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# First record of Forbes-Watson's Swift *Apus berliozi* in southern Africa, with comments on vocal and visual identification

*by Etienne Marais, Faansie Peacock & Gary Allport*

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*http://zoobank.org/urn:lsid:zoobank.org:pub:2B944092-B279-4F80-BA05-A56759A75EB4*

Summary.—We report the first record of Forbes-Watson's Swift *Apus berliozi* for the southern Africa region from coastal southern Mozambique. Identification was primarily based on vocal characters using sonogram analyses, which show that voice is diagnostic compared to all seven possible confusion species in the region. Current knowledge of the distribution and life history of *A. berliozi* is summarised, which shows that the Mozambique record extends the non-breeding range *c*.1,700 km south and suggests that Forbes-Watson's Swift is a migrant to the littoral of Tanzania and northern and central Mozambique. Field identification of Forbes-Watson's Swift using visual characters is challenging, but information is presented to aid separation from the most likely confusion species, Common Swift *A. apus*.

Forbes-Watson's Swift *Apus berliozi* was originally described as a subspecies of Pallid Swift *A. pallidus* based on specimens from the Yemeni island of Socotra collected by A. D. Forbes-Watson in 1964 (Ripley 1966). Subsequently, Brooke (1969) treated it as a species, and this arrangement has persisted until the present. More recently, molecular phylogenetic work has placed Forbes-Watson's Swift in a clade with Nyanza *A. niansae*, Bradfield's *A. bradfieldi*, African Black *A. barbatus*, Plain *A. unicolor*, Pallid *A. pallidus* and Common Swifts *A. apus* (Päckert *et al*. 2012), but phenotypically it can be grouped with the 'paler brown' swifts including Pallid, Nyanza and Bradfield's Swifts and, less distinctly, the *pekinensis* subspecies of Common Swift.

Two subspecies of Forbes-Watson's Swift are recognised, both with restricted breeding ranges. *A. b. berliozi* is known only from Socotra, where it nests in two systems of caves in limestone cliffs, at sea level and at *c*.500 m. The population has been estimated at 1,000–2,400 birds but potential breeding areas on smaller islands nearby have not been surveyed (Porter & Suleiman 2013). Breeding seasonality on Socotra is not completely clear. Screaming and display flights have been regularly observed in February and March, but there was no evidence of breeding during the period 31 March–7 April 1993 (Porter *et al*. 1996). Forbes-Watson collected 32 birds, nearly all of them in breeding condition, on 9–14 May 1964 (Ripley 1966), and the species has been observed entering caves late February−May, which is presumably the local breeding season (Porter & Suleiman 2013). The species has not been recorded on Socotra between June and September during the peak monsoon, but this could simply reflect the lack of visits during this season of stormy weather. It has been suggested that the Socotran population is resident (Porter & Aspinall 2010, Kirwan 2010) but none was recorded in surveys during 20 December−19 February, when Porter & Suleiman (2013) considered it to be probably absent from the archipelago. If this is the case then it is a migrant, the non-breeding area of which is unknown.

The other subspecies, *A. b. bensoni*, is locally common, present all year and breeds in March–September in coastal and, perhaps, inland Somalia (Ash & Miskell 1983). Nesting records are mostly from sea caves, but a specimen from Borama, north-west Somalia

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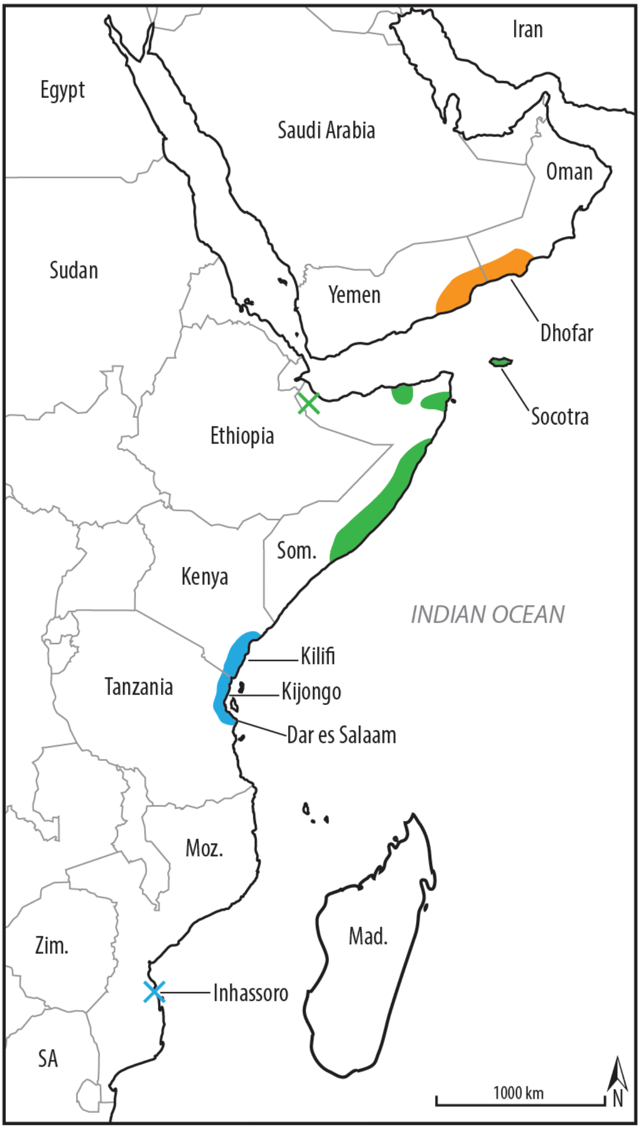

Figure 1. Distribution of Forbes-Watson's Swift *A. berliozi*, showing breeding range in Somalia ('Som.') and Socotra (green), southern Arabia (orange), and non-breeding range in coastal southern Kenya and northern Tanzania (blue). The location of the observation reported herein (Inhassoro, Mozambique) is indicated with a blue 'X'.

(09°53′37.5″N, 43°11′19.3″E; 122 km inland) was in breeding condition when collected on 27 June 1958, suggesting that inland nesting in Ethiopia and Djibouti is also possible (Brooke 1972, Ash & Miskell 1983; Fig. 1).

After more than 50 years of observations of 'mystery' swifts in south-west Oman and neighbouring eastern Yemen (since Smith 1956), birds which had been previously identified as *A. pallidus* or *A. apus pekinensis* were re-identified as Forbes-Watson's Swift *A. b. bensoni* by Grieve & Kirwan (2012), extending the known breeding range to southern Arabia. Observations in Oman span mid-April to late December, peaking between mid June and mid October (Eriksen & Victor 2013; https://ebird.org/species/fowswi1/OM), but the identity of birds seen, but not heard calling, after late September is uncertain (G. M. Kirwan *in litt*. 2020).

Specimen records from East Africa are all of this subspecies (see below) and, along with seasonal absence from Oman (Grieve & Kirwan 2012), show it to be at least a partial migrant

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in parts of its range (Chantler & Driessens 2000), despite year-round occurrence in Somalia (Ash & Miskell 1983).

In the non-breeding season the species has been known from coastal southern Kenya since Forbes-Watson collected ten specimens in early December 1964 and late January 1966 (Brooke 1969). None of these birds—which form the type series of *A. b. bensoni*—was in breeding condition, whilst feather wear varied from worn, darker and 'even browner' plumage in the December series to freshly moulted plumage in those collected in January (Brooke 1969).

Since then there have been fairly regular sight records in coastal Kenya, almost all of them during November to February over forested areas at Kilifi, Gede Ruins, Gazi, Ribe, Tiwi, Arabuko-Sokoke and the Shimba Hills (Brooke 1969, Britton 1980, Fry 1988, Zimmerman *et al*. 1996, Chantler & Driessens 2000, Stevenson & Fanshawe 2002; D. A. Turner *in litt*. 2020), although there have been relatively few reports since 2010 (R. Nussbaumer *in litt*. 2020). It has also been noted further north at Kipini Conservancy, on the coast between the Tana River delta and the villages of Witu and Mpeketoni, where small numbers were seen during 1 November–26 December 2006 and the species was presumed to be seasonally resident or on passage (Dowsett-Lemaire & Dowsett 2014). The area around Malindi and Watamu is regularly used and apparently monospecific flocks have been seen flying out to sea at dusk, possibly to roost on Whale Island, a small rocky islet 2 km off the mouth of Mida Creek (Britton 1980, Zimmerman *et al*. 1996; D. A. Turner *in litt*. 2020).

