

Distribution, habitat, identification and taxonomy of Streaked Scrub Warbler in Morocco

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Streaked Scrub Warbler *Scotocerca inquieta* sensu lato is widely distributed in arid landscapes from western Asia through Arabia to North Africa, reaching the Atlantic coast in Morocco (including Western Sahara). Several subspecies have been recognized, including two from Libya west to the Atlantic coast of North Africa. These are *S. i. saharae* from south-eastern Morocco eastward, and *S. i. theresae* in south-western Morocco including Western Sahara (Thévenot et al 2003). Hereafter, these two subspecies are called *saharae* and *theresae*, respectively. For this paper, we researched the distribution and biology of both little-known subspecies in Morocco, and looked at identification, vocalizations and differences with other subspecies further east.

Distribution in Morocco

Origin of records

A database has been used to compile the published data (Meinertzhagen 1940, Ruthke 1966, Vernon 1973, Heinze 1979, Goriup 1983, Schollaert et al 1994, Suarez et al 1996, El Ghazi & Franchimont 1998-99, El Ghazi et al 1998-99 and many others quoted in the text and cited in the references) and unpublished records of Streaked Scrub Warbler. The latter include sightings by the authors, records collected in the 1980s during the Breeding Birds Atlas Survey (Thévenot 1987) and by the Centrale Ornithologique Marocaine (COM) during the late 1970s and the 1980s (Thévenot et al 1980, 1981, 1982) and records collected subsequently from scientists, naturalists and birders following the increase of eco-tourism; some data were obtained from www.observado.org and most of them are available on www.go-south.org.

The database comprises 551 records from 1927 up the spring of 2012, of which 401 have been geo-referenced. All these data were plotted on a distribution map using MapInfo Professional software v8.0, in a grid of topographic 1:50 000 scale maps. Each map (15' latitude, 15' longitude) is c 24 x 27 km² (figure 1).

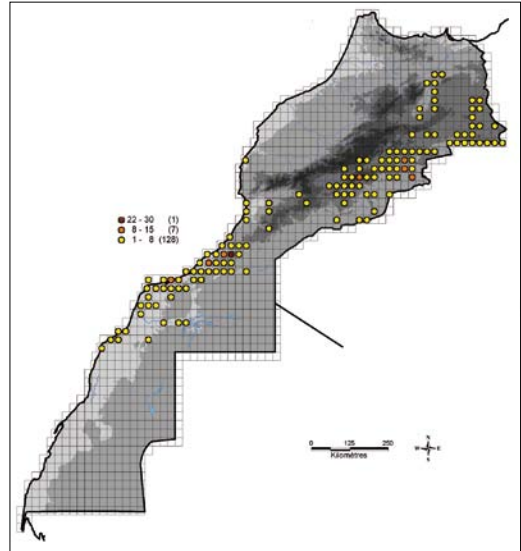


FIGURE 1 Distribution map of Streaked Scrub Warbler *Scotocerca inquieta* in Morocco, based on *The atlas of breeding birds in Morocco* (Michel Thévenot in prep)

Detailed distribution per region

We used the regions described in Thévenot et al (2003) (figure 2) to detect recent changes in distribution range between the end of 1999 (summarized in Thévenot et al 2003) and early 2012 (table 1).

Eastern Morocco (and marginally Eastern High Atlas)

There are no data since 1994 for the northern part of the eastern area of distribution, eg, in High Plateaux, Eastern High Atlas, Middle Moulouya and Plains of Eastern Morocco, where it has been previously observed (table 1). In Eastern Morocco, it is now only observed in Saharan Atlas, particularly in bushy steppes with scattered Phoenician Junipers *Juniperus phoenicea* in Jbel Grouz (Qninba et al 2005a) and it has not been recorded anymore at Bouarfa.

Rif

- I.1 Tangier Peninsula
- I.2 Jbala
- I.3 High Rif
- I.4 Southern Rif
- I.5 Eastern Rif

North Atlantic Plains & Hills

- II.1 Rharrb
- II.2 Prérif
- II.3 Sais
- II.4 Zemmour
- II.5 Zaër

Middle Atlantic Plains & Plateaux

- III.1 Chaouïa
- III.2 Doukkala
- III.3 Abda
- III.4 Chiadma
- III.5 Plateau des Phosphates
- III.6 Tadla
- III.7 Rehamna
- III.8 Srahna
- III.9 Haouz & Jbilet

Central Plateau

- IV Central Plateau

Middle Atlas

- V.1 Western Middle Atlas
- V.2 Eastern Middle Atlas

High Atlas

- VI.1 Haha
- VI.2 Western High Atlas
- VI.3 Central High Atlas
- VI.4 Eastern High Atlas

Eastern Morocco

- VII.1 Plains of Eastern Morocco
- VII.2 Hills of Eastern Morocco
- VII.3 High Moulouya
- VII.4 Middle Moulouya
- VII.5 High Plateaux
- VII.6 Saharan Atlas

Souss

- VIII Souss

Anti-Atlas

- IX.1 Western Anti-Atlas
- IX.2 Central Anti-Atlas
- IX.3 Eastern Anti-Atlas
- IX.4 Sarhro

