunately, the photos of this bird have been lost. Louette and Hasson (2011), however, showed a photo of a Slaty Egret at Simama in Katanga on 3 June 2011. Dylan Aspinall observed Slaty Egret on the DRC border north of Lake Mweru in the 1980s. Birds of the World and Avibase both include the species on the DRC bird checklist.

Malawi

Although there are several claims for Slaty Egrets in Malawi (e.g., on the lower Shire River), none of these have been confirmed (Bob Medland, *in litt.*). Dowsett-Lemaire (2006) had no records from

the Nyika Plateau National Park. However, the species is included on various checklists of birds in Malawi and its occasional occurrence on the western border with Zambia is not unlikely.

Mozambique

Snow (1978) had no records of Slaty Egret from Mozambique. Whilst recorded by Ginn *et al*. (1989) for the Zambezi Delta, Slaty Egrets have not been seen in this delta by fieldworkers such as Bob Douthwaite or Richard Beilfuss (pers. comm.). Richard Beilfuss, in an E-mail of 3 Jan 2004, noted "Observers from the International Crane Federation and from Mozambique (Carlos Bentos) have been surveying the Zambezi Delta fairly intensively for about eight or nine years and have not observed any Slaty Egrets. No doubt an individual here and there may have been missed from the air (most of the delta is inaccessible by land) so their presence is not questioned, but it is likely there are very few."

BirdLife International (2000) noted that Slaty Egrets wandered to the delta when not breeding but Parker (2001) did not mention Slaty Egret as occurring in the Zambezi Delta Important Bird Area. In a letter dated 15 February 2004, Vincent Parker wrote "As far as I know, no credible records exist for Slaty Egrets in Mozambique. I know that Peter Ginn's book and also the BirdLife International Red Data list for 2000 mention Slaty Egrets in Mozambique, but their sources are not specified (the BirdLife publication quotes Herremans, who denies any knowledge). There was a report on an aerial buffalo census in the Zambezi Delta some years ago by the Wildlife Department which mentioned Slaty Egrets. I traced the author of that report (Paul Dutton), who says that he doesn't remember seeing Slaty Egrets, and if he did, he would not have been able to distinguish them from Black Herons from the air. It is possible that Slaty Egrets do occur in the Zambezi Delta without having been discovered, but as far as I am concerned, its presence in Mozambique is unconfirmed."

However, Parker (2010) then reported confirmation of several sightings of single Slaty Egrets between 2003 and 2005 near Marromeu in the Zambezi River Delta by various observers including B. Gibson, with some of these birds photographed. Unfortunately, these records have not been traced or published. Parker considered that the species is at least an occasional non-breeding visitor to central Mozambique. Since then there had been no other definite sightings and there were no e-bird records nor was it included in the SABAP (Southern African Bird Atlas Project) database although it is included by Avibase in their checklist of Mozambique in the bird checklists of the world series and in Wikipedia's list of birds found in Mozambique. However, in 2023 evidence was obtained of a bird in Mozambique (Hogg *et al*. in press).

Namibia

In Namibia, it is known mainly from the Caprivi Strip, the Okavango River and the Tsumkwe District (formerly known as Bushmanland); two areas where colonies of Slaty Egrets have been recorded are the 'Pannetjies Veld' wetlands, 25 km east of Tsumkwe, and at Nyae Nyae Pan, the largest of the Tsumkwe Pans (Hines 1992). In his estimate of Namibian populations during flood years in the Pannetjies Veld, east and south-east of Etosha Pan, Hines (1992) noted 269 sightings between 1984 and 1989. The Bushmanland population is undoubtedly part of the Botswana population (Chris Hines, pers. comm.).

Slaty Egrets were recorded regularly in the Mahango area of the Bwabwata National Park on the Okavango River (18° 09′ S, 21° 42′ E) from 1991 to 2000 (Mark Paxton, unpubl. data). In this park, January counts generally produce only one or two birds (one in 1993, 1995 and 1999, two in 2001) but 20 in 1991 whilst winter counts in July/August at Mahango have included one in 1991, four in 1997, 11 in 2000, and six in both 2002 and 2003 (Mark Paxton and Linda Sheehan, pers. comm.). Further up the Okavango River, Mark Paxton has also seen them at Shamvura where

usually single birds are encountered, sometimes groups of three to four birds all keeping their distance from one another.

On the Chobe River, counts undertaken on both sides indicated similar figures. Numbers of Slaty Egrets on the Botswana side in the January and July waterbird counts were usually very low, often just one bird, occasionally more as 39 in January 1993, 10 in January 2003, 21 in July/August 2003 and 19 in August 2004 (Tyler *et al*. 2005). Fifteen Slaty Egrets were counted in September 1998 on the Namibian side (Mark Paxton and Linda Sheehan, pers. comm.). In 23 km of Chobe River in the Salambala Conservancy of Namibia, Rob Simmons (unpubl. data) noted nine birds, giving a density estimate of 3.9 birds per 10 km. Given that the Chobe River in Namibia is about 100 km long, the total number of birds was estimated at 40, similar to that on the Botswana side. Population numbers undoubtedly fluctuate with high rainfall and birds probably disperse to the Okavango Delta or the Linyanti Swamps. In August 2004, 19 birds that were seen along the Botswana side of the Chobe River included 13 at three drying lagoons in the Satau grasslands outside the national park (Tyler *et al*. 2005). With the extent of suitable lagoon habitat on these grasslands, I suggested that the population on either side of the Chobe River/Linyanti system could seasonally be well over 100 birds.

