

RECORDING ARRESTED PRIMARY MOULT IN TERNS, USING BLACK TERNS *CHLIDONIAS NIGER* AS EXAMPLES

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Van der Winden J. 2005. Recording arrested primary moult in terns, using Black Terns *Chlidonias niger* as examples. *Atlantic Seabirds* 7(1): 23-30. *This paper presents some adaptations to usual primary moult scores in terns. It is proposed to score old 'arrested' moult series separately, to facilitate the analysis of moult in the breeding period more effectively. To do this in a comparable manner, it is proposed to record moult scores for active series (after breeding) as A = new first series, B = new second series and C is new third series. For old (arrested) primaries this can be expanded to: E = old first series, F = old second series and G = old third series. Some examples for Black Tern are presented for the whole annual cycle.*

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INTRODUCTION

In comparison with for example waders, rather few adult terns are captured along the East Atlantic flyway. Present knowledge of (primary) moult patterns in terns is therefore incomplete (Craik 1994; Ward 2000; Walters 1987; Schouten 1982; Van der Winden 2002ab; Zenatello *et al.* 2002). One of the main characteristics of tern moult is that primaries are moulted such that the wing gap is kept to a minimum. Moreover, terns are 'notorious' in starting second and sometimes even third moulting series within their annual cycle (Ginn & Melville 1983; Van der Winden 2002b). This feature is probably a result of evolutionary processes allowing these birds to stay aloft with maximum manoeuvrability, as they are completely dependent on flight for feeding. This paper proposes some adaptations to the usual primary moult scores to facilitate the analysis of moult in terns during the breeding period.

RECORDING WING MOULT

Terns moult primaries descendant, starting from the innermost primary (P1) outwards, during a period of about six months. Before completion of the first series (P1-P10) they start a second series again from P1. Some species, such as Common Tern *Sterna hirundo*, Little Tern *S. albifrons* and Black Tern

Chlidonias niger, may even start a third series at P1 during the final phase of the non-breeding season. A captured tern may thus have as many as three active moult centres (Baker 1993). During the breeding period, primary moult is arrested, but will start again around July, sometimes just before the chicks fledge (Walters 1987; Van der Winden 2002a).

To describe the subsequent moult series in terns, Underhill & Prŷs-Jones (1986) suggested an adjustment of the classic moult score of Ginn & Melville (1983) by separating new primaries in subsequent series. New primaries in the first series were scored as '5' as usual, but new primaries of later series were scored as '6' (2nd series) or '7' (3rd series). However, old primaries were still scored as '0' in their system, even although old primaries from subsequent series can be separated in most cases. I would propose, in addition to Underhill & Prŷs-Jones (1986), to score these old primaries in arrested wings as well. This addition would facilitate studies of previous moult activity in the breeding areas (arrested moult period). A modified recording system is proposed (Table 1), to be able to fully describe tern primary moult within one moult season (in between two breeding seasons) for Palearctic terns:

Table 1. Proposed primary moult scoring system for Palearctic terns. In this system 5 and 0 are subdivided in three separate age series. It is strongly advised not to use 5 and 0, but in case of difficulties separating series or if time is lacking the classic system still can be used and thus separated from properly treated birds.

Tabel 1. Voorstel voor een systeem om handpenrui bij Palearctische sterns te scoren. In dit systeem zijn 5 en 0 onderverdeeld in drie aparte leeftijdseries. Het wordt sterk aangeraden om 5 en 0 niet te gebruiken, maar bij problemen om series te onderscheiden of bij tijdgebrek kan het klassieke systeem nog steeds gebruikt worden én kunnen 'klassiek' gescoorde vogels onderscheiden worden van 'goed' gescoorde vogels.