East Saharan Morocco

- X.1 South Eastern Sahara
- X.2 Tafilalet
- X.3 Dadès-Draa
- X.4 Middle Draa

West Saharan Morocco

- XI.1 Lower Draa
- XI.2 Tarfaya
- XI.3 Saquiat Al-Hamra
- XI.4 Oued Ad-Deheb

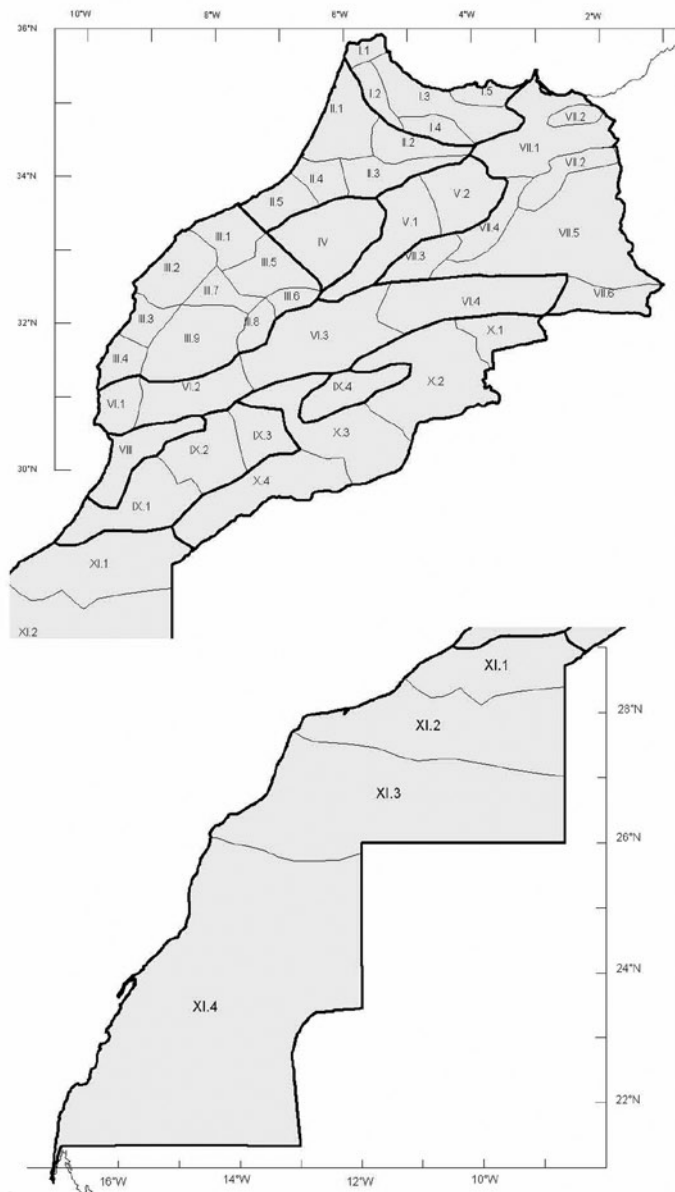


FIGURE 2 Geographical divisions and subdivisions of Morocco (Thévenot et al 2003)

TABLE 1 Summary of available data on regional distribution of Streaked Scrub Warbler *Scotocerca inquieta* in Morocco

Geographic divisions (after Thévenot et al 2003)	≤ 1981		1982-1999		≥ 2000		Total	
	n data	n maps	n data	n maps	n data	n maps	n data	n maps
Plains of Eastern Morocco	2	2	1	1			3	3
Middle Moulouya			4	4			4	4
High Plateaux	4	4	3	3			7	7
Saharan Atlas	3	3	7	5	7	4	17	8
Eastern Morocco	9	9	15	13	7	4	31	22
South-Eastern Sahara	11	8	14	6	1	1	26	10
Tafilalt	26	10	35	11	51	10	112	15
Dadès-Draa	3	2	10	7	12	8	25	13
Middle Draa	1	1					1	1
East Saharan Morocco	41	21	59	24	64	19	164	39
Sarhro	10	5	12	8	17	3	39	11
Eastern High Atlas	1	1	3	3			4	4
Central High Atlas	1	1	3	2	3	2	7	3
High Atlas	2	2	6	5	3	2	11	7
Eastern area of distribution	62	37	92	50	91	28	245	79
Central Anti-Atlas			5	3			5	3
Western Anti-Atlas (easternmost part)					1	1	1	1
Souss (inland)	1	1	1	1			2	1
Central 'gap'	1	1	6	4	1	1	8	5
Western Anti-Atlas	13	5	20	7	10	3	43	7
Lower Draa	21	7	64	11	69	10	154	14
Tarfaya	6	5	44	12	27	9	77	15
Saquiati Al-Hamra	6	5	6	5	9	5	21	13
West Saharan Morocco	33	17	114	28	105	24	252	42
Western area of distribution	46	22	134	35	115	27	295	49

East Saharan Morocco (and marginally Central High Atlas)

The species was regularly noted in South-Eastern Sahara up to the late 1990s, eg, near Bou-Bernous and on the 'Hammada' of Boudenib, but there has been only one record after 2000 (near Atchana, area of Mengoub, in 2002 by M Lepley). It was still often observed in the Tafilalt but the majority of records came from a few sites, eg, km 43 west of Errachidia, and in Dadès-Draa, particularly in rocky hilly slopes in relatively well vegetated steppe-like areas. In the southern slopes of Central High Atlas, it has only been recently recorded at Azarhar n'Iguer n'Ait Zekri (1950 m) in southern foothills of Mgoun massif (SENS 2005) and in Gorges de Todra (but no more in Dadès Gorges). There are no recent records from Middle Draa where it has been previously observed once in the easternmost part of this region close to Dadès-Draa.

Sarhro

The warbler is abundant in the Jbel Sarhro where it frequents the bushy steppe with scattered junipers (arid and semi-arid bio-climatic stages; Qninba & Thévenot 2005, SENS 2005).

Eastern and Central Anti-Atlas (and easternmost part of Western Anti-Atlas)

In the 'gap' between the eastern and the western part of its distribution, the species remains unrecorded in Eastern Anti-Atlas. There are no recent records in Central Anti-Atlas where it was previously recorded (from east to west) at Tizi-n-Tarhatine (October 1992 by J Wittenberg, record omitted in Thévenot et al 2003); near Taliouine (April 1982 by W Dick in Thévenot et al 2003, May 1983 by P Isenmann and April 1993 by G Trochard; latter two records omitted in Thévenot et al 2003); and Souk El-Arba d'Assads (May 1986 by D Barreau & J P Marfin in Thévenot et al 2003). There are no recent records inland in Souss, where it has been previously reported twice from an area south of Taroudant, in 1954 (Bierman 1959) and in 1984 (J Franchimont; record omitted in Thévenot et al 2003). The only recent record in the 'gap' is from Tafraout in the mountains of the easternmost part of Western Anti-Atlas (March 2009 by B Recorbet).