There have also been reports of *A. berliozi* from Tanzania's coast. The only published record was of a notably large flock of *c*.1,000 individuals near Dar es Salaam on 29 March 1996, moving north in a single, spiralling group (Fisher & Hunter 2014; B. Finch *in litt*. 2020, sound-recording on the *eGuide to birds of East Africa*, mydigitalearth.com). Unpublished records include unauthenticated sightings of two birds over primary montane evergreen forest at Mazumbai Forest Reserve, in the West Usambaras, in February 2009, and *c*.30 foraging over the East Usambara foothills *c*.10 km east of Siggi (Zigi) in March 2014 (J. Wolstencroft *in litt*. 2020), as well as two records documented with video, photographs and audio. One involved hundreds of birds around Kijongo Bay 26 km south-west of Pangani (05°38′49.8″S, 38°54′30.9″E) on 20–26 March 2017 (J. Haureljuk *in litt*. 2017; Fig. 2; https://www.facebook.com/groups/241108492733888/permalink/764278667083532/); the other of

Figure 2. One of hundreds of Forbes-Watson's Swifts *A. berliozi* in a low-flying flock, Kijongo Bay, Tanzania, March 2017 (J. Haureljuk)

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90 at Manta Resort, Pemba Island, Zanzibar (04°53′00.5″S, 39°40′44.4″E) on 12 April 2017 (J. Wolstencroft *in litt*. 2017; https://www.facebook.com/groups/241108492733888/permalink/780996082078457/).

The Tanzanian records involving large numbers of birds further south than previously recorded, and within a restricted period, suggesting possible passage, led to speculation that this species may be migrating to and from wintering localities further south than hitherto known (N. Baker *in litt*. 2018, 2020). It was this suggestion that prompted GA to consider the species as a possible migrant to Mozambique.

The field identification of Forbes-Watson's Swift is challenging. Grieve & Kirwan (2012) were the first to combine a review of specimen biometrics with analyses of both field photographs and vocal characters. They found that in general appearance this species is the palest of the paler brown group of swifts, but the only diagnostic field character is the better-defined triangular pale throat patch. Although the vocalisations of Forbes-Watson's Swift have been described previously (e.g. Zimmerman *et al*. 1996), it was only via sonogram analysis, and comparison with other swift species known or likely to occur in southern Arabia, that Grieve & Kirwan (2012) demonstrated that its screaming calls are clearly distinct. This was evident in high, low and mean peak frequency measurements—the calls showing less variation in frequency and with a significantly lower mean peak of 3.9 kHz, vs. 5.9 kHz for both Common and Pallid Swifts, resulting in a rasping scream relatively low and flat in structure. This represented a significant step forward in the field identification of Forbes-Watson's Swift.

## Recent record from Mozambique

On the morning of 3 March 2017 EM was leading a bird tour in the Save Woodlands (21°16′8″S, 34°36′21″E), a tract of semi-disturbed forest *c*.350 km$^2$ in extent, 40 km inland of Inhassoro (21°31′52″S, 35°11′34″E) in southern Mozambique. A flock of what were assumed to be Common Swifts was seen above the forest and EM noted that they were calling intermittently, which is unusual for the species in southern Africa, but did not pay further attention.

Later that day the group returned to Inhassoro, on the coast *c*.50 km north of Vilanculos and due west of the northern tip of the Bazaruto archipelago. At sunset EM observed a flock of large dark swifts above a beachfront lodge. The birds were swirling around 30–100 m above ground. It was hard to estimate numbers as they formed a loose, fast-moving group, but there were at least 50. They were initially thought to be Common Swifts (possibly *A. a. pekinensis*, of which EM had previous experience) but they were uncharacteristically vocal, which prompted EM to study them. The swifts circled above the lodge for *c*.20 minutes, then moved north-east over the ocean. The following notes were compiled subsequently, from memory.

***Description***.—Similar in size to Common Swift. Flight a little slower and 'lazier' than typical of Common Swift; at the time, this was thought probably to be a function of calm conditions. The evening light was poor but some appeared to be paler (browner) than Common Swift and to have a more obvious whitish throat patch. The screaming calls were unfamiliar to EM, albeit reminiscent of African Black Swift (known to EM at breeding colonies) but 'mellower' in comparison. EM considered that, given the locality, date and habitat, a migrating flock of African Black Swifts was extremely unlikely. He made a sound-recording using an Olympus voice recorder (WS-853).

***Initial identification***.—All possible species of swifts were considered for both encounters, and most were easily excluded; Mottled Swift *A. aequatorialis* on the basis of overall size and behaviour, as well as call, with which EM was very familiar, and Scarce

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*Schoutedenapus myoptilus*, Alpine *A. melba*, Horus *A. horus*, White-rumped *A. caffer* and Little Swifts *A. affinis*, and African Palm Swift *Cypsiurus parvus*, by general appearance and flight action. After initially thinking that they were Common Swifts, EM subsequently felt that he was unable to identify them with certainty and planned to review the voice recording of the birds at the lodge. This was not done until late March 2020, when GA raised the possibility of Forbes-Watson's Swift occurring in Mozambique. An initial analysis revealed that the Inhassoro swifts' screaming calls were very similar to Forbes-Watson's Swift. A more thorough comparative analysis of the calls of potential confusion species was therefore undertaken. In hindsight, the birds seen over the Save Woodlands may also have been the same species, but no such claim is made here due to the cursory nature of the observations.

## Identification

Four species of large swift with the potential to be confused with Forbes-Watson's Swift are currently known from the southern Africa and Madagascar region. These are discussed below in relation to the identification of the 'Inhassoro swifts'.

Bradfield's Swift breeds in western southern Africa and Angola. It is locally common, being the commonest swift in Namibia, and is thought to be resident and sedentary. *A. bradfieldi* occurs marginally in south-east Botswana and is found no further east than Kimberley, South Africa: there are no records from Mozambique (Hockey *et al*. 2005). It is relatively distinctive, being paler brown overall than other species (but see *A. a. pekinensis*). A previously accepted specimen record of Pallid Swift from the southern Africa region (Hockey *et al*. 2005) has since been re-identified as this species (Davies 2013).

The nominate race of African Black Swift *A. barbatus* breeds widely in mountainous regions of South Africa, Lesotho and Eswatini, with a minor presence in eastern Botswana. It is uncommon in the uplands of southern Mozambique and in the Lebombo Mountains, the highlands bordering Eswatini. There is also a population of the subspecies *oreobates* resident in the Chimanimani Mountains of Mozambique bordering Zimbabwe and this taxon is also reported from Mount Gorongosa (Brooke 1970, Clancey 1996, Hockey *et al*. 2005). The subspecies *hollidayi* has a very restricted range, in western Zimbabwe, where it is apparently resident. Nominate *barbatus* is mostly absent from large parts of its southern range between May and August, although some over-winter. It has been recorded on passage in Zimbabwe in May and August, with one record in Mozambique in April (Fry 1988, Hockey *et al*. 2005). The non-breeding range is unknown but is assumed to be tropical Africa (Hockey *et al*. 2005). Away from its colonies, this species represents an identification challenge in the region, being similar to *A. a. apus*, but is separable with good views of the upperparts (often difficult to achieve), showing a characteristic dark 'saddle' on the mantle contrasting with paler secondaries (less clear in *hollidayi*) (Hockey *et al*. 2005).

Malagasy Black Swift *A. balstoni* occurs throughout Madagascar and the Comoros, where it is generally presumed to be resident and sedentary. However, it is apparently highly mobile within this range, with fluctuations in numbers in several parts of Madagascar (Safford & Hawkins 2013, del Hoyo *et al*. 2020). Large flocks of swifts reported arriving off the sea in Mozambique have been suggested to be this species, rather than *A. barbatus*, but this is unproven and hypothetical (Chantler & Driessens 2000, del Hoyo *et al*. 2020). *A. balstoni* is smaller than African Black Swift with a blacker head and body, and smaller pale throat patch distinctly streaked dark (Safford & Hawkins 2013).

Common Swift (*A. a. apus* and *A. a. pekinensis*) is a Palearctic migrant present late October–March in the southern African region (Hockey *et al*. 2005, Chantler *et al*. 2020). The Western Palearctic-breeding *A. a. apus* is the darker of the two subspecies, similar in overall tone to African Black Swift, with a poorly defined pale throat patch. Eastern *A. a. pekinensis*

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is more variable in tone but is normally a paler brownish bird which can show a 'saddle' on the mantle (Grieve & Kirwan 2012), similar to African Black Swift. This subspecies is not illustrated in most African field guides, contributing to its confusion with Bradfield's and Forbes-Watson's Swifts. The migratory ranges of the two forms in southern Africa are not well known; *A. a. apus* is considered to reach only the eastern part of the region whilst *pekinensis* is recorded over-wintering further south and west, especially in arid regions (Brooke 1975, Hockey *et al*. 2005). For more detail see section below on temporal occurrence in the subregion.