Score	feather scoring system	Source
1	old feather missing or new feather completely in pin	usual definition <i>cf</i> Ginn & Melville 1983
2	new feather just emerging from the sheath up to one third grown	usual definition <i>cf</i> Ginn & Melville 1983
3	new feather between one and two thirds grown	usual definition <i>cf</i> Ginn & Melville 1983
4	new feather more than two-thirds grown and with remains of waxy sheath at its base	usual definition <i>cf</i> Ginn & Melville 1983

Table 1 continued. Tabel 1 vervolg.

Score	feather scoring system	Source
A	new fully grown feather developed in the first series (onset in Europe around June-July)	<i>cf</i> 5 in Underhill & Prÿs - Jones 1986
B	new fully grown feather developed in the second series (onset in Africa around October)	<i>cf</i> 6 in Underhill & Prÿs - Jones 1986
C	new fully grown feather developed in the third series (onset in Africa around January)	<i>Cf</i> 7 in Underhill & Prÿs - Jones 1986
	<i>Prior to breeding, old feathers</i>	
E	old feather developed in the first series (Europe/Africa)	<i>this contribution</i>
F	old feather developed in the second series (Africa)	<i>this contribution</i>
G	old feather developed in the third series (Africa)	<i>this contribution</i>
(5)	new fully grown feather (series not separated)	usual definition <i>cf</i> Ginn & Melville 1983
(0)	old feather; series indistinguishable or not scored	usual definition <i>cf</i> Ginn & Melville 1983

In this scheme, scores A, B and C represent feathers developed within the same moult season (between two breeding periods). Note that terns might migrate twice within this period. Codes E, F and G are codes for three arrested series, which can be distinguished within and partly after breeding (if not replaced). This primary moult score specifies the former undefined "0" into different feather age categories and all usual moult patterns in terns anywhere in the world and at any time during the non-breeding season can be properly described. This method also makes it possible to score the arrested 'moult' during the breeding period in a systematic way. The advantage is that the progress of primary moult be studied more comprehensively as well in the non-breeding as breeding areas. Subadults may be treated as adults.

Terns with four active/arrested moult series can also be included in the proposed system, by adding D in new series or H in old (arrested) series. However, such individuals are very rare (reported only in Little Tern; A.J. Tree *pers. comm.*). Rarely, and if so mainly in immature birds, one or more primaries are skipped ("forgotten") during primary moult or arrested for a relative long

period (Schouten 1982; Behmann & Persson 2003). Such primaries are older (more worn) than primaries on either side and can be scored as 'I' (intermediate; A.J. Tree *pers. comm.*).

BLACK TERN *CHLIDONIAS NIGER*

To exemplify the proposed system, some case studies of Black Tern moult scores are included. Firstly a theoretical moult score is given. Based on captures from breeding as well as stopover and non-breeding areas some data are presented about moult progress based on the extended scoring system.

Breeding season May-June with arrested (not active) wing moult (Fig. 1)

In general 4 to 5 primaries are replaced in the second series resulting in the typical light inner wing. Theoretical standard bird with one arrested series: FFFFFEEEEEE. Theoretical standard bird with two arrested series (rare): GFFFFEEEEEE. Data from colonies in The Netherlands May-June 1999-2003: Average number of replaced primaries of the second (arrested) series (B): $4.8 n = 144$. Percentage of terns with a third series (C): 5.0% $n = 140$.



Figure 1. Breeding period May-July (The Netherlands). Arrested primary moult FFFFFEEEEEE. (J. van der Winden).

Figuur 1. Broedseizoen mei-juli (Nederland). Onderbroken handpenrui FFFFFEEEEEE. (J. van der Winden).



July-September active moult (Fig. 2)

Theoretical standard bird: AA41FFEEEE. In general P1-P3 are replaced in August and one or more growing primaries are visible. Above this, 1 or 2 primaries of the second (arrested) series (F) and the outer dark and worn primaries of the first series (E) are still visible. In such wing patterns it is clear that third series cannot be detected because they are replaced by new ones (A). Data from The Netherlands July-August 1983 (Schouten *unpubl.*). Average number of replaced primaries of the second series (F) for birds still in arrested moult: 4.8 $n = 248$. Average primary score in July-August: 7.1 with a max of 29 ($n = 248$). Percentage of terns, which replaced second series (F) completely with new primaries (1 to A): 11.9% ($n = 1831$).