Western Anti-Atlas and West Saharan Morocco

The species is common in Western Anti-Atlas



128 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, Khnifiss lagoon, Tarfaya, West Saharan Morocco, 14 January 2012 (Arnoud B van den Berg) **129** Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, Oued Sayed, Goulimine, Lower Draa, Morocco, 5 April 2004 (Arnoud B van den Berg) **130** Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, Oued Boukila, Goulimine, Lower Draa, Morocco, 30 April 2010 (Tomas Svensson) **131** Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, young, Oued Boukila, Goulimine, Lower Draa, Morocco, 30 April 2010 (Tomas Svensson)

where it has recently been observed mostly in coastal areas west and north-west of Goulimine (eg, Fom Assaka, Oued Noun, Fort Bou-Jerif). It is common in Lower Draa from Goulimine to Tantan (especially at Asrir, Oued Boukila, and along the Draa valley near Tafnidilt, but it is irregular at Oued Sayed), and in Tarfaya where it is especially abundant on the littoral between Akhfénir and the Khnifiss lagoon and further inland in the *graras* (well vegetated depressions with herbaceous and bushes of, eg, *Nitraria*, *Atriplex*, *Rhus* and Boxthorn *Lycium*), on the plateaus and in the wadi valleys (eg, Oued El Ouair, Oued Ez-Zehar, Khaoui Naâm, Rhoulba; Qninba et al 2005b). Its range extends southwards into Saquiat Al-Hamra where

it was discovered by Valverde (1957) and still occurs in the coastal area from Layoune to Boujdour (eight records in 2001-11). However, it has probably disappeared inland from the bottom of Saquiat Al-Hamra near Smara where it was recorded in April 1973 (Congost-Tor 1976). The only recent record inland is from 2007 near Boukraa (see below). The species remains unrecorded further south in Oued Ad-Deheb.

The southernmost records to date are from Saquiat Al-Hamra: Boujdour on the coast (2 km north of Boujdour, 26,117°N-14,480°W, 9 April 2010, C Bermejo & J Portillo in Bergier et al 2011), and inland near Boukraa (26,283°N-12,800°W, 11 December 2007, Y Kayser).



132-133 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, Asrir, Goulimine, Lower Draa, Morocco, 21 January 2012 (Arnoud B van den Berg)



Mauritania

Mauritania is often included in the species' distribution range (eg, Urban et al 1997, del Hoyo et al 2006). However, there is no evidence for the species' occurrence south of Boujdour, Western Sahara. The species is not listed for Mauritania by Ienmann et al (2010), who conclude that reports do not rule out Cricket Warbler *Spiloptyla clamans*. The latter is a breeding species of Oued Ad-Deheb, Western Sahara (Amezian et al 2011, Charlton 2011) and in Mauritania north to Adrar but not mentioned for the Western Palearctic region by, eg, Cramp (1992).

We would be grateful if, in future, birders could inform us about records of Streaked Scrub Warbler, especially in Eastern Morocco, in the 'central gap' (which, however, is not as large as previously thought; cf Urban et al 1997) and in the south-westernmost part of its range (West Saharan Morocco).

Habitat

As already stated by Heim de Balsac & Mayaud (1962), Streaked Scrub Warbler is not a true Saharan species (in French): 'Considered as a desert bird, the Streaked Scrub Warbler lives actually in steppes or in attenuated desert. The Sahara desert constitutes the limit of its ecological possibilities'. In the same way, F Cuzin (in SENS 2005) wrote (in French): 'In the saharan borders, the species lives in fairly productive environments with a good vegetal cover – pre-saharan steppes rich in herbal and woody vegetation'.

In the Middle Moulouya valley, for example, Streaked Scrub Warbler has been recorded in April 1984 in the bottom of a gully with genistas *Genista*, wild olive trees *Olea oleaster* and rosemary *Rosmarinus officinalis*, on the slopes of Jbel Lahloua (850 m above sea level) covered with Alfa Grass *Stipa tenacissima* and Phoenician Junipers (arid bioclimatic layer) (by M Thévenot, R Prodon & H Tournier).

Most of the species' distribution range is situated in the Saharan bioclimatic layer 'sensu

Emberger' (Sauvage 1963) (Saharan Atlas, South-Eastern Sahara, Tafilalet, Dadès-Draa, inland Lower Draa and Tarfaya, Saquiati Al-Hamra) and in the Arid bioclimatic layer (Eastern High Plateaux, Western Anti-Atlas, coastal region of Lower Draa and Tarfaya). Locally, it also inhabits the Semi-arid bioclimatic layer (southern slopes of the High Atlas, eg, Gorges du Todra, and summits of Jbel Sarhro).

The highest-elevation records come from Jbel Sarhro where it is abundant in bushy steppe with wormwood, broom species (*Cytisus balansae*, *Genista scorpius*), germander *Teucrium*, distaff thistle *Carthamus fruticosus*, etc, scattered with a few Phoenician or Spanish junipers *J. thurifera* (arid and semi-arid bioclimatic layers) up to 2500 m above sea level. In May 2005, records here have included a pair and a young bird at 2450 m on the upper southern slopes of Jbel Kwawouche and several territorial pairs at 2508 m on the upper southern slopes of Jbel Isk n'Ala, and at 2510 m on the plateau of Jbel Amellal (A Qninba, F Cuzin & M Thévenot). On Jbel Amellal, birds have been recorded up to the summit (2550 m) in winter (January 2001; F Cuzin).

At high altitude, the associated breeding species included Barbary Partridge *Alectoris barbara*, Moussier's Redstart *Phoenicurus moussieri*, Western Black-eared Wheatear *Oenanthe hispanica*, Tristram's Warbler *Sylvia deserticola* and Sardinian Warbler *S. melanocephala* and not typical desert species.

Streaked Scrub Warbler is a resident in Morocco although there is evidence of some post-breeding dispersal outside of its breeding range (table 2). The northernmost extralimital record is from Essaouira in November 1986 (R E Wake in Thévenot et al 2003).