In Mozambique, Clancey (1996) described Common Swift (*sensu lato*) as 'probably of fairly general occurrence, but so far known on the basis of three specimens'. It is unclear which specimens these are but they may be those collected by Pinto (1959) on 24 March at Funhalouro. Parker (2000, 2005) reported the regular occurrence of Common Swift in southern Mozambique, but only inland, from 24°S as far north as northern Tete province, in November–March (but with observations until May). However, it is unclear what criteria were used to identify these birds, and there was no mention of subspecies. More recently, Common Swift has been recorded regularly in Sofala province south of the Zambezi, particularly in the latter's basin, west of Mount Gorongosa and in the Pungwe River catchment, between November and February (SABAP2 database: http://sabap2.birdmap.africa/) often in flocks of hundreds, possibly thousands, in stormy weather (EM pers. obs.; e.g. https://ebird.org/checklist/S68018268). At least ten *pekinensis* were seen together with the nominate in Sofala province, central Mozambique, on 6 December 2010 (EM pers. obs.; https://ebird.org/checklist/S67277339). Large swifts are generally very uncommon in the southern littoral of Mozambique. None was found there by Parker (2000) and GA recorded only three birds (in two observations) over nine years of birding in the region (see Allport 2018 for locations and effort), one of which was identified as *A. a. apus* (https://ebird.org/checklist/S51956079). However, there is an observation of 40 swifts logged as *A. apus* near Xai-Xai, in March 2016 (EM pers. obs.; https://ebird.org/checklist/S68021013), which is now in question.

## Voice analysis

***Methods***.—Seven species of swift known, or thought possibly, to occur in southern Mozambique were included in the analysis; the four species discussed above, plus Pallid, Nyanza and Forbes-Watson's Swifts. Pallid and Nyanza Swifts have not been recorded in the region but were included based on similarity in voice and plumage. The two subspecies of Common Swift were analysed separately.

Sound-recordings were located via online resources (Xeno-canto [XC] and the Macaulay Library of Wildlife Sounds) and personal contacts. The vocalisations chosen for comparative purposes were limited to flight calls, and no attempt was made to cover the full variety of vocalisations made in courtship and at the nest.

Adobe Audition was used to prepare sonograms for initial review. Analysis was attempted following the methodology of Grieve & Kirwan (2012), but the algorithm for maximum and minimum peak frequency used in their analysis was found to be heavily influenced by incidental sounds on many recordings, which resulted in readings from false signals. However, in trial analyses, the algorithm for frequency (kHz) at peak amplitude (Pk) yielded consistent results, and this algorithm was adopted for the comparative analysis.

Recordings were selected based on clarity and length of strophes of 'screaming' calls. Each 'scream' was individually analysed by selection in a hamming window with a fast Fourier transformation size of 2,048 points and the frequency at peak amplitude was measured.

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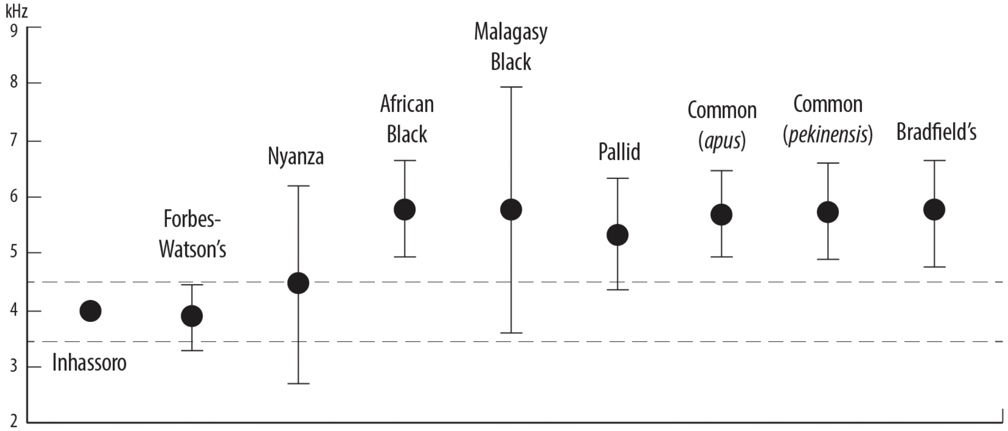

Figure 3. Comparison of mean (circle) frequency (kHz) at peak amplitude (Pk) of the screaming calls of 'Inhassoro swifts' with Forbes-Watson's *Apus berliozi*, Nyanza *A. niansae*, African Black *A. b. barbatus*, Malagasy Black *A. balstoni*, Pallid *A. pallidus*, Common (*A. a. apus* and *A. a. pekinensis*) and Bradfield's Swifts *A. bradfieldi*. Bars show 95% range in values (± 1.96 SD), and range for 'Inhassoro swifts' shown as broken lines.

It was noted that higher pitched harmonics in individual screams were evident on the best-quality recordings so only the lowest-pitched first-fundamental harmonic was considered, even if one or more overlying higher harmonics were visible in the sonograms. The data thus comprised a series of measurements of individual screams but were pooled to form a combined dataset for each taxon for the purpose of analysis.

Call series were assessed both visually on the sonograms and aurally at normal playback speed and with speed reduced by 0.3×; the slower playback was found to aid characterisation of the rapid, complex screaming calls. The terminology of Robb & Pelikan (2020) was followed to describe the sound structure.

***Results***.—The recording of the 'Inhassoro swifts' was 39 seconds in duration and comprised 33 screams from multiple birds; each rasping scream was of a flat tone at *c*.4 kHz (Figs. 3–4; full call series XC543748).

Twenty-one recordings of screaming call sequences from the nine taxa were analysed (Appendix 1). There was no significant difference between mean frequency at peak amplitude of the calls of 'Inhassoro swifts' and Forbes-Watson's Swift, but all other swift species analysed vocalise at higher frequencies at the peak of the call (Table 1, Fig. 3). The nearest call within the range of both the Inhassoro recording and Forbes-Watson's Swifts was that of Nyanza Swift, which, along with Malagasy Black Swift, exhibited wider ranges of variation in this measurement (Fig. 3). However, there were reasonable sample sizes of these two species and *t*-tests revealed significant differences from the 'Inhassoro swifts' in both cases (Table 1).

The sonogram signatures of flight calls across the species tested are shown in Fig. 4. These high-pitched, rather frantic screams all sound quite similar to the human ear. Structurally, the long screams are 0.7–1.0 second in duration and often exhibit a rapid rise in frequency in the 'foreleg', which can form a very rapid spike. There is a crest, when frequency is highest, followed by a slightly less rapid decline in frequency towards the call terminus (the 'hindleg'). In several species the 'hindleg' is attenuated and has the effect of a notable down-slur. Many calls have very rapid oscillations in frequency or volume, and this modulation creates a 'buzz', 'rasping' note or a 'trill', as opposed to a smooth sound, which is often most pronounced in the 'hindleg'. Modulation also varies in the rate of oscillations: very fast modulation sounds shrill, whereas slower modulation is more like a trill with the vibration clearly audible. The calls of each species are described in Appendix 2.

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TABLE 1
Comparison of mean frequency at peak amplitude of screaming calls of the 'Inhassoro swifts' (Fig. 4; XC543748) with Forbes-Watson's *Apus berliozi*, Nyanza *A. niansae*, African Black *A. b. barbatus*, Malagasy Black *A. balstoni*, Pallid *A. pallidus*, Bradfield's *A. bradfieldi* and Common Swifts (*A. a. apus* and *A. a. pekinensis*). See Appendix 1 for details of samples.

| | Sample size (*n*) | Mean frequency at peak amplitude (kHz) | Standard deviation | Standard error | Comparison *t*-test with the Inhassoro birds |
|---|---|---|---|---|---|
| 'Inhassoro swift' | 33 | 3.945 | 0.259 | 0.045 | |
| Forbes-Watson's Swift | 33 | 3.846 | 0.290 | 0.050 | NS |
| Nyanza Swift | 17 | 4.465 | 0.896 | 0.217 | $P$=<0.001 |
| African Black Swift | 44 | 5.795 | 0.430 | 0.064 | $P$=<0.001 |
| Malagasy Black Swift | 32 | 5.801 | 1.123 | 0.198 | $P$=<0.001 |
| Pallid Swift | 32 | 5.361 | 0.498 | 0.088 | $P$=<0.001 |
| Bradfield's Swift | 35 | 5.681 | 0.461 | 0.078 | $P$=<0.0001 |
| Common Swift (nominate) | 27 | 5.678 | 0.390 | 0.075 | $P$=<0.001 |
| Common Swift (*pekinensis*) | 23 | 5.761 | 0.426 | 0.088 | $P$=<0.001 |

## Discussion

All swift species analysed had vocal characters significantly and diagnostically different from the 'Inhassoro swifts', except Forbes-Watsons's Swift, to which they were almost identical (https://www.xeno-canto.org/set/5842; Table 1, Figs. 3–4). The vocalisations of *A. berliozi* are distinct from other species in both frequency and details (Fig. 4, Appendix 2; Grieve & Kirwan 2012). The recording from Inhassoro is thus consistent with Forbes-Watson's Swift, as also are the plumage characters observed.