Elsewhere in Namibia, it is rare, appearing only when exceptional rains and floods occur on the Kunene River, the Olushandja Dam near Onesi, the north-central regions, in Etosha National Park, Grootfontein, Daan Viljoen Game Park and Otjivero Dam (Simmons *et al.* 2015). Since 2015 there have been two further records from Onesi Dam, one in September/October and the other in February. Another February record came from 70 km north-west of Tsumeb (Recent Reports in African Bird Club Bulletins). These refer to singletons except for February 2020 when at least three birds were present at Onesi Dam. Chris Hines (pers. comm.) suspects that it is largely overlooked as a breeding bird on the farms north and east of Grootfontein where there are extensive areas of calcrete that flood for extended periods (and a metre or so deep) where the breeding conditions are not unlike those of Bushmanland. Slaty Egrets are regularly seen on these farms (but not reported as the farmers are not part of the 'network').

The population in Namibia was estimated as 300 birds by Simmons *et al*. (2015). However, it is likely that the 'Namibian' birds originate from the Okavango, moving into Namibia when conditions are suitable, opportunistically taking advantage of the high productivity environments of the seasonal pans and wetlands of north-east Namibia.

South Africa

The species is sparse in South Africa. Visitors or vagrants occasionally turn up at wetlands throughout the country. For example, one was noted by Geoff McLileron just on the South African side of the Limpopo near Pontdrif on 1 January 1999 (Brewster and Tyler 2001) and another noted by Paul Funston at Leeuwdril in the Kalakgadi Transfrontier Park on 7 March 2000 (Brewster and Tyler 2000b).

One or two Slaty Egrets have been seen quite regularly at Marievale Bird Sanctuary outside Johannesburg since March 1999. From Trevor Hardaker's Southern African Rare Birds News Reports there are at least 13 records of one to three birds at this wetland reserve. Elsewhere in Gauteng around Pretoria and Johannesburg, there are more than 11 records from other sites as Dieplant sewage works, Germiston Golf Course, Grootvaly wetland reserve, Muldersdrift, Dicken's Pan, Mkhombe Dam and Gnu Valley.

At least four sightings, all of single birds, since 2000 have been in KwaZulu Natal mainly at Ndumo Game Reserve and also at Muzi Pan; three sightings in North West Province at Vaalkop Dam, Kgomo Kgomo and at Faan Meintjies Nature Reserve; one in the Northern Cape – an immature

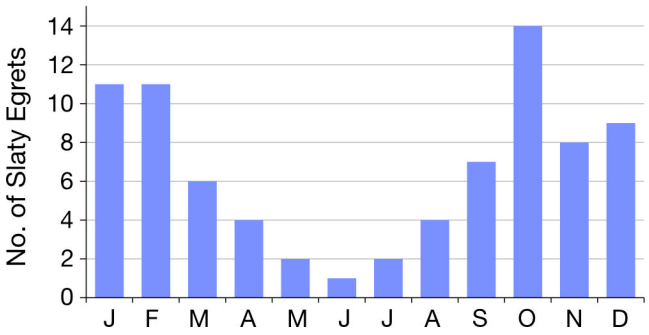

Figure 3. Seasonal occurrence of Slaty Egrets in South Africa, up to 2021. Some birds stay for more than one month.

at Nieuwoudtville in September 2006; four in Mpumulanga at Dullstroom and around Kruger; four in Limpopo Province at Zaagkuildrift, Nylsvley, Mapungubwe National Park and Palala Boutique Game Lodge; and also in the Free State at Zeekoevlei, Memel from 5 November 2005 to 11 February 2006, with an older March 1999 record from there (Demey 2003).

Up to 2021 there had been 44 records of 50 Slaty Egrets in South Africa. Given the temporal and geographical separation of the observations, it is highly unlikely that the same individuals were counted in different records (Hardaker 1990-2021). The highest numbers of birds were from October to February, outside the main breeding season in Botswana (Fig. 3). Some birds stayed only a few days but some stayed for up to eight months.

Zambia

Sightings are widespread south of S14°. The "core distribution" includes the Barotse Floodplains including Liuwa National Park, where Slaty Egrets appear to be largely seasonal, possibly the Kwando river, the "Caprivi wetlands" between Katima and Kazangula, where presumably year-round and may breed, and the Kafue Flats (Fig. 4). Seasonal movements have been shown by Aspinall (1989) and Dowsett (1981) noted that overall there are fewest reports during the rains, which is the time when birds are breeding in Botswana. Dowsett (2009) noted the species' presence in eight national parks in the country.

On the Barotse floodplain, Slaty Egrets appear to occur in most years in good numbers, only 50 km from the Angolan border. Large numbers were recorded in Liuwa National Park in November 2001 (Demey 2002) and about 100 birds were seen there in June 2003; these included 54 in one flock (Pete Leonard, pers. comm.). A recent report by BirdWatch Zambia describes a survey of Slaty Egrets in the Barotse floodplain between December 2017 and October 2018 (Phiri and Nanja 2019). The authors carried out transect and point counts and recorded 31 birds, mainly in floodplain grasslands along the Zambezi within the Liuwa National Park but found no evidence of breeding.

At the Kafue Flats, Slaty Egrets are also regular with scattered sightings year round on most visits to Lochinvar or Blue Lagoon National Parks. Although there are no breeding records, Pete Leonard suspects that they may now be breeding at Lochinvar as a short-billed juvenile was seen on 9 March 1998 and two adults at Lochinvar were in worn plumage in early October. Reports from Lochinvar include 23 in July 1999 (Demey 2000a), three in July 2000 (Pete Leonard, in Demey 2001), 21 birds in January 2003 by Carl Beel (Demey 2003) and two Slaty Egrets at Chunga Lagoon in Lochinvar National Park between 1 March and 10 May 2009 (Demey 2010); one was seen in 2020 at Musangashi Conservancy, directly upstream from the Kafue National Park (Frank Willems, pers. comm.).

In July 1999, birds were regular in the Zambezi floodplain in the Simungoma area (Demey 2000b). A roost of about 100 Slaty Egrets was seen in reeds on a Zambezi tributary, the Lingongole River in Simungoma Important Bird Area, north-east of Katima Mulilo, on 11 August 2009 by Lizanne Roxburgh (Demey 2010).