Range contraction

Although it is difficult to prove that Streaked Scrub Warbler has disappeared from several of the above-mentioned regions, it is likely that its populations have suffered from habitat degradation. There is no indication that its disappearance from

TABLE 2 Records of Streaked Scrub Warbler *Scotocerca inquieta* in Morocco outside normal distribution range (not summarised in table 1)

date	number	place	observer	reference
1 February 1993	1	Souss estuary	N Redman	Thévenot et al 2003
18 November 1986	1	near Essaouira	R E Wake	Thévenot et al 2003
18 November 1979	1	Massa	U Hirsch	Thévenot et al 1980, 2003
24 December 1978	1	Massa estuary	P E Betzholtz	Thévenot et al 2003
22-26 December 1978	1	Souss estuary	P E Betzholtz & M B Hansen	Thévenot et al 2003

certain areas follows a regular pattern (eg, nomadism caused by weather circumstances). This can be illustrated by the situation in the following regions.

In the eastern part of its Moroccan range (High Plateaux, Middle Moulouya and South Eastern Sahara), the species was regularly seen in the 1960s, 1970s and 1980s. Nowadays, it is rare or not even recorded anymore. This decrease is probably due to the progressive degradation in vegetation cover caused by global warming and an increase in human pressure (overgrazing and cultivation of flat areas initially covered with thick vegetation favourable to the species). When this human pressure is lower, eg, at high altitudes in mountains where the herbaceous and small tree cover is preserved (Jbel Grouz, Jbel Sarhro), populations are still doing well.

In other regions (Tafilalt, Dadès-Draa, inland of Saquiat Al-Hamra), it has become less abundant and has even disappeared from several sites where it was once common.

It is still a common bird in most of the westernmost parts of its Moroccan range, especially in the coastal areas of Lower Draa and Tarfaya, probably because of the oceanic influences and a lower human pressure on the habitat than more inland.

Breeding

In table 3, information on nesting sites and breeding phenology is summarized. Nearly always, nest building takes place from early February (3 February 1988, west of Errachidia, by NA Lethaby)

through April (latest being 1 May 1982, 16 km north of Agdz, by P Chadwick & R G Thomas (Thévenot & Beaubrun 1983)). However, a family flock observed on 30 January 2013 at Asrir, south-east of Goulimine, shows that nest building may occur as early as December as well. The nest is placed in a tussock or a low bush 0.2-0.5 m above the ground. It is a fairly big sphere built with dry material and with a lateral entrance. The inner incubating chamber is lined with down. Brood size varies from two to four nestlings (four times two, five times three, four times four). Fledglings are generally found from mid-April (Achouria, 14 April 1980; Thévenot et al 1981) but sometimes much earlier in the western part of the range (at Asrir on 30 January 2013 and on 25 February 2011). Probably, the species breeds twice, at least locally.

Taxonomy

Nomenclature

Formerly, the genus *Scotocerca* was placed close to *Prinia* in Cisticolidae (Dickinson 2003). However, it is more closely related to Cetti's Warbler *Cettia cetti* and for a short while it was incorporated in the newly formed Cettiidae (Sangster et al 2010, Alström et al 2011). Nowadays, *Scotocerca* is placed in Scotocercidae (Fregin et al 2012, Gill & Donsker 2013).

Up to eight subspecies of Streaked Scrub Warbler are listed by Cramp (1992) and del Hoyo et al (2006). Nominate *S i inquieta* is distributed

134 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, Gorges du Todra, north of Tinerhir, Central High Atlas, Morocco, 26 January 2012
(Frank Dhermain)



135 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, Tinjdad, Tafilalt, Morocco, 26 February 2011
(Daniel Trim)



Distribution, habitat, identification and taxonomy of Streaked Scrub Warbler in Morocco

TABLE 3 Breeding details of Streaked Scrub Warbler *Scotocerca inquieta* in Morocco sorted per area of distribution and date

date	place	details	observer(s)	reference
Eastern area of distribution				
15 February 1963 or 1964	wadi on plain of Tamlelt	pair nest building in thorny plant		Smith 1965
15 February 1963 or 1964	wadi near Ksar Es Souk (Errachidia)	pair nest building in thorny plant		Smith 1965
15 February 1963 or 1964	wadi near Tinerhir	pair nest building in thorny plant		Smith 1965
late May 1963	Jbel Saghro	family party of 6		Smith 1965
14 April 1980	W of Achouria, Gheriss valley	pair with 4 fledglings	M Bournaud	Thévenot et al 1981, Destre 1984
6 April 1981	E of Boudenib (Oued Guir)	nest building	S Nicolle	Thévenot et al 1981
1 May 1982	Agdz, 16 km north	pair collecting nest material and flying to nest	P Chadwick & R G Thomas	Thévenot & Beaubrun 1983
17 May 1982	SW of Boudenib	pair with 3 fledglings	R Destre	Destre 1984
4 June 1982	hamada E of Meski	pair with 3 fledglings	R Destre	Destre 1984
15 May 1983	S of Tinjdad, Jbel Ougnat	pair with 3 flying young	R Destre	Destre 1984
3 February 1988	5 km W of Errachidia	pair gathering nest material	N Lethaby	
14 April 1997	Marrha plain, east of Touroug	nest building	H Dufourny	
7 May 2004	Ajifa, Jbel Grouz (Figuig)	family party of 6	A Qninba, P Bergier & M Thévenot	
13 May 2005	Gorges of Aqqa Wlili (Jbel Saghro)	6 including a family party of 5	F Cuzin	Qninba & Thévenot 2005
8 April 2010	SW of Errachidia	pair with 2 fledglings	A B van den Berg	
13 March 2012	SW of Errachidia	pair nest building	A B van den Berg, H Delin & K Mullarney	
3 April 2012	SW of Errachidia	4+ including a pair finishing nest-building	J Muddeman	
Western area of distribution				
19 April 1979	10 km N of Goulimine	2 adults and 2 fledglings, outside nest	R Lévêque	
4 May 1985	Khniiss lagoon	pair with 3 fledglings	D M Parker	Thévenot et al 1988
14 May 1985	Tarfaya	pair with 2 fledglings	M Thévenot	Thévenot et al 1988
25 April 1986	Khniiss lagoon	group of 3 with 1 adult feeding young outside of nest, next to other adult building new nest	M Thévenot	Thévenot et al 1988
15 February 1994	Oued Sayed	pair nest building	H Karhu	Schollaert & Franchimont 1995
15 April 1999	Goulimine, 8-10 km S of town	family party of 4 flying young and 2 adults	P Castell	
26 February 2002	Oued Boukila	pair nest building	A László et al	
17 April 2002	Tantan road, S of Goulimine	2 birds collecting nesting material	A B van den Berg	
9 May 2009	30 km S of Tantan	family party of 4	L G R Evans	Bergier et al 2010
24 April 2010	Oued Boukila	family party of 4	C Lansdell	Bergier et al 2011, 2012
30 April 2010	Oued Boukila	feeding young outside of nest	T Svensson	
25 February 2011	Asrir, SE of Goulimine	family party of 5	R Brendan	Bergier et al 2012
5 April 2011	'Tantan 100', 33km SW of Goulimine	occupied nest in tiny low bush	C Chapleo et al	Bergier et al 2012
30 January 2013	Asrir, SE of Goulimine	family party of 6	A B van den Berg et al	