This is the first record of Forbes-Watson's Swift for Mozambique and the southern African region (Hockey *et al*. 2005; T. Hardaker *in litt*. 2020). Although the species was not a widely anticipated new bird for the country, indeed it was little known to most birders in southern Africa (J. R. Nicolau *in litt*. 2019), the emerging pattern of records further north, particularly in Tanzania, indicate its occurrence probably could have been expected (N. Baker *in litt*. 2018, 2020; L. Kearsley *in litt*. 2020).

This record extends the non-breeding range *c*.1,700 km south and suggests that Forbes-Watson's Swift may be found anywhere along the East African littoral, from Somalia to southern Mozambique. Whether the Inhassoro record is an example of a regular occurrence or vagrancy is yet to be established. It is noteworthy that there was a cluster of records on the East African coast in March/April 2017 with four observations in Tanzania (see above) in addition to the Mozambique occurrence. Together, these suggest that there may have been an unusual movement at the time. Plausibly, Forbes-Watson's Swift has an 'irruptive' population dynamic or migratory cycle (Newton 2006), but, equally, it may be that these are simply the first records of a previously unnoticed normal migration.

Large swifts are uncommon on the coast of southern Mozambique; for example, none has been reported on the relatively well-watched San Sebastian Peninsula, 70 km south of Inhassoro (Read *et al*. 2014; C. Read & D. Gilroy *in litt*. 2020). This suggests that Forbes-Watson's Swift is at least not widespread in this part of Mozambique. However, like its close relatives, the species might select airspace over forest for daytime foraging, but unlike Common Swift, which ascends in vesper flight at dusk and roosts on the wing (Dokter *et al*. 2013, Hedenström *et al*. 2016), Forbes-Watson's Swift may roost in caves on offshore islands (as suspected in Kenya—Zimmerman *et al*. 1996) or on the mainland, perhaps on coastal cliffs similar to those in which it breeds. In this case the daily foraging distance inland

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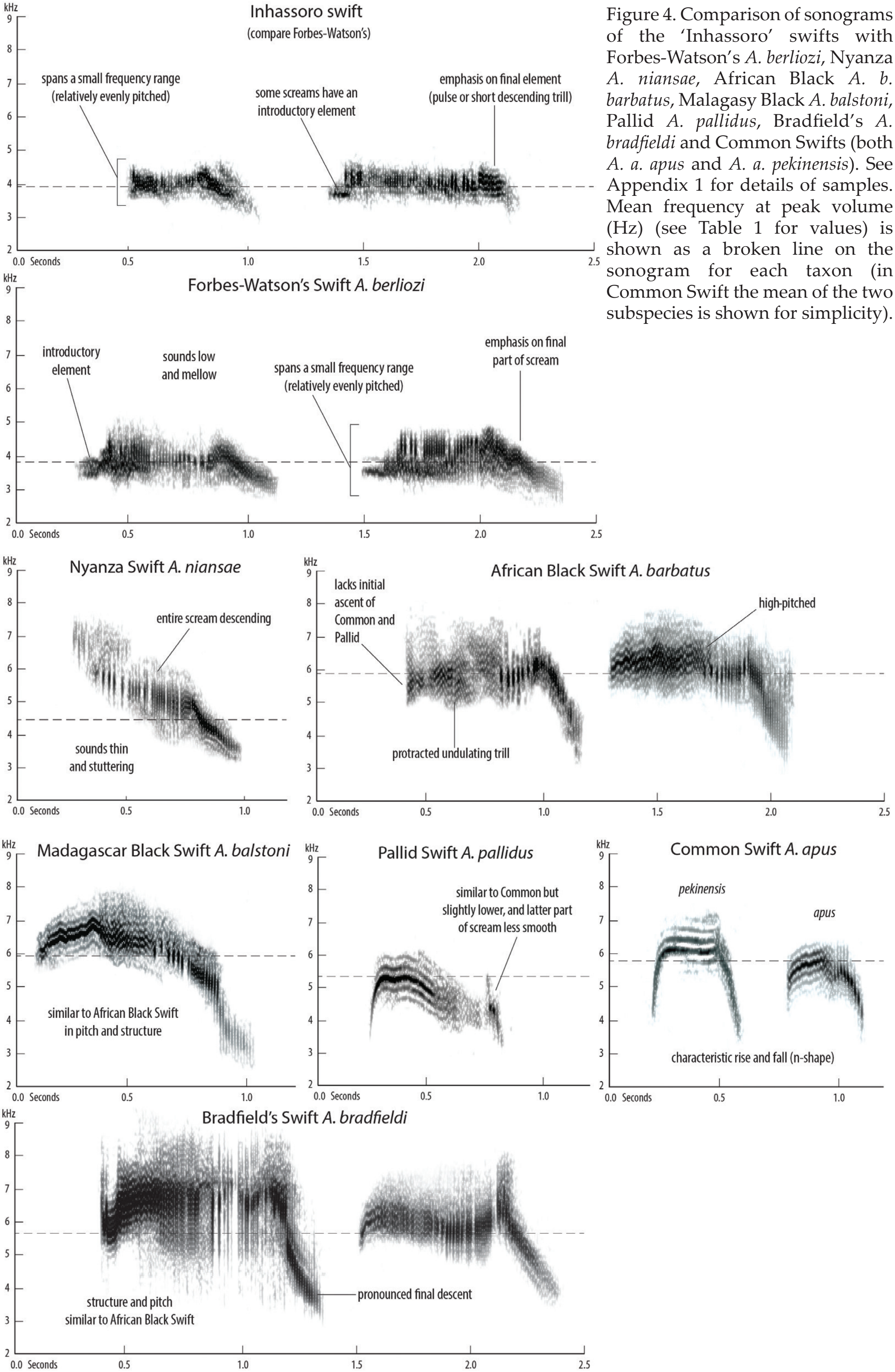

Figure 4. Comparison of sonograms of the 'Inhassoro' swifts with Forbes-Watson's *A. berliozi*, Nyanza *A. niansae*, African Black *A. b. barbatus*, Malagasy Black *A. balstoni*, Pallid *A. pallidus*, Bradfield's *A. bradfieldi* and Common Swifts (both *A. a. apus* and *A. a. pekinensis*). See Appendix 1 for details of samples. Mean frequency at peak volume (Hz) (see Table 1 for values) is shown as a broken line on the sonogram for each taxon (in Common Swift the mean of the two subspecies is shown for simplicity).

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will be limited to those areas that can be reached during daylight from coastal roosts. It is possible that feeding over areas such as the Save Woodlands and use of offshore island roost sites in the Bazaruto archipelago, or on the cliffs north of Inhassoro, provides suitable non-breeding season habitat for *A. berliozi*. Such requirements may be met only at a limited number of localities in the coastal region.

The records of non-breeding *A. berliozi* reported here all involved monospecific flocks. It may be that the species occurs only or mainly in single-species groups, and is more likely to be identified under such circumstances, whereas if part of multi-species flocks they are more likely to go unnoticed especially if not vocalising. However, the observations reported here, although few, support the hypothesis that the species may have different habits and requirements to other swifts and so behaves independently, at least at certain times.

The timing of the 2017 records from Mozambique and Tanzania abut or overlap the reported breeding dates in Somalia and on Socotra. However, the precise timing of the species' nesting season is not well known; the population in Oman appears not to arrive at the breeding sites until early May (https://ebird.org/species/fowswi1/OM) and on Socotra they arrive in February but are not reported breeding until mid-May (Porter & Suleiman 2013). As Common Swifts are known to migrate rapidly, covering up to 300 km/day (Åkesson *et al*. 2012), assuming equivalent speeds for Forbes-Watson's Swift, it is possible that from Inhassoro they could reach the breeding areas in *c*.10 days.