Dowsett (1981) noted the species' presence at Bangweulu. It was described as "very numerous" at Bangweulu swamps in late June 1981 when

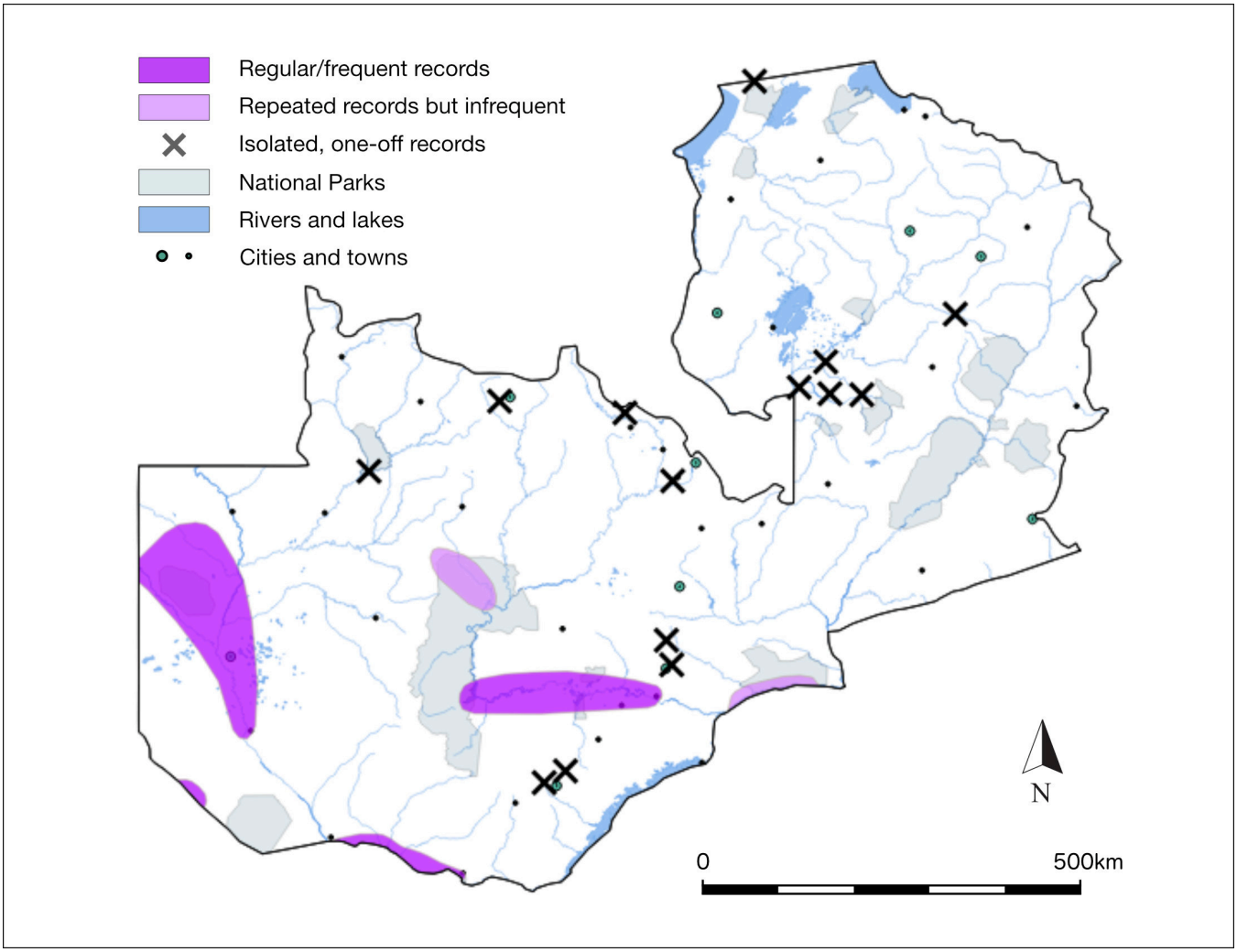

Figure 4. Occurrence of Slaty Egrets in Zambia, up to 2021 (Willems 2021b).

many flocks were seen (Aspinall 1989). It is clear that in more recent years the species has become very scarce in northern Zambia and Pete Leonard suggested that conditions were different in the late 1970s and early 1980s. There was a report of three seen at Chikuni at Bangweulu in 2006 (Chris Wood, pers. comm.) and quoted in Dowsett (2009) but these were unsubstantiated as no photographs or descriptions were submitted. Frank Willems has spent 150 days between 2007 and 2016 in Bangweulu but had not seen one. Two or three birds were, however, seen and photographed in the Chikuni area of Bangweulu in December 2019, May 2020 and July 2020. This is the first recent evidence of their presence in the Zambian Congo system (Willems 2021a).

In the late 1970s and 1980s, wanderers were noted in West Lunga N.P., on the Copperbelt at Luanshya and Chililabombwe, at Lusaka and even from Chiawa in the Middle Zambezi (Dowsett 1981). One was seen on the Matabele Plain in April 1999 (Demey 2000b). In recent years, there have also been reports with some regularity from the Lusaka and Choma areas and small numbers have been regular along lower parts of the Zambezi, as in the Livingstone area e.g., a long-staying individual at Livingstone Sewage Ponds (Demey 2002, 2003) and Lower Zambezi National Park and adjacent Chiawa area where it may perhaps breed (Frank Willems, pers. comm.).

The estimated Zambian population ranges from a few hundred (Bob Dowsett) to 500-1,000 birds (Pete Leonard, in BirdLife International 2000).

Zimbabwe

Slaty Egrets are regularly seen near Kazungula and also on the Zambezi River above Victoria Falls where they have been recorded throughout the year, except in June (Marshall 2011). The species is sparse and uncommon elsewhere in Zimbabwe with most records on the Mashonaland highveld. Marshall (2011) reviewed the records on the Mashonaland Highveld and elsewhere. Single birds, occasionally two or three, have been reported from Rainham Dam and Lake Chivero and also from Manyana Lakes area. The first record from Manyana Lakes was in January 1990 when a single bird was seen on four dates from 1-12 January at Darwendale Dam (MacCallum 1990). A single bird was seen again on two dates in early February and then two were seen on 10 February. March sightings were of one bird on four occasions, two birds on six visits and three birds on two visits; April sightings were of one bird on seven visits and three birds on two visits (MacCallum 1990). Four other sightings then came from Manyana Lakes up to October 2002. Records came in 1990 also from the Mukwadzi River in the Banket area and from Glendale (Marshall 2011).