136 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, west of Errachidia, Tafilalt, Morocco, 8 April 2010 (Arnoud B van den Berg) **137** Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, west of Errachidia, Tafilalt, Morocco, 13 March 2012 (Arnoud B van den Berg) **138** Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, south of Erfoud, Tafilalt, Morocco, 3 May 2010 (Benoît Maire) **139** Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, west of Errachidia, Tafilalt, Morocco, 29 March 2009 (Arnoud B van den Berg)

from north-eastern Egypt to Jordan and central Arabia. Three other subspecies are described further south in the Arabian Peninsula (*S i grisea*, *S i buryi* and *S i striata*) but Jennings (2010) suggests that a review is needed. In western Central Asia from Iran to Uzbekistan, Kazakhstan, Pakistan and north-western India, also three subspecies are known (*S i montana*, *S i platyura* and again *S i striata*). *Saharae* occurs from eastern and southern Morocco eastward (Thévenot et al 2003) and through Algeria and Tunisia into Libya. *Thesae* has been described by Meinertzhagen (1939) from a male collected near Bou Izakarn on 5 November 1938 and, according to Thévenot et al (2003), it occurs in south-western Morocco. It should be noted that there is confusion about the distribu-

tion of *thesae* which according to some sources can be found in all of Morocco (eg, Cramp 1992).

Morphology

Saharae has been described as pale sandy brown above and whitish below, less distinctly streaked than *thesae* (eg, del Hoyo et al 2006). *Thesae* is said to be distinctly darker than *saharae* (upperparts dark grey-brown), with heavier streaking on nape and breast and warm buffy flanks and vent (Cramp 1992, del Hoyo et al 2006). From photographs, it is hard to link plumage differences with the alleged regions of the two subspecies in Morocco (cf Thévenot et al 2003). In the field, this was also noted by Will Soar (in litt) and his fellow

birders who observed c 10 individuals at Lamsied between Layoune and Boujdour, Saquiat Al-Hamra, Western Sahara, on 11-13 February 2012. They were 'extremely surprised' to see that these birds showed the features of *saharae*, quite different from the *theresae* birds they had seen near Goulimine, Lower Draa, that month (Bergier et al 2012). Similarly, in West Saharan Morocco, V Schollaert et al (in Lenglar et al 2001-02) observed *theresae* individuals at Tantan, Lower Draa, on 10 September 1999, two days after identifying four individuals at Layoune, Saquiat Al-Hamra, as *saharae*.

A comparison of photographs by Arnoud van den Berg from three different areas, the region between Errachidia and Goulmima in East Saharan Morocco (possibly in *saharae* range, cf Thévenot et al 2003), near Goulimine in Lower Draa, West Saharan Morocco (in *theresae* range) and at Khnifiss lagoon, Tarfaya, West Saharan Morocco (in *theresae* range) showed that some but perhaps not all photographs from Goulimine in south-western Morocco were in accordance with what has been described for *theresae*, showing warm buffy colours. On the other hand, however, from further south-west in West Saharan Morocco, at Khnifiss lagoon, photographs showed birds as pale as those near Errachidia in East Saharan Morocco.

Other observers, however, reported that they recognized *theresae* in a much larger area than indicated by Thévenot et al (2003), such as in Dadès-Draa (eg, 43 km east of Goulmima), High Atlas (eg, Gorges de Todra), and Atlantic Sahara in Lower Draa (eg, Asrir, Oued Boukila, Grandes Plaines) and Tarfaya (Khnifiss). Photographs by F Dhermain at Gorges du Todra, Tinerhir, in January 2012 showed birds similar to most *theresae* at Goulimine. Photographs by B Maire from Erfoud, Tafilalt, East Saharan Morocco, on 3 May 2010 showed birds with less reddish brown tones, especially on the supercilium. Obviously, it is hard to judge colours from photographs taken in strong light, especially when different cameras are used by different photographers, and further study should be done, eg, in museum collections.

The variation in colour intensity within the population of *theresae* found near Goulimine, Lower Draa, having richer and darker colours than in areas further east or south may perhaps relate to an ecological adaptation. According to Gloger's Rule (Gloger 1833), birds in more humid habitats tend to show darker and redder colours than those in drier areas ('coastal populations acquire more 'eumelanin' and, therefore, are darker or redder



140 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta inquieta*, Hameishar plains, southern Negev, Israel, 17 December 2012 (Yoav Perlman)

than inland populations of drier habitats which acquire more 'pheomelanin' and, therefore, appear paler or more sandy coloured'). Therefore, we think that, because of a presumed lack of consistent plumage differences, *theresae* can be regarded as a synonym of *saharae*, rendering *theresae* as an ecological type rather than a subspecies.

Much more striking are differences in morphology between Streaked Scrub Warblers in North Africa and *S i inquieta* (hereafter nominate *inquieta*) in the Middle East from Egypt to north-western Arabia and Syria. According to Svensson et al (2009), nominate *inquieta* differs from North African birds, eg, by a whitish instead of buffish supercilium, a dark instead of a pale iris, and slightly different colour tones on the underside.