## Identification and temporal occurrence in southern Africa

The difficulty of identifying Forbes-Watson's Swift, in particular its separation from Common Swift, limits understanding of its occurrence in southern Africa. We review what is known of the seasonality of its occurrence in the East and southern Africa regions as well as that of, the most likely confusion species, Common Swift, and discuss how these species can be separated in the field.

*Seasonality*.—Forbes-Watson's Swift is absent from Socotra in December–February (Porter & Suleiman 2013) and there are very few records from Oman between January and late April (Grieve & Kirwan 2012, Eriksen & Victor 2013; https://ebird.org/species/fowswi1/OM). Records of migrants from Kenya are sparse and range from early November to early April, with a small peak in mid November (Brooke 1969; https://ebird.org/species/fowswi1/KE; R. Nussbaumer *in litt*. 2020). Thus, the broadest date range when migrants may be present on the east coast of southern Africa is likely to be November to April.

Common Swifts arrive in southern Africa in late October–November and depart between January and early March, with *pekinensis* present in the south-west and nominate *apus* in the north-east of the region (Hockey *et al*. 2005). However, these conclusions were based on limited data, and given the difficulty of subspecific identification and paucity of reliable observations over much of south-central Africa, this simple interpretation may be inaccurate.

Recent studies have investigated the migrations of Common Swifts. The results are mostly still unpublished but initial findings have shown that *A. a. apus* tagged in Western Europe travelled to East Africa, arriving in early December and departing in late January. Most of these remained in Kenya and Tanzania where they fed over forested areas, although many individuals reached northern Mozambique (Appleton 2012, Wellbrock *et al*. 2017) and one as far south as Beira before returning north-west to the Congo Basin (Klaassen *et al*. 2014). Individuals were found to return annually to specific localities (Wellbrock *et al*. 2017). In contrast, *A. a. pekinensis* tagged in Beijing, China, migrated via Central Africa to overwinter in south-west Africa in October where they stayed until mid-January. On their

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return journey they passed through eastern South Africa and Mozambique, where present between mid to late January and February, and then moved to the Congo Basin by early March (Kearsley 2016, 2019). Nominate *apus* might therefore be expected to occur on the littoral of central and northern Mozambique from perhaps late November until early March, especially north of Beira, and *pekinensis* from mid January to late February. However, all of these tagged birds were adults, and juveniles may have a different pattern of occurrence (Common Swifts are thought to return to the breeding grounds in their second year, possibly arriving later than adults: Jukema *et al*. 2015). Furthermore, tagged individuals of the two subspecies were from the longitudinal extremes of the breeding range, and may not cover the full range of migration strategies.

Forbes-Watson's Swift may overwinter in the same areas as Common Swifts in East Africa and venture south at the same time as *A. a. apus* in December–January, and co-occur with *pekinensis* in February. Thus, flocks of swifts in the region merit particular attention in March–April when most Common Swifts should have departed. Previous records of Forbes-Watson's Swifts may have been overlooked in Mozambique, for there are reports of Common Swifts much later in the season than might be expected (Parker 2005) and the specimens collected in March by Pinto (1959; Colecção de Aves do Museu da História Natural de Maputo, CPMM.AVE.1958.15–16) warrant re-examination.

*Moult*.—Moult is a useful means to age birds in the field and can be critical in the identification of some swifts (Larsson 2018), but it is unclear to what extent it is relevant to the separation of Common and Forbes-Watson's Swifts. However, a summary of known data is presented here as an aid to interpreting swift plumages in the region.

Migrant *Apus* mostly time their moult cycles to coincide with arrival in the non-breeding quarters, either by starting primary moult on the breeding grounds and then suspending the process until they reach the non-breeding areas, or by delaying moult until after arrival (Cramp 1985, Ginn & Melville 1985, Chantler & Driessens 2000).

Adult Common Swifts commence a lengthy moult in August, taking 5–6 months to regrow their primaries and secondaries, completing the process in late December and January. Many Common Swifts—and possibly Forbes-Watson's Swifts—return north with an old outermost primary (p10), which is not replaced until the following winter (De Roo 1966, Brooke 1969, Ginn & Melville 1985). Such heavily worn outer primaries may result in a blunter than usual wing shape. First-winter Common Swifts moult their body feathers, lesser and median coverts, and (usually) rectrices and secondaries on the non-breeding grounds, so their primaries and greater coverts look increasingly worn and therefore slightly browner and more contrasting than adults as the non-breeding season progresses. The contrast in age is more evident once adults have replaced several inner primaries, which then contrast in tone with the outer wing (De Roo 1966, Cramp 1985).

The moult cycle of Forbes-Watson's Swift is largely unknown but photographs from Oman in November show a bird in worn plumage except three innermost primaries and median underwing-coverts (P. Kennerley *in litt*. 2019; https://ebird.org/checklist/S49665050), whilst December specimens from Kenya were in active primary moult but those collected in January were in completely fresh plumage (Brooke 1969). Photographs from Tanzania in March/April show birds in fresh plumage and none was in active wing moult (J. Haureljuk *in litt*. 2017; https://www.facebook.com/groups/241108492733888/permalink/764278667083532/; J. Wolstencroft *in litt*. 2017; https://www.facebook.com/groups/241108492733888/permalink/780996082078457/). This suggests its moult cycle is probably similar to Common Swift, at least in adults; there is no information for immatures.

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## Field characters

The generally fleeting nature of sightings of swifts, often against a bright sky, make accurate assessments of colour difficult, as apparent shades can change quickly depending on the light. For detailed reviews of judging the colour of swifts in the field see Ahmed & Adriaens (2010) and Roberts & Campbell (2015). They emphasised plumage and structural characters that are less dependent on light conditions, such as general shape, head pattern, patterns of scaling on the underparts, and contrasting features on both wing surfaces.

It is hoped that the following, which focuses on the appearance in the field of the three taxa concerned, with key features shown in Fig. 5, will help with identification. We stress, however, the value of good-quality photographs and indeed of sound-recordings in this process.

*Common Swift*.—Both subspecies are generally sooty brown in tone, bleaching with wear, but *pekinensis* is typically (but not always) paler (Larsson 2018). Features that separate *pekinensis* from nominate are the more extensive pale throat patch, often paler head (especially forehead) and variable but sometimes prominent 'saddle' effect, due to the mantle and scapulars appearing darker relative to the inner wing and greater primary-coverts, but never as contrasting as in African Black Swift. Most *pekinensis* exhibit clear scaling on the underparts, most pronounced on the vent and undertail-coverts, the latter sometimes appearing contrastingly pale when fresh (from early January), and aligned diagonally in neat rows on the breast and belly. Faint scaling is visible on the rump in certain lights (Fig. 5; see fresh adult *pekinensis* in February and March, Plates 5–6 in Roberts & Campbell 2015). Common Swift usually shows no scaling on the upper- or underparts, appearing uniformly dark, but can simultaneously possess both darker recently moulted and paler old bleached body feathers, thereby seeming to be irregularly mottled (but not scaled). Our own observations suggest that *pekinensis* appears slimmer and more cigar-shaped than *apus*, the wings held slightly straighter and less scythe-shaped than in *apus* (GA pers. obs.).

*A. a. pekinensis vs. Forbes-Watson's Swift*.—The *pekinensis* subspecies is likely to be the main confusion subspecies with Forbes-Watson's Swift as it is the paler form, but the features described below also apply to separation from *A. a. apus*.

Grieve & Kirwan (2012) thoroughly reviewed this identification challenge and found the throat patch to be the most useful character. Although they found overlap in the range of measurements, the differences were statistically significant (Fig. 6). They described the throat patch in Forbes-Watson's Swift as 'Broad and deep, whitish or pale … [which] extends almost to upper breast though slightly less extensive on some. Centres of throat feathers possess dark, fine, vertical streaking (which wears off)' and an overall whiter shade of pale, as opposed to off-white in Common Swift. This feature was also noted in the field by Dowsett-Lemaire & Dowsett (2014) who described Forbes-Watson's Swift as 'showing [a] big white chin'. However, it can vary with the light and the throat patch may be extensive but have ill-defined boundaries (see Fig. 2) with the fine streaking possibly reducing the definition. In *pekinensis* Common Swift, 'Narrower and less deep whitish or pale throat patch, extending to just over 50% down throat or even less extensive on some birds. Throat lacks fine streaking' (Grieve & Kirwan 2012).