Away from the Mashonaland Highveld, birds were seen in Hwange National Park in September 1989 and March 1998, four sightings from Kazuma Pan close to the Botswana border in 1986 to 1989, in April and October and from Lake Mutirikwe a single in April 2002 with three Black Egrets. The only middle Zambezi record was of one at Mana Pools in April 2005 (Marshall 2011). Most records of vagrants away from the Upper Zambezi, including Kazungula, occurred between September and April with one June record. Most sightings were in the rainy season between January and April (Marshall 2011).

Since 2011 there was a record of a single bird at Muzvikadei Dam, some 18 km north of Banket in January 2018 (Louw 2018). Recent sightings at Kazungula include two in January 2015 (Rockingham-Gill 2015), one on 16 and 17 December 2016 and one on 15 and 28 November 2019 (Baker 2017, 2019).

The bird remains a scarce occasional vagrant in much of Zimbabwe, with a small resident population at Kazungula where it possibly could breed.

Detailed distribution and movements in Botswana

Chobe/Linyanti

Slaty Egrets are frequent on the Chobe/Linyanti system but in relatively small numbers. One of the highest counts was of 39 in July 1993 along 65 km of the river (Herremans 1993) and 14 roosting in reeds near Sedudu Island in December 1999 (Randall, in Brewster and Tyler 2000b). In January 2003, 10 were seen along the Chobe River but in July and August 2003 none were seen during a survey by C. Brewster along the Chobe River from Sedudu to Ngoma although one was seen upriver between Ngoma and Kavimba. In August 2004, as many as 20 in flooded grassland between Kavimba and Satau towards Lake Liambezi, including 13 at three drying lagoons in the Satau grasslands, the others being along the river towards Kasane (Tyler *et al.* 2005). Given the extent of suitable habitat on these grasslands between July and October, before the lagoons dry out, an estimated 300 birds or more could occur there in years of inundation. These birds must move elsewhere, perhaps to the Linyanti or into the Okavango Delta, when the grasslands are dry. In the Linyanti, birds are not numerous but singles are regularly seen in the Selinda area (1823C2/D1). Between late 2002 and February 2003 at Linyanti Camp, a bird regularly fed at Makoba lagoon (1823D1), another at a reed-filled pan at Zibalianja camp and one in a pan near Selinda.

Along the Chobe River between Kasane and west

to Ngoma Bridge, the mean of four January counts between 2000 and 2010 was only four (maximum 5) whilst Slaty Egrets were only seen on one of seven July counts when seven individuals were noted. In seven counts between 2012 and 2019, one to three birds were seen on four January counts and singles on three July counts but 16 in July 2016.

The Puku Flats and around Sedudu Island were regular haunts in the late 2000s (Lynn Francey, *in litt.*).

Okavango Delta

Slaty Egrets occur throughout the Delta from the Panhandle down to the Thamalakhane and Boteti Rivers south of Maun, depending on the time of year and state of the floodwater. The species shows local movements connected with seasonal variations in habitat conditions. For example, birds move into areas that have been recently inundated on seasonal floodplains, or to drying pools with good emergent vegetation. As these wetlands dry out, birds move elsewhere. Some dispersal of young birds may lead to vagrants turning up well away from current strongholds. Within Botswana, records have come from near the Makgadikgadi Pans, at Nxai Pan, at Kuke and at Phakalane sewage ponds near Gaborone, almost 1,000 km from the Okavango Delta (SJT, pers. obs., Birdlife Botswana, unpubl. data).

Roosting

Slaty Egrets roost communally with other species outside the breeding season. Most Ardeids forage within 20-30 km of their roost but Grey Herons *Ardea cinerea* may move up to 38 km from the roost and Western Cattle Egrets *Bubulcus ibis* up to 60 km away although one to 20 km is more usual (Brown *et al*. 1982).

Up to ten Slaty Egrets were seen flying to mixed roosts at Xakanaxa and at Xigera in November 1998. In January 2003 in the Okavango Delta, seven of 20 mixed egret/heron roosts included Slaty Egrets (Tyler 2003). Roosts contained from one to 153 Slaty Egrets. In the south at Sitatunga Camp, only one bird was seen flying in to a large roost in trees and reeds, dominated by Western Cattle Egrets but with smaller numbers of Reed Cormorants *Phalacrocorax africanus* and other species; one was also seen foraging nearby during day counts. Three, 85 and 31 Slaty Egrets were counted, respectively, at the Xaxanaxa, Gadikwe and Gcobega roosts on the Maunachira River in Moremi Game Reserve and four at a large roost by the Kgaola Thogo channel in the Panhandle south of Shakawe. In the austral summer of 2004/2005 further roost counts were made in the Okavango Delta. At least 200 and probably nearer 300 Slaty Egrets were observed coming in to roost, mostly to the Pom Pom camp roost (Tyler 2005b). In the light conditions it was sometimes difficult to distinguish Slaty Egrets from Black Herons.

On the Boro at Xaxaba, a mixed roost has long been known (Randall 1988, 1990). Counts have fluctuated widely with 61 on 15 October 1986, 33 on 21 October 1986, 51 on 8 February 1987, 159 on 10 November 1987, 119 on 19 November 1987, just 48 on 24 November 1987 and 76 on 21 December 1989 (Randall 1988, 1990). In January 2003, 153 Slaty Egrets flew into this large mixed roost, mainly into *Phragmites* reeds (Tyler 2003). A further unidentified 20 dark egrets, either Black or Slaty, flew in but it was then too dark to separate the species. In January 2005, 43 Slaty Egrets flew in to roost at Xaxaba with a further nine ‘dark’ egrets (Tyler 2005b). At Xigera, although only one Slaty Egret was observed flying northeast towards Mombo at dusk in 2003, 20 birds were seen here during the day (Tyler 2003).