Genetics

For their research on relationships of Streaked Scrub Warbler, Alström et al (2011) used DNA from a *saharae* from Tunisia. Apparently, they did not include individuals from elsewhere but they mentioned the finding, in GenBank, of 'a cytochrome b sequence of an individual (AF139826) from an unpublished study, presumably collected somewhere in the former Soviet Union, submitted by E P Sokolov, which is sister to the North African sample (BI PP 1.0) but differing by the substantial margin of 10.8% (uncorrected)'. It indicates that genetic research may be of help in establishing relationships between Streaked Scrub Warblers in different regions (for an early example of such a cytochrome b sequence approach, see Helbig et al 1995).

Vocalizations

Sound recordings in the collection of The Sound Approach indicate that no differences in song and calls exist between Streaked Scrub Warblers in West Saharan Morocco, Central High Atlas, or East Saharan Morocco. There are 38 recordings from two sites near Goulimine (Oued Sayed and Asrir) in West Saharan Morocco, in November, January, March and April 2002-12; two recordings from above Gorges du Todra, Central High Atlas, at c 1500 m altitude in April 2011; and five recordings west of Errachidia in East Saharan Morocco in March 2012. They all have identical song and call elements. There are also three *prrruuu* recordings of *saharae* from Douz in southern Tunisia in May 2005 which do not differ from similar *prrruuu* series from different areas in Morocco. Reports of differences in song (eg, Lee Evans in litt) are not substantiated by sound-recordings and probably concern non-homologous sounds.

The vocalizations of North African birds and nominate *inquieta* in the Middle East are quite different. The Moroccan sounds were compared with two recordings from Israel in December 2001 and 14 recordings from Jordan (Wadi Dana) in April-May 2004. The *prrruuu* call recorded in all regions of Morocco and in Tunisia (see sonagrams) could not be found in the Middle East recordings and, according to Yoav Perlman (in litt), sound distinctly lower than nominate *inquieta* calls. Also, the songs recorded in Morocco differ from those recorded in Israel and Jordan (see sonagrams). Only one song was available from Central Asia, recorded by Ian Farrow at Repetek, Turkmenistan, and available at www.xeno-canto.org/41373 (presumably *S i montana*); although it sounds reminiscent of nominate *inquieta* it is certainly different from North African songs. Combined with morphological and DNA differences, the sound differences may be a reason to reconsider the systematic position of North African *saharae*.

Discussion and conclusions

The distribution range of Streaked Scrub Warbler in Morocco is shown to be not as disjunct as previously thought, and the species does not occur in the south of Western Sahara or in Mauritania, where its alleged presence seems to be based upon misidentifications. It is not a real desert species and it is suggested that its disappearance from certain areas where it occurred in the past is not due to nomadic behaviour of the birds, eg, linked with precipitation, but caused by degradation of

vegetation. Most nest building takes place from early February through April and fledglings have been seen from late January to late May. The best examples of birds showing features of the subspecies *theresae*, with dark reddish plumage parts, seem to be present in the Goulimine area. It is suggested that there could be a relation between such rich colours and ecological circumstances. Otherwise, the colour differences between local populations appear to be small and variable. Possibly, all Moroccan birds (at least east to Errachidia, East Saharan Morocco) may be called *theresae* but, when birds from Algeria to Libya are not clearly different from East Saharan Morocco, both Moroccan subspecies could be better treated as synonyms. Within southern Morocco (from where a large sample could be used), we could not find differences in vocalizations between birds in the west or the east as well as southern Tunisia. However, there are obvious differences in sounds between populations of North Africa and the Middle East, and possibly also further east in Central Asia (from where only one recording was available). Further research is needed on morphology, vocalizations and genetics of all taxa in the Middle East and Central Asia to investigate how consistent these differences are. Given the differences presented here between North African and Middle Eastern birds, it would be no surprise when more than a single species should be recognized within Scotocercidae.

Samenvatting

VERSPREIDING, HABITAT, DETERMINATIE EN TAXONOMIE VAN MAQUISZANGER IN MAROKKO Maquiszanger *Scotocerca inquieta* sensu lato heeft een groot verspreidingsgebied van westelijk Azië en het Arabische schiereiland west in Noord-Afrika (Maghreb) tot aan de Atlantische kust van de Westelijke Sahara, Marokko. Er worden acht ondersoorten onderscheiden waaronder twee in zuidelijk Marokko, *S i saharae* in het oosten en *S i theresae* in het westen (hierna *saharae* en *theresae*, respectievelijk). In dit artikel worden gegevens over de biologie, het voorkomen en de herkenning van de weinig bekende Marokkaanse ondersoorten gepresenteerd en de verschillen met andere taxa besproken. Het blijkt dat het verspreidingsgebied meer aaneengesloten en minder verbroken is dan tot nu toe bekend. De soort blijkt niet voor te komen ten zuiden van Boujdour, Westelijke Sahara, en dus ook niet in Mauretanië, waar hij in het verleden mogelijk is verward met Kerkelprinia *Spiloptila clamans*. Het leefgebied in Marokko wordt gevormd door steppenachtige randen van 'echte' woestijn, met een kruidlaag en struikgewas, niet alleen in vlak terrein maar ook in bergen tot op 2550 m hoogte. Het is geen trekvogel maar na het broeden vindt enige dispersie plaats, zoals blijkt uit een noordelijke waarneming in Essaouira,

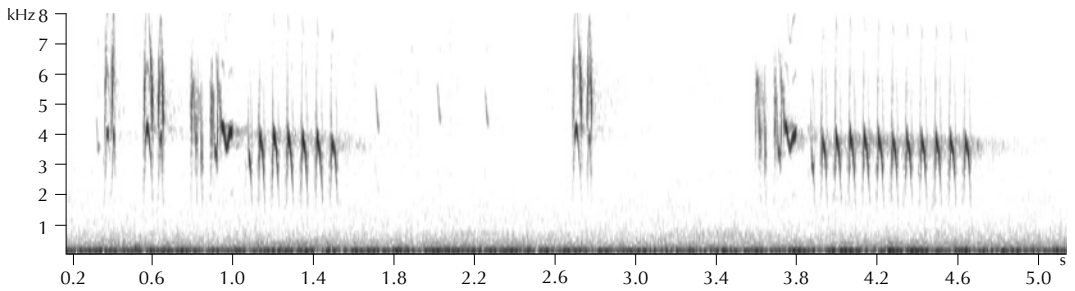


FIGURE 1 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta inquieta*, song, Israel, 2 December 2001 (01.014.KM.00004 Killian Mullarney/The Sound Approach)