There is also a difference in the width of the outermost (or fourth) tail feather. This was found to be consistent and statistically significant but slight, being *c*.10% broader in Forbes-Watson's Swift (Grieve & Kirwan 2012). This feature may be visible in good-quality digital photographs.

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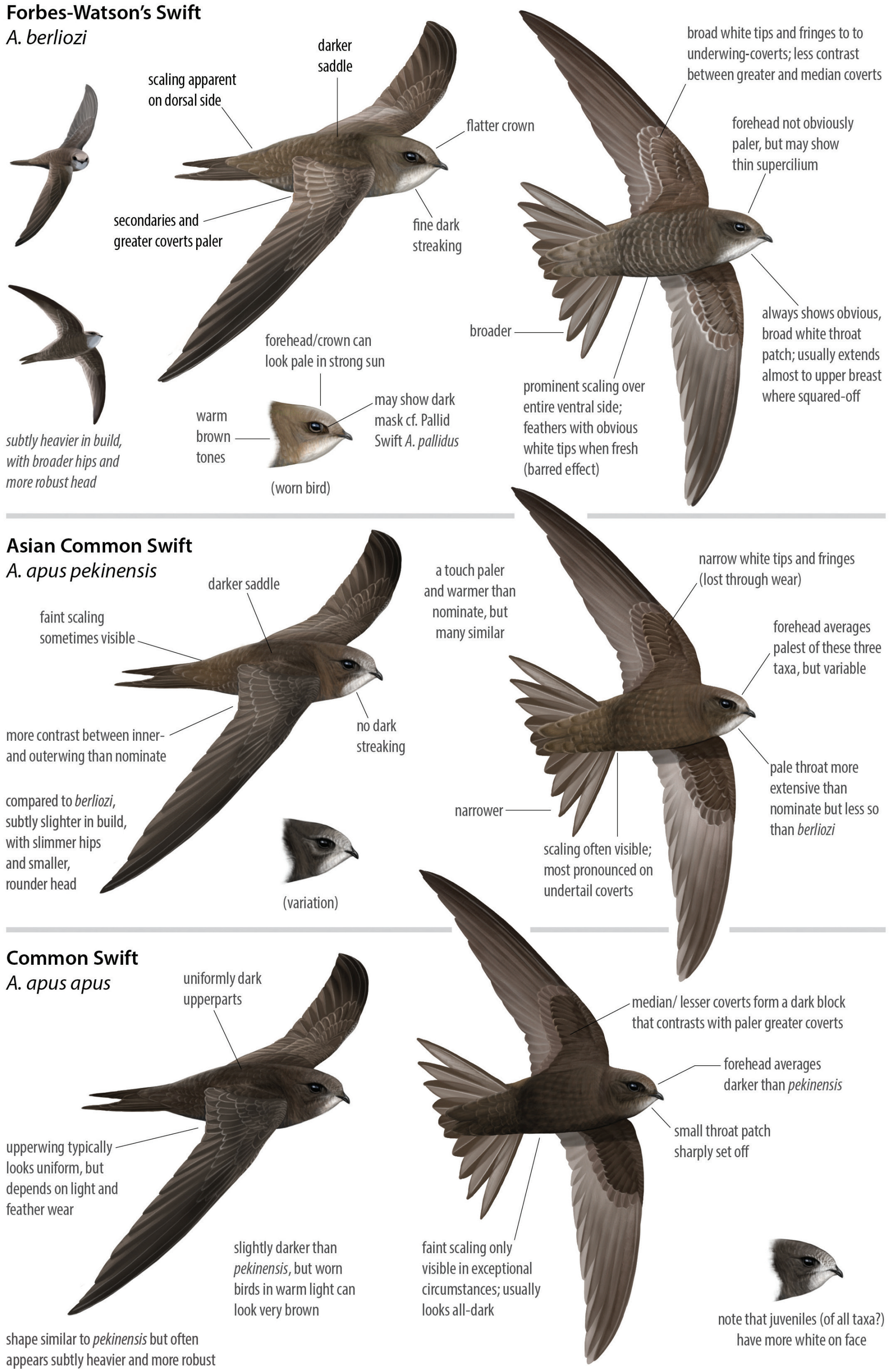

Figure 5. Identification characters of Forbes-Watson's *Apus berliozi*, Asian Common Swift *A. a. pekinensis* and Common Swift *A. a. apus* (Faansie Peacock)

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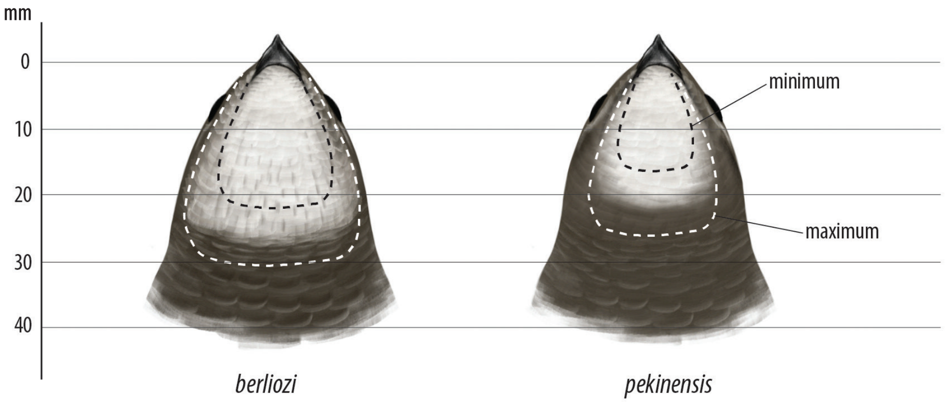

Figure 6. Comparison of throat patches of Forbes-Watson's Swift *A. berliozi* (left) and Common Swift *A. a. pekinensis* (right). Dimensions from Grieve & Kirwan (2012); in *A. b. bensoni* depth (from base of bill): mean 25.5 mm (range 21.6–29.8 mm), width (at widest point): 22 mm (range 15.7–25.2 mm); in *pekinensis* depth: 22 mm (range 15.6–26.5 mm), width: 16 mm (range 12.1–20.7 mm). Minimum dimension indicates the lower ranges, maximum, upper ranges, and the illustrated throat patch the mean dimensions. Note slightly whiter ground tone and fine throat streaks in Forbes-Watson's Swift (Faansie Peacock)

Furthermore, Zimmerman *et al*. (1996) stated that the two species are diagnosable by bill length, citing measurements apparently repeated from Brooke (1969) for the 'chord of tomium' (presumably the length of the cutting edge of the bill, or the linear distance from bill tip to the base of the gape), which is 17.5–20.0 mm in *A. berliozi* and 16.0–19.0 mm in *A. apus* (subspecies and genders pooled). This is not therefore a clear-cut feature as suggested by Zimmerman *et al*. (1996), and is unlikely to be helpful in the field.

Other possible plumage characters to distinguish Forbes-Watson's Swift include a blackish mask, the so-called 'alien eye' characteristic of Pallid Swift (Larsson 2018), which is not usually evident in Common Swift (but is apparent in some images of *pekinensis* in China; T. Townshend *in litt*. 2020). In addition, photographs suggest that, like Pallid Swift, *A. berliozi* does not show a strong contrast between the darker lesser and median underwing-coverts and slightly paler, more silvery greater underwing-coverts, and therefore lacks the dark underwing-covert block found in both Common Swift subspecies (Larsson 2018).

## Summary of identification features and likely occurrence

The key features that separate Forbes-Watson's Swift from Common Swift (Figs. 5–6) are listed below.

1. Larger and broader white throat patch, usually well defined, often extending almost to the upper breast and is squared-off, appearing triangular from below, with faint dark streaking.
2. Slightly heavier build with wider hips and a broader, flatter head. Build may be less useful in relation to *A. a. apus*, which can be more bulky than *pekinensis*.
3. Greater uniformity between the greater and median underwing-coverts.
4. Extensive and obvious scaling on the underparts—bolder than *pekinensis* when both are compared in fresh plumage (most evident later in the non-breeding season)—and on the dorsal side where the contrast between species is clearer, if more difficult to observe in the field (usually only very faint in *pekinensis* and not visible in nominate).

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5. Most likely in monospecific flocks on the east coast of southern Africa during early December–late March, and probably especially obvious in March when most Common Swifts have departed. Likely over forested areas near the coast.

## The use of voice and vocal analysis

Whilst many birding apps now provide samples of vocalisations, most field guides do not offer guidelines for identifying birds by sound that draw on the recent advances in digital recording and sonogram analysis. It is fortuitous that Forbes-Watson's Swift seems to be quite vocal and, given the obvious differences in voice from the most common large dark swifts in the region, these calls can significantly assist in the identification of this group. We hope that this paper will stimulate increased sound-recording in the field and sharing of information using online databases, as this has greatly facilitated the identification of the birds in this study, and our understanding of one of the least well-known members of this mysterious group.