On the Chobe River near Kasane, where there is a small breeding colony, at least 20 birds gathered to roost in a small reedbed at the edge of the Chobe River on 15 December 1999 (Brewster and Tyler 2000a). On 14 December 1999, Richard Randall noted 14 roosting in reeds at the eastern end of Sedudu Island (Brewster and Tyler 2000b).

Breeding

Botswana

Rather little is known of the breeding biology of Slaty Egrets (del Hoyo *et al.* 1992). The species will breed at temporary wetlands but most described colonies are from trees in lagoons in the permanent swamps in the Okavango Delta (Fig. 5), on Wild Date Palm tree islands (Fig. 6) or in riverine reeds *Phragmites* as on the Chobe River. Slaty Egrets in Botswana usually nest in small colonies sometimes with other herons or egrets (Ardeidae) such as Rufous-bellied Herons *Ardeola rufiventris* or Litle Egret *Egretta garzetta*. A large breeding colony discovered by Tim Liversedge (see below) appears to be exceptional.

Despite the size of the Okavango Delta, rather few 'heronries', breeding colonies containing a mix of herons, egrets, storks or pelicans, have been recorded. The best known mixed heronries are in Moremi Game Reserve on the Maunachira River, viz. Xakanaxa, Gadikwe and Gcobega lagoons (Cooper 1969, Masterson 1971, Fothergill 1982, Gaosafelwe *et al*. 1997, Tyler *et al.* 2002). A list of known heronries was provided by Tyler and Hancock (2006). Another large heronry at Kanana was found by Muller and Flatt (2013) and surveyed again in 2018 and 2019 by Francis (2020) and a large mixed heronry is known from the Chobe River in Kasane (Tyler and Hancock 2006, Brown 2012). Slaty Egrets have been found in only one of these mixed heronries although D. Skinner recorded Slaty Egrets breeding with other species in 1980/81; unfortunately no further details are provided (Anonymous 1981).

Generally it seems that Slaty Egrets nest earlier than other herons and egrets and nest in single species colonies or with Rufous-bellied Herons. Eleven Slaty Egret breeding colonies have been found in Botswana – one in the Chobe area and the

Figure 5. An aerial view of part of the Okavango Delta. Photo: Mark Muller.

Figure 6. Slaty Egret Date Palm breeding habitat. Photo: Mark Muller.

rest in the Okavango Delta. The Slaty Egret breeding sites may be used in one or two years and then abandoned and a new site occupied.

Until 2000 only three breeding sites were known in the Okavango Delta and one in the Chobe system. Since then, Slaty Egrets have been found breeding at nine other sites in the Delta (Fig. 7). These have mainly been single species colonies in reeds or in palm thickets. Breeding occurs between March and August in years of high floods and after good rains.

1. **Xakanaxa Lediba in Moremi Game Reserve (G.R.)**: An occupied nest of Slaty Egret with two nestlings (pulli) was discovered in June 1975 in Water Figs *Ficus verruculosa* at a mixed heronry at Xakanaxa (Cakanaca) Lediba (Dowsett 1981). Nest and pulli are described, and other observations compared with previous documented data on the species. On 28 March 1985, the mixed heronry at Xakanaxa included 11 active Slaty Egret nests as well as nests of Rufous-bellied Herons and Little Egrets (Anonymous 1985, Fry *et al.* 1986). Most of the Slaty Egret nests had eggs (2-3). Colin Bell (pers. comm.) also found a Slaty Egret nest at Xakanaxa with chicks in April and May 1988 . In October 2005, there were six pairs in Water Figs at this lagoon (Pete Hancock, pers. comm.).

2. **Boro River**: Slaty Egrets were found breeding in a mixed heronry with Rufous-bellied Herons in a reed-bed on the Boro River north of Xaxaba in the central Okavango Delta (Randall and Herremans 1994). Breeding occurred in 1988, 1989 and again in 1992 after the reed-bed had recovered from fire and reedcutting. There was no breeding in this area in 1990, 1991 and 1993. It is estimated that 50 pairs of Slaty Egrets were present in 1988 and 1992 and 60 in 1989. During the six years, the reed-bed was the only site used for breeding by Slaty Egrets in 75 km of floodplain along the Boro River (no alternative site was used in 1990, 1991 or 1993) and differences in quality of the reeds (mainly as a result of fire history) suggested that it was the only suitable site.

3. **Jao/Boro area:** Tim Liversidge (pers. comm.) reported a large heronry with up to 500 pairs of Slaty Egrets breeding in reeds *Phragmites* (in 1922D2) at the top of the Jao/Boro during the early 1990s. Some film of this colony was obtained but no other information has been published.

4. **Jao Concession NG35**: In August 2003, a colony of 35-45 birds (ca. 20 nests) was discovered in a small Date Palm *Phoenix reclinata* thicket on an island in the Jao Concession (Atkinson 2003). The breeding colony was active again in 2004 and birds were seen there in 2006 (Pete Hancock, pers. comm.).

5. **Xini Lediba, Moremi G.R.**: In late August 2004, Mark Muller (pers. comm.) discovered another breeding colony at Xini Lediba near South Gate within Moremi Game Reserve. The colony comprised only four or five nests which were in reeds *Phragmites*. One nest contained an egg and small chick on 27 August. By the start of October, most of the large chicks had fledged. The nest with small chick(s) was then not visible (Pete Hancock, pers. comm.). Eggs must have been laid during July. Several pairs nested again in 2006 (Mark Muller, pers. comm.).