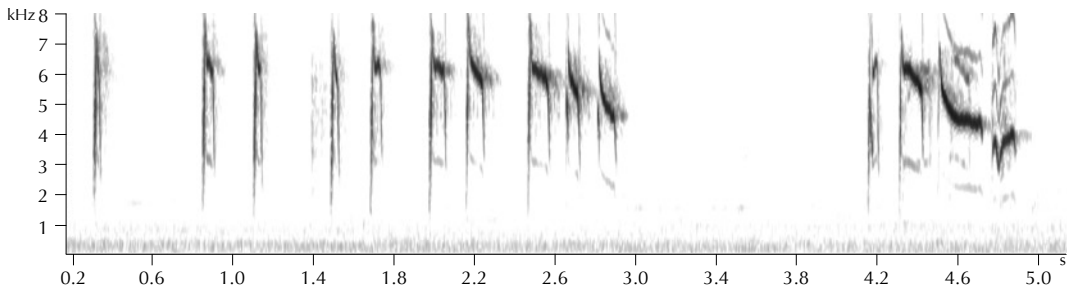


FIGURE 2 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta inquieta*, All Bara forest, Wadi Dana, Jordan, at 1300 m altitude, 30 April 2004 (04.014.MR.04611 Magnus S Robb/The Sound Approach)

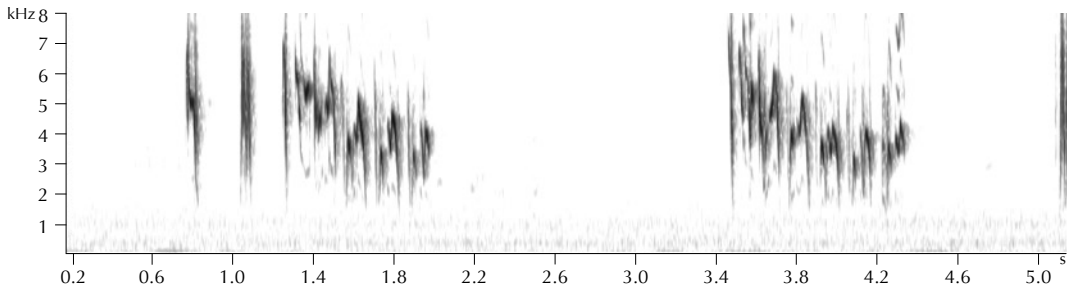


FIGURE 3 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta inquieta*, song, All Bara forest, Wadi Dana, Jordan, at 1141 m altitude, 2 May 2004 (04.015.MR.05515 Magnus S Robb/The Sound Approach)

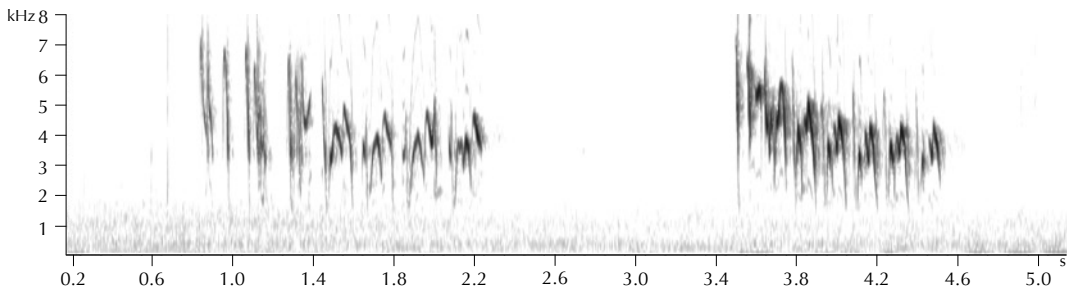


FIGURE 4 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta inquieta*, song and pee calls, All Bara forest, Wadi Dana, Jordan, at 1141 m altitude, 2 May 2004 (04.015.MR.05547 Magnus S Robb/The Sound Approach)

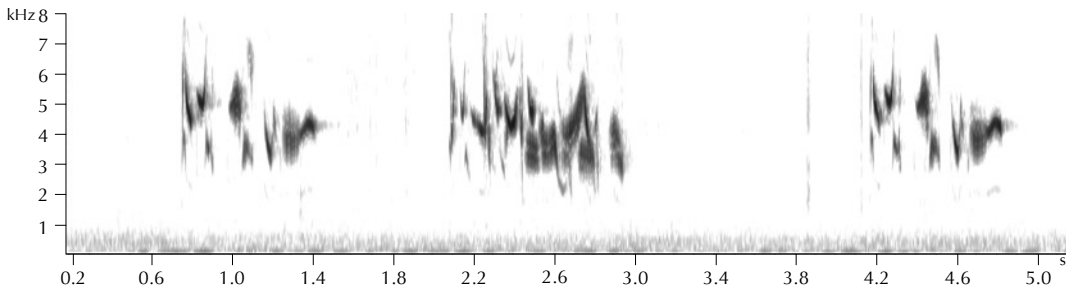


FIGURE 5 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, songs and calls, Oued Sayed, Goulimine, Lower Draa, Morocco, 4 April 2004 (04.007.AB.03355 Arnoud B van den Berg/The Sound Approach)

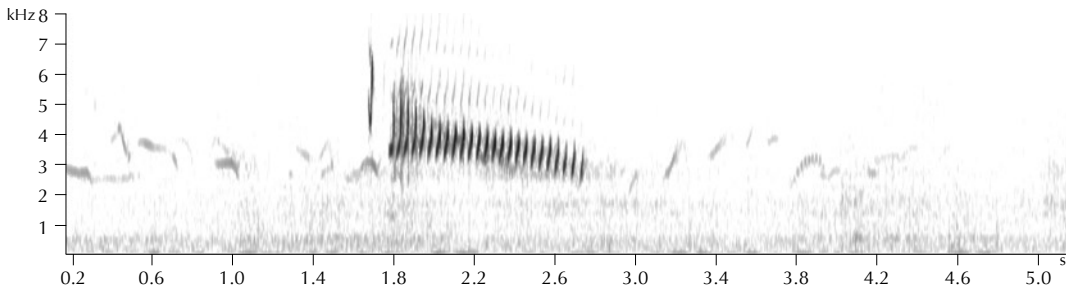


FIGURE 6 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta saharae*, *prrruuu* call, Kebili, Douz, Tunisia, 6 May 2005 (05.008.AB.11510 Arnoud B van den Berg/The Sound Approach)