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References:

Ahmed, R. & Adriaens, P. 2010. Common, Asian Common and Pallid Swift: colour nomenclature, moult and identification. *Dutch Birding* 32: 97–105.

Åkesson, S., Klaassen, R., Holmgren, J., Fox, J. W. & Hedenström, A. 2012. Migration routes and strategies in a highly aerial migrant, the Common Swift *Apus apus*, revealed by light-level geolocators. *PLoS ONE* 7(7): e41195.

Allport, G. 2018. Notable recent records of terns, gulls and skuas in southern Mozambique including the first country records of Black Tern *Chlidonias niger*. *Bull. Brit. Orn. Cl.* 138: 100–115.

Appleton, G. 2012. Swifts start to share their secrets. *BTO News* 299: 16–17.

Ash, J. S. & Miskell, J. E. 1983. Birds of Somalia: their habitat, status and distribution. *Scopus Spec. Suppl.* 1. East Africa Natural History Society, Nairobi.

Britton, P. (ed.) 1980. *Birds of East Africa*. East Africa Natural History Society, Nairobi.

Brooke, R. K. 1969. *Apus berliozi* Ripley, its races and siblings. *Bull. Brit. Orn. Cl.* 89: 11–16.

Brooke, R. K. 1970. Geographical variation and distribution in *Apus barbatus*, *A. bradfieldi* and *A. niansae* (Aves: Apodidae). *Durban Mus. Novit*. 8: 363–374.

Brooke, R. K. 1972. On the breeding and migratory status of *Apus berliozi bensoni*. *Bull. Brit. Orn. Cl.* 92: 114.

Brooke, R. K. 1975. Seasonal distribution of the migratory European Swift *Apus apus* (Linnaeus) (Aves: Apodidae) in the Ethiopian region. *Durban Mus. Novit*. 10: 239–249.

Clancey, P. A. 1996. *The birds of southern Mozambique*. African Bird Books, Westville.

Chantler, P., Boesman, P. F. D. & Kirwan G. M. 2020. Common Swift (*Apus apus*), version 1.0. *In* del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E (eds.) *Birds of the world*. Cornell Lab of Ornithology, Ithaca, NY. https://doi.org/10.2173/bow.comswi.01.

Chantler, P. & Driessens, G. 2000. *Swifts: a guide to the swifts and treeswifts of the world*. Second edn. Pica Press, Robertsbridge.

Cramp, S. (ed.) 1985. *The birds of the Western Palearctic*, vol. 4. Oxford Univ. Press.

ISSN-2513-9894
(Online)

Davies, G. 2013. Critical examination of specimen evidence for pallid swift (*Apus pallidus*; Aves: Apodidae) in southern Africa. *Ann. Ditsong Natl. Mus. Nat. Hist*. 3: 183–193.

De Roo, A. 1966. Age characteristics in adult and subadult Swift *Apus apus* (L.) based on interrupted and delayed wing-moult. *Gerfaut* 56: 113–134.

Dokter, A. M., Åkesson, S., Beekhuis, H., Bouten, W., Buurma L., van Gasteren, H. & Holleman, I. 2013. Twilight ascents by common swifts, *Apus apus*, at dawn and dusk: acquisition of orientation cues? *Anim. Behav*. 85: 545–552.

Dowsett-Lemaire, F. & Dowsett, R. J. 2014. Checklist of the birds of Kipini Conservancy, Lamu and Tana River districts, coastal Kenya. *Scopus* 33: 1–44.

Eriksen, J. & Victor, R. 2013. *Oman bird list. The official list of the birds of the Sultanate of Oman*. Center for Environmental Studies and Research, Sultan Qaboos Univ., Muscat.

Evans, M. 2019. Obituary: Rodney P. Martins (1957–2019). *Sandgrouse* 41: 217–219.

Fisher, D. & Hunter, N. 2014. East African Rarities Committee Report 2010-2013. *Scopus* 33: 87–91.

Fry, C. H. 1988. Apodidae, spinetails and swifts. Pp. 197–242 *in* Fry, C. H., Keith, S. & Urban, E. K. (eds.) *The birds of Africa*, vol. 3. Academic Press, London.

Ginn, H. B. & Melville, D. S. 1983. *Moult in birds*. British Trust for Ornithology, Tring.

Grieve, A. & Kirwan, G. M. 2012. Studies of Socotran birds VII. Forbes-Watson's Swift *Apus berliozi* in Arabia—the answer to the mystery of the 'Dhofar swift' *Bull. Brit. Orn. Cl*. 132: 194–206.

Hedenström, A., Norevik, G., Warfvinge, K., Andersson, A., Bäckman, J. & Åkesson, S. 2016. Annual 10-month aerial life phase in the Common Swift *Apus apus*. *Current Biol*. 26: 3066–3070.

Hockey, P. A. R., Dean, W. R. J. & Ryan, P. G. (eds.) 2005. *Roberts' birds of southern Africa*. Seventh edn. John Voelcker Bird Book Fund, Cape Town.

del Hoyo, J., Collar, N. & Kirwan, G. M. 2020. Madagascar Swift (*Apus balstoni*), version 1.0. *In* del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E (eds.) *Birds of the world*. Cornell Lab of Ornithology, Ithaca, NY. https://doi.org/10.2173/bow.madswi1.01.

Jukema, J., van de Wetering, H. & Klaassen R. H. G. 2015. Primary moult in non-breeding second-calendar-year Swifts *Apus apus* during summer in Europe. *Ring. & Migr*. 30: 1–6.

Kearsley, L. 2016. Beijing Swift animation (https://videos.files.wordpress.com/KcGtMXgy/beijing-swifts-screen-recording-44_dvd.mp4). Birding Beijing: celebrating the birds of China's capital city. https://birdingbeijing.com/.

Kearsley, L. 2019. Beijing Swifts are back (https://birdingbeijing.com/2019/04/12/beijing-swifts-are-back/). Birding Beijing: celebrating the birds of China's capital city. https://birdingbeijing.com/.

Kirwan, G. M. 2010. Forbes-Watson's Swift *Apus berliozi*. Pp. 438–440 *in* Jennings, M. C. (ed.) *Atlas of the breeding birds of Arabia*. Fauna of Arabia 25. Frankfurt & King Abdulaziz City for Science & Technology, Riyadh.

Klaassen, R., Klaassen, H., Berghuis, A., Berghuis, M., Schreven, K., van der Horst, Y., Verkade, H. & Kearsley, L. 2014. Trekroutes en overwinte-ringsgebieden van Nederlandse Gierzwaluwen ontrafeld met geolocators. *Limosa* 87: 173–181.

Larsson, H. 2018. The identification of juvenile Common and Pallid Swifts. *Brit. Birds* 111: 310–322.

Maclean, G. L. 1993. *Roberts' birds of southern Africa*. Sixth edn. John Voelcker Bird Book Fund, Cape Town.

Malacarne, G., Palomba, I., Griffa, M., Castellano, S. & Cucco, M. 1989. Quantitative analysis of differences in the vocalizations of the Common Swift *Apus apus* and the Pallid Swift *Apus pallidus*. *Avocetta* 13: 9–14.

Newton, I. 2006. Advances in the study of irruptive migration. *Ardea* 94: 433–460.

Päckert, M., Martens, J., Wink, M., Feigl, A. & Tietze, D. T. 2012. Molecular phylogeny of Old World swifts (Aves: Apodiformes, Apodidae, *Apus* and *Tachymarptis*) based on mitochondrial and nuclear markers. *Mol. Phyl. & Evol*. 63: 606–616.

Parker, V. 2000. *The atlas of the birds of Sul do Save, southern Mozambique*. Avian Demography Unit, Cape Town & Endangered Wildlife Trust, Johannesburg.

Parker, V. 2005. *The atlas of the birds of central Mozambique*. Endangered Wildlife Trust, Johannesburg & Avian Demography Unit, Cape Town.

Pinto, A. A. da Rosa. 1959. Alguns novos 'records' de aves para o Sul do Save e Mozambique, incluindo um género novo para a subregião da África do Sul, com a descrição de novas subespécies. *Bol. Soc. Estud. Mozambique* 118: 15–28.

Porter, R. & Aspinall, S. 2010. *Birds of the Middle East*. Second edn. Christopher Helm, London.