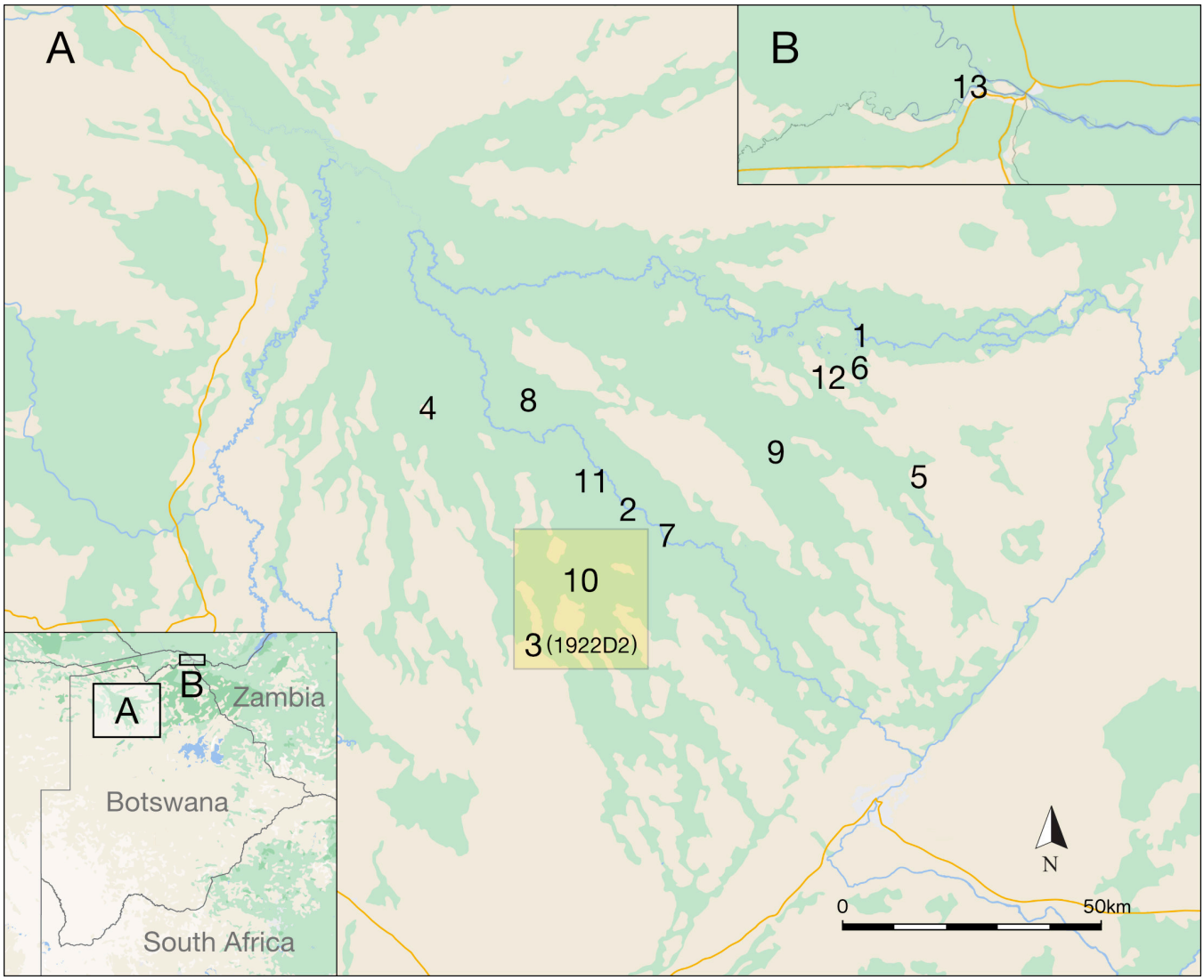

Figure 7. Slaty Egret breeding colonies in Botswana, up to 2021. A in the Okavango Delta and B along the Chobe River. 1: Xakanaxa Lediba in Moremi Game Reserve (G.R.), 2: Boro River, 3: Jao/Boro area (shown in the yellow square, including the QDGC code in parentheses), 4: Jao Concession NG35, 5: Xini Lediba, Moremi G.R, 6: Near Maya Pan, Fourth Bridge, Moremi G.R., 7: North of Eagle Island Camp, 8: Qagha Island between Xigera and Mombo, 9: Xou Lediba area, 10: Near Pom Pom airstrip, Ngamiland, 11: Upper Boro, 12: Near Third Bridge, Moremi G.R., 13: Chobe River.

6. **Near Maya Pan, Fourth Bridge, Moremi G.R.**: In June 2000, near Maya Pan in the Xakanaxa region of Moremi Game Reserve, Reed (2006) noted at least four pairs of Slaty Egret busy constructing nests in a dense thicket of Candle-pod Acacia *Acacia hebeclada*. These trees were in an open flood plain that covered approximately 2 ha. This area had flooded historically but not in the 1980s or 1990s; only the very heavy rains and high floods of 2000 (and 2006 and 2009) filled this floodplain again.

7. **North of Eagle Island Camp**: Oake (2011) reported a small mixed breeding colony of Slaty Egrets and Rufous-bellied Herons in a reedbed 2 km north of Eagle Island Camp in the Boro flood-plain in April and May 2006. Up to 10 pairs of Slaty Egrets were nesting. This site was listed by Tyler (2012) but more data are given by Oake (2011). There were about 20 nests in all of the two species. The Slaty Egret nests were less sub-stantial than those of Rufous-bellied Herons. Of five Slaty Egret nests that he could see, two had

two eggs, two had three eggs and the fifth had two eggs and a small chick. Oake and Oake (2019) provide photographs of a Slaty Egret at its nest at this site. There are also photographs of nest sites in Palm islands and of a nesting bird feeding its two half-grown chicks taken by Mark Muller (see Hancock 2008). Birds nested there again in September 2009.

8. **Qagha Island between Xigera and Mombo**: More than 30 pairs nested on five palm islands at three sites in March/April 2006 (Mark Muller and Pete Hancock, pers. comm.).