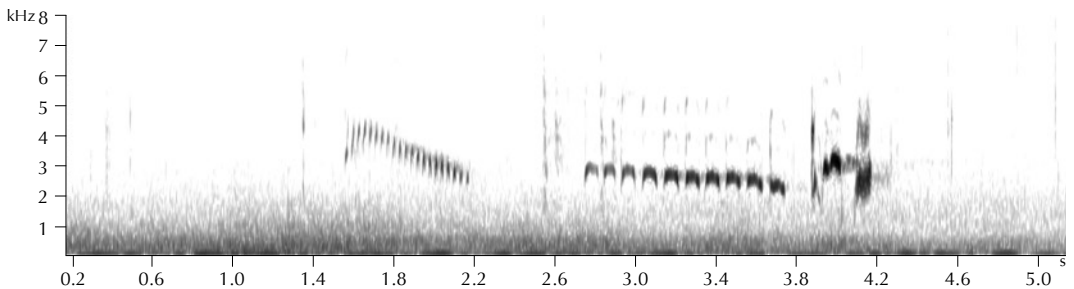


FIGURE 7 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, *prrruuu* call, Gorges du Todra, north of Tinerhir, Central High Atlas, Morocco, at 1584 m altitude, 15 April 2011 (110415.AB.155700 Arnoud B van den Berg/The Sound Approach)

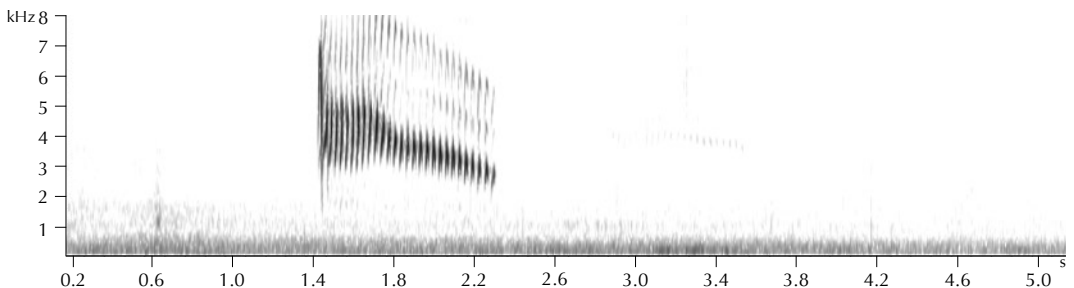


FIGURE 8 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, *prrruuu* call, Asrir, Goulimine, Lower Draa, Morocco, at 273 m altitude, 16 January 2012 (120116.AB.105800 Arnoud B van den Berg/The Sound Approach)

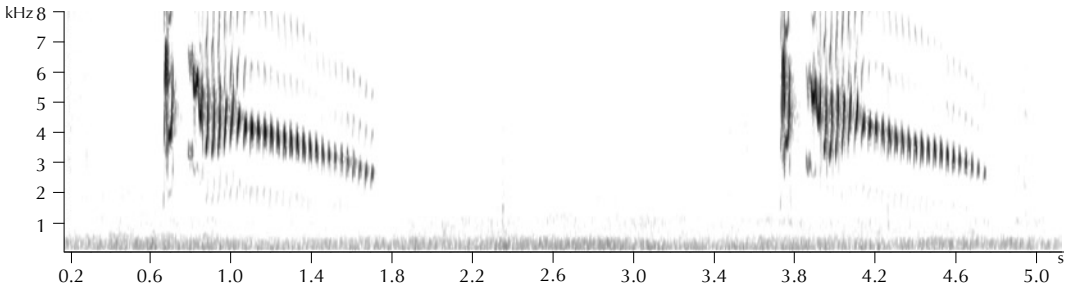


FIGURE 9 Streaked Scrub Warbler / Maquiszanger *Scotocerca inquieta*, prruuu calls, west of Errachidia, Tafilalt, Morocco, at 1092 m altitude, 13 March 2012 (120313.AB.152200 Arnoud B van den Berg/The Sound Approach)

Marokko. Het areaal lijkt te krimpen en de soort is zeldzaam geworden of zelfs verdwenen in grote delen van de oosthelft van zuidelijk Marokko, waar hij in 1960-80 nog vaak werd gemeld. Als oorzaak van deze achteruitgang wordt het verdwijnen van vegetatie genoemd, bijvoorbeeld door begrazing of klimaatsverandering; in berggebieden met een intacte vegetatie is geen sprake van achteruitgang. In het westen van Marokko, zoals in Lower Draa en Tarfaya, is de soort niet zeldzaam geworden, mogelijk door de invloed van de oceaan. De gegevens over broedbiologie laten zien dat meestal van begin februari tot in april nestbouw plaatsvindt maar dat soms ook al in december met nestelen kan worden begonnen; er worden twee tot vier jongen grootgebracht. Het wordt betwijfeld of de uiterlijke verschillen tussen *saharae* en *theresae*, zoals in kleur en streping, gerelateerd zijn aan hun veronderstelde verspreidingsgebied. Er blijken tussen vogels in het westen en oosten van Marokko of die van Tunesië geen verschillen in geluid te zijn. Dankzij DNA-onderzoek is recent gebleken dat de soort tot een aparte familie Scotocercidae dient te worden gerekend. De Maghreb-vogels verschillen dermate sterk in uiterlijk en geluid van de nominaat ondersoort *S. i. inquieta* in het Midden-Oosten dat genetisch onderzoek gewenst is; over de kenmerken van andere ondersoorten in westelijk Azië en het Arabisch schiereiland is zo weinig bekend dat verder onderzoek noodzakelijk wordt geacht.

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