Porter, R. F. & Suleiman, A. S. 2013. The populations and distribution of the breeding birds of the Socotra archipelago, Yemen: 1. Sandgrouse to buntings. *Sandgrouse* 35: 43–81.

Porter, R. F., Dymond, J. N. & Martins, R. P. 1996. Forbes-Watson's Swift *Apus berliozi* in Socotra. *Sandgrouse* 17: 138–141.

Read, C., Tarboton, W. R., Davies, G. B. P., Anderson, M. D. & Anderson, T. A. 2014. An annotated checklist of birds of the Vilanculos Coastal Wildlife Sanctuary, southern Mozambique. *Orn. Observ*. 5: 370–408.

Robb, M. & Pelikan, L. 2020. The Sound Approach guide to nocturnal flight calls. https://soundapproach.co.uk/the-sound-approach-guide-to-nocturnal-flight-calls/#UFOsandrustybicycles.

Ripley, S. D. 1966. Le martinet pale de Socotra. *Oiseau & RFO* 35 (no. spéc.): 101–102.

ISSN-2513-9894
(Online)

Roberts, H. & Campbell, O. 2015. Proving the occurrence of Common Swift *Apus apus pekinensis* in the United Arab Emirates. *Sandgrouse* 37: 79–86.

Safford, R. J. & Hawkins, A. F. A. (eds.) 2013. *The birds of Africa*, vol. 8. Christopher Helm, London.

Smith, K. D. 1956. On the birds of the Aden Protectorate. *Ibis* 98: 303–307.

Stevenson, T. & Fanshawe, J. 2002. *Field guide to the birds of East Africa*. Christopher Helm, London.

Wellbrock, A. H. J., Bauch, C., Rozman, J. & Witte, K. 2017. 'Same procedure as last year?' Repeatedly tracked swifts show individual consistency in migration pattern in successive years. *J. Avian Biol*. 48: 897–903.

Zimmerman, D. A., Turner, D. A. & Pearson, D. J. 1996. *Birds of Kenya and northern Tanzania*. Christopher Helm, London.

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**Appendix 1:** sound-recordings used for comparative analysis of East and southern African large *Apus* swifts. XC denotes the Xeno-canto reference number (https://www.xeno-canto.org) and ML reference in the Macaulay Library of Wildlife Sounds (https://www.macaulaylibrary.org/).

| Species | Recording | No. of screams analysed | Location | Recordist |
|---|---|---|---|---|
| 'Inhassoro swift' | XC543748 | 33 | Inhassoro, Mozambique | E. Marais |
| Forbes-Watson's Swift *A. berliozi* (subspecies unknown, but both presumably *bensoni*) | Forbes-Watson's Swift; *eGuide to birds of East Africa*, mydigitalearth.com | 5 | Dar es Salaam, Tanzania | B. Finch |
| | XC488728 | 24 | Khawr Rawri, Oman | J. Lidster |
| Forbes-Watson's Swift *A. b. bensoni* | XC321549 | 4 | Wadi Darbat, Dhofar, Oman | G. Kirwan |
| Nyanza Swift *A. niansae* | XC209974 | 17 | Gemessa Gedel, Ethiopia | A. Spencer |
| African Black Swift *A. barbatus* | XC368196 | 33 | Graskop, South Africa | O. Campbell |
| | XC279844 | 8 | Memel, South Africa | P. Boesman |
| | XC413388 | 3 | Mossel Bay, South Africa | L. Rudman |
| Malagasy Black Swift *A. balstoni* | Mad_Black_Swift-01 BF | 7 | Madagascar | B. Finch |
| | XC162908 | 1 | Ranomafana National Park, Madagascar | M. Nelson |
| | ML93639 | 24 | Toliara, Madagascar | L. Macaulay |
| Pallid Swift *A. pallidus* | XC493531 | 10 | Migjorn, Spain | J. Fischer |
| | XC274847 | 11 | Sevilla, Spain | 'Carlos W.' |
| | XC33948 | 8 | Turin, Italy | G. Boano |
| | XC499549 | 3 | Lagos, Portugal | J. Leitão |
| Common Swift *A. a. apus* | XC492936 | 15 | Cheboksary, Russian Federation | A. Lastukhin |
| | XC480871 | 3 | Tychy, Poland | I. Oleksik |
| | XC482476 | 6 | Extremadura, Spain | C. Fernández |
| | XC486189 | 2 | Faro, Portugal | N. Conceição |
| | XC487370 | 1 | Gelderland, The Netherlands | J. van Bruggen |
| Common Swift *A. a. pekinensis* | XC451146 | 9 | Tashkent, Uzbekistan | Ding Li Yong |
| | XC185710 | 7 | Tashkent, Uzbekistan | A. Lastukhin |
| | XC185708 | 7 | Tashkent, Uzbekistan | A. Lastukhin |
| Bradfield's Swift *A. bradfieldi* | XC65278 | 10 | Ugab River, Namibia | F. Bruneliere |
| | XC346607 | 6 | Spitzkoppe, Namibia | P. Boesman |
| | XC337014 | 10 | Windhoek, Namibia | C. Robertson |
| | Faansie Peacock Sound Library | 9 | Omaruru, Namibia | F. Peacock |

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## **Appendix 2:** detailed descriptions of calls shown in sonograms (Fig. 4).

**Forbes-Watson's Swift**.—The scream is overall lower pitched and less harsh, with the least rise and fall of pitch of any of the species reviewed (Fig. 4). Modulation is obvious throughout the call and attenuated at the end. Max. volume occurs two-thirds of the way through the scream, before a slight final decline in pitch. The 'Inhassoro swifts' were inseparable from Forbes-Watson's Swift in the sonograms and aurally.

**Nyanza Swift**.—Lower pitched than all but Forbes-Watson's Swift, comprising a single steady 'down-slur', not showing the rise and fall in pitch of most of the other species. Max. volume was three-quarters through the call. Modulated throughout but attenuated towards the end of the scream.

**African Black Swift**.—Described as a high-pitched *shree*, higher pitched than Common Swift (Hockey *et al*. 2005); heard at breeding colonies in the region. Our analysis found screams to be similar in pitch to Common Swift, but longer (up to 800 milliseconds), more drawn-out and without the prominent 'foreleg' of the latter species. The 'hindleg' is very strong and the scream often ends at a much lower frequency than it commences. Max. volume is about two-thirds into the scream, as the long down-slur starts. Modulation is more obvious than in Common and Pallid Swifts, often with a stronger up-slurred trill just before the end. The stronger modulation makes the scream sound 'mellower' to the human ear. This species also utters much shorter screams, which consist of a fast spike and a fast 'hindleg'.

**Madagascar Black Swift**.—Described as a high-pitched, screaming trill, *zzzzziiieeewwww*, which falls at the end and lasts 1–2 seconds, often given in chorus, reportedly slightly lower in frequency than *A. apus* (del Hoyo *et al*. 2020; B. Finch *in litt*. 2020). Analysis showed this species' scream to be similar in pitch and structure to African Black Swift, although some of the shorter screams consist primarily of a strong downward slur with a pulse in volume at the start of the scream.

**Bradfield's Swift**.—Voice is little known but described as a harsh scream (Maclean 1993). The screams of this species are longer (0.8–0.9 seconds) than Common Swift, but possess a similar structure to African Black Swift, with a very small 'foreleg' followed by a flat section. The 'hindleg' is a strong down-slur, even more pronounced than in African Black Swift. Modulation is also pronounced throughout the scream, but more prominent on the 'hindleg'.

**Pallid Swift**.—The most distinctive call is described as a grating disyllabic *shree-er*, not as shrill as Common Swift (Chantler & Driessens 2000). Screams are slightly longer in duration and lower pitched, with a similar overall structure to Common Swift. The 'foreleg' is less pronounced and the 'hindleg' longer, with a slower decline and a pulse of energy towards the end. The scream sounds 'mellower' than Common Swift, with modulation obvious towards the end of the scream.

**Common Swift (*A. a. apus*)**.—Described as a high-pitched *shree* (Cramp 1985) but both subspecies of Common Swift are largely silent in their African wintering grounds (Hockey *et al*. 2005). The scream is generally fairly short in duration, averaging 343 milliseconds (Malacarne *et al*. 1989) and sounds disyllabic. The call starts with a rapid spike in frequency, and the main part of the scream is flat in pitch or ascends slightly towards the crescendo, before the 'hindleg'. Modulation is most discernible at the max. volume just before the 'hindleg', as well as during the down-slur.

**Common Swift (*A. a. pekinensis*)**.—Similar to nominate but, based on the samples analysed, this taxon sometimes produces screams without a 'hindleg' to the call.

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