9. **Xou Lediba area**: Seen from microlight in May 2006 (Mark Muller and Brian Bridges, pers. comm.). Unknown number of pairs.

10. **Near Pom Pom airstrip, Ngamiland**: 30 nests near Xoranna Camp – occupied by Slaty Egrets and Rufous-bellied Herons in 2010 (Mark Muller, pers. comm.).

11. **Upper Boro**: A sizeable breeding colony was found on the upper Boro north-west of Tchau Island in Moremi Game Reserve, just below the Xo flats, on 17 June 2020 (Grant Reed, pers. comm.). This colony had probably in the region of 50 pairs over a five hectare area breeding almost exclusively in Wild Date Palms *Phoenix reclinata*. Some had eggs (clutch of 3), some with chicks. There were a few Rufous-bellied Herons in among the Slaty Egrets. The area was dry in April but the 2020 floods would have peaked at the colony site at about the beginning of May and Slaty Egrets would have commenced nesting at peak flood level.

12. **Near Third Bridge, Moremi G.R.**: A single nest was seen on the floodplain south-west of Third Bridge camp site (1923A4) in Moremi Game Reserve in August 2020 by Mark Muller and Ali Flatt (pers. comm.). The nest was in a small Candle-pod Acacia (Candle Thorn) *Vachellia* (=*Acacia*) *hebeclada* and a bird was sitting. However, due to the presence of Nile Crocodiles and Hippopotamus, it was not possible to approach any closer to see whether the bird had eggs or chicks.

In October 2012, Muller and Flatt (2013) visited and described a large 'heronry' at Kanana (1922B4) in very dense "islands" of Gomoti Figs *Ficus verruculosa* of varying sizes, mixed in with Waterberry trees *Syzygium guineense* and Papyrus *Cyperus papyrus*. A range of herons and egrets including Rufous-bellied Herons were breeding there but no Slaty Egrets were evident.

13. **Chobe River**: Benson (1982) wrote (erroneously) that Slaty Egrets were only known to breed on the Chobe River, although they were recorded at some localities elsewhere. In view of the 1975 breeding record in the Okavango, this statment is surprising. Birds probably breed along the Chobe every year but are rarely recorded doing so. In June 1996, three to four pairs were, however, nesting in reeds *Phragmites* just above Kasane rapids (Randall 2001) and there were five or six pairs here in June 1997 (Randall, in Brewster and Tyler 2000b).

Namibia

Hines (1992) described two colonies containing eggs and chicks in Floodplain Acacia *Vachellia* (=*Acacia*) *kirkii* trees in temporary wetlands – inundated tree savanna in eastern Bushmanland in northern Namibia in the wet season from February to April 1992. A small colony was also found by Chris Hines and Steve Braine in the eastern Caprivi on the bank of the Zambezi River (Chris Hines, pers. comm.).

South Africa

A pair was found building a nest in a mixed egret colony by Tarboton (1996) in the Nyl Floodplain near Nylsvley. The nest had two eggs in March 1996 but both the nest and egg later disappeared. This was the first recent breeding record in South Africa. All other records refer to vagrants although as in Namibia breeding may occur after exceptional rain and flooding.

Timing of breeding

The data from the records listed above show that Slaty Egrets start breeding in February and lay eggs up to August (Fry *et al.* 1986, Dowsett 1981, Randall and Herremans 1994, del Hoyo *et al*. 1992, Skinner 1997, Hancock 2008, Oake and Oake 2019). On the Boro, breeding started in May or early June close to peak flood levels (Randall and Herremans 1994) but at Xakanaxa nests were already active in March. At the Xini Lediba colony, egrets laid later, perhaps because of the exceptional floodwater during 2004.

Breeding biology

Nests are usually built in reeds *Phragmites* as along the Boro and Chobe Rivers or in Water Figs *Ficus verruculosus* as at Xakanaxa some 1-2.5 m off the ground. One colony of about 20 pairs was found in Date Palms *Phoenix reclinata* (Atkinson 2003). The nest is typical of small herons, being a platform constructed of sticks (30-40 cm in diameter and 10 cm deep) with no lining of reeds and measure 30-40 cm in width and 10-15 cm in depth. The clutch is 2-3 eggs of a pale blue-green colour (Fig. 8) and incubation is by both sexes as in all Ardeids (Fry *et al*. 1986, Hines 1992, del Hoyo *et al*. 1992). Of 11 nests in Moremi Game Reserve in 1985, eight contained two eggs, one had three eggs, one two chicks and the last nest had an egg and a chick. Eggs in Namibia measured 40.2-45.9 x 29.5-32.6 mm; the mean weight of 25 eggs in Namibia was 23.2 g with a range of 21-25 g (Hines 1992). Little is known of the incubation length but is 14-20 days in small bitterns and 18-30 days in larger species (del Hoyo *et al.* 1992). Hines (1992) found an incubation length of about 24 days at one nest and noted that in other small herons it was up to 27 days. Hatching is asynchronous because birds begin incubating from the first or second egg. Chicks have blackish down but are paler below (Fig. 9). As in all herons, egrets and bitterns both sexes feed and guard the chicks. One adult always guards the nest with chicks whilst the other is away foraging. The fledging period is 25-30 days in small bitterns (maximum of 12-13 weeks in large *Ardea* herons) but chicks often leave the nest and wander about in the tree canopy or in reeds when half-fledged.

Breeding success can be affected by human interference, by predators, fire and poor floods (BirdLife International 2000). In Namibia, Hines (1992) found very heavy predation, probably by a juvenile African Fish Eagle *Haliaeetus vocifer*. Some 26 nests were predated causing total breeding failure. Ginn (1974) reported Fish Eagles raiding a heronry in Moremi G.R. in August 1974. On the Boro River, breeding success of Slaty Egrets was low: *c.* 30% in 1988 and 1989 while all eggs were preyed upon in 1992, giving an overall success of *c.* 10% for the six years. Other potential predators include Black Crake *Amaurornis flavirostris* as Masterson (1971), during a trip to

Figure 8. Slaty Egret nest, eggs and one chick. Photo: Mark Muller.

Figure 9. Slaty Egret adult and chicks in wild date palm. Photo: Mark Muller.

Botswana in August/September 1970, observed Black Crake predation on Purple Heron *Ardea purpurea* eggs.

Immature and adult plumage

Hines (1992) described the immature as having grey-green legs rather than yellow as in the adult and being a paler grey. The brown throat and upper breast were, in the immature birds, buff-pink to pale brown and immature birds had no crest. The adult plumage varied from very dark to pale slate-grey. Leg colour was variable. Some birds had bright chrome yellow feet with less intense yellow up the legs whilst others had yellow-pink tarsi and greyer upper legs.

Threats

Threats to the Slaty Egret in various parts of its range include flood regulation, water abstraction, destruction of habitat for agriculture and rice production, reed-cutting, fire and tourism (see Penry 1986, Tyler 2012). Fire in the Okavango Delta was a particular problem in 2020, burning huge swathes of the Delta. It is known that birds have disappeared from part of the Kafue Flats due to human control of flooding. Tourism is included as a threat because breeding success can be adversely affected by human disturbance. Another potential threat not mentioned in Tyler (2012) is the spread of the alien Red-claw Crayfish *Cherax quadricarinatus,* first introduced from Australia into Zambia in 1992. Escapes or deliberate introductions have seen it spread into the Kafue and Zambezi river systems and there is concern that the crayfish could move from the Upper Zambezi into the Okavango Delta via the Chobe River and Selinda Spillway (Nunes *et al.* 2016), and that fish populations could be adversely affected. Low breeding success of Slaty Egrets may also limit the population whilst climate change might be of concern. The existing population in southern Africa may be a relict from former times.

Conservation and research measures proposed

Tyler (2012) provided in section 4 and Tables 4.1 and 4.2, some measures needed to safeguard Slaty Egret populations and to fill in gaps in our knowledge. Most of these measures are still relevant although this review does update our knowledge of distribution through contacts with ornithologists in each range state and collation of records in the literature.

Funding is a key issue as most of the work already carried out has been by volunteers although a small grant from the DWNP in the early 2000s did boost surveys of birds and their diet. Continued conservation and research needs are listed below.

1. Establish a Slaty Egret Working Group. *There is now a loose association of key people in all the countries within the range of Slaty Egrets with whom the author is in contact – see acknowledgements.*
2. Monitor population trends by surveying along fixed transects. *In Botswana many such transects were formerly carried out along rivers and on floodplains by boats and vehicles but in recent years volunteers have been lacking. Some regular waterbird counts occur in Namibia, Zambia and Zimbabwe.*
3. Conduct further baseline surveys and ecological studies to clarify the factors affecting its range and population in Angola and confirm whether breeding in Angola. *Michael Mills is a key person for that country where the terrain makes survey work very difficult.*
4. As above in Zambia and search for breeding Slaty Egrets in Kafue and Kazungula area. *The International Crane Foundation has a long-term management agreement with Zambian Parks. ICF staff are clearing invasive Mimosa trees Mimosa pigra and are also keeping records of any Slaty Egrets encountered. Other helpful individuals and organisations include Frank Willems, Chaona*

Phiri, BirdWatch Zambia and the Kafue Trust.

5. Maintain a record of all sightings in South Africa, Mozambique, Zimbabwe and the Democratic Republic of Congo, and possibly Malawi. *The author is keeping such records through liaison with Country Bird Recorders and publications such as the African Bird Club Bulletin.*
6. Conduct further surveys in the Okavango and Chobe areas to locate any previously unknown breeding sites. *DWNP staff, guides at camps within the Delta and Chobe/Linyanti areas and Safari Operators as Letaka Safaris as well as local ornithogists must be encouraged to record all sightings of Slaty Egrets and especially of colonies.*
7. Co-ordinated roost counts in the Okavango to assess populations. *This is a major exercise which would involve a team of at least 4 people for 2 weeks in the summer months.*
8. Monitor any breeding occurrence in Nambia after good rainfall.
9. Research into movements of birds through radio-tracking and use of numbered Darvic Rings. *This first entails catching adults or perhaps more easily, ringing juveniles at breeding colonies. This is a major research undertaking.*
10. Enforce legislation and raise public awareness to curb illegal burning of water-margin vegetation and reed-cutting.
11. Protect breeding sites and if possible, construct firebreaks around breeding sites.
12. Conduct research into the importance of burning and grazing by Red Lechwe and Hippos to the suitability of habitat for the species.
13. Carry out studies into whether food is limited at feeding sites and whether this affects survival. *Liason with Fisheries Department and monitoring for Red Crayfish.*
14. Control the spread of *Salvinia* and other invasive plants – *government departments, ICF.*
15. Increase the awareness of tourists about the impact of disturbance and encourage tourist guides to adopt a code of conduct for visiting breeding sites (*DWNP, safari operators, camp guides*).
16. Incorporate concerns over the damage of nesting sites by elephants into elephant management plans.
17. Prevent activities that decrease the area of floodplains, e.g., channel clearing, drainage, large-scale water abstraction, damming and construction of weirs. *The damming of the river at Kafue and construction of the Itezhi Tezhi Dam in 1977 to regulate the river for hydropower had a deleterious effect on the floodplains.*
18. Investigate the effects of Deltamethrin on the availability of the species' prey. *Tsetse –flies are now scarce in the Okavango Delta because of the aerial spraying programmes and insecticide-laced targets since the 1960s but the chemicals used had an adverse impact too on small fish and fish-eating birds (Douthwaite 1982).*

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Appendix 1. Illustration of Quarter Degree Grid Cells (QDGC) described by Penry (1994). A half degree square as a geographical area is defined by boundaries of the degree and half degree lines of latitude and longitude. A square with 30 minutes of latitude and longitude has a side length of 50 km and an area of 2,500 km2; each 30 minute square can be subdivided into four A, B, C and D.