Figure 2. (A, top) July-August (Ukraine, Sivash). Start of primary moult AA43EEEEEE; (B, bottom) July-August (Ukraine, Sivash). Start of primary moult 12FFEEEEEE. Still 3 primaries of second pre breeding series remaining (J. van der Winden).

Figuur 2. (A, boven) Juli-augustus (Oekraïne, Sivash). Begin van handpenrui AA43EEEEEE; (B, onder) Juli-augustus (Oekraïne, Sivash). Begin van handpenrui 12FFEEEEEE. Nog steeds drie handpennen van de tweede pre breeding serie overgebleven (J. van der Winden).

October, Africa active moult (Fig. 3)

Theoretical standard adult: AAAA41EEEE. In general P4 to P6 are replaced in Oct and one or more growing primaries are visible. Sometimes few old primaries of second arrested series remaining (F). All birds in active moult. Data from Ghana early October 2002 (Ghana Wildlife Society, Centre for African Wetlands *unpubl.*) Average primary score early October: 25.7, with min 16 and max 46 ($n = 53$). Percentage of terns, which replaced second series (F) completely with new primaries (1 to 5): 67.9% ($n = 53$).



Figure 3. October (Ghana). One active primary moult series AAAA44EEEE (J van der Winden)

Figuur 3. Oktober (Ghana). Een serie actief ruiende handpennen AAAA44EEEE (J van der Winden)

February-March, Africa active moult (Fig. 4)

Theoretical standard adult: BB4AAAAA3E. In general up to P9 or P10 replaced for the first time (E). Series 2 active or already arrested. Data from Namibia February-March 1999 (WIWO, *unpubl.*). Average primary score February-March: 43.1, with min 22 and max 50 ($n = 270$; all with A & B calculated as 5 in order to compare with historical data). Outer primary of series 2 replaced (code 1, 2, 3, 4 or A & B) 3.2, with min = 0 max = 6.

DISCUSSION

In the classic approach, moult scores of 50 are the maximum (Ginn & Melville 1983). In terns this approach can be followed if new feathers with scores A, B or C are all regarded as 5 (new). This provides a general idea of moult progression speed. However, as terns moult 'new' feathers again, it is useful to distinguish



Figure 4. February (Namibia). Two active primary moult series B421AAAAA4. Pattern of picture 1 almost completed. (J. van der Winden.)

Figuur 4. Februari (Namibië). Twee handpenseries in actieve rui B421AAAAA4. Het patroon van figuur 1 is vrijwel voltooid (J. van der Winden).

moult progression of each series of primaries separately (Van der Winden 2002b), or more advanced (Underhill, 2003). The maximum for series 1 is always 50 points. The maximum for series 2 and 3 is not the same in all individuals and can be as high as 30 points if transformed to 5 points for each feather (series 2). The recording system proposed here facilitates a more comprehensive description of complicated moult patterns, such as those commonly observed in terns.

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REGISTRATIE VAN ONDERBROKEN HANDPENRUI BIJ STERNS, MET VOORBEELDEN VAN DE ZWARTE STERN *CHLIDONIAS NIGER*

In aanvulling op eerdere methoden om de vleugelrui bij sterns te registreren wordt in dit artikel voorgesteld om zowel oude (onderbroken, 'arrested') als nieuwe ruiseries op een systematische wijze te beschrijven. Het voordeel ten opzichte van eerdere methoden is dat onderbroken series afzonderlijk worden onderscheiden zodat de voortgang van de winterrui achteraf, dus in de

broedtijd, beschreven kan worden. Om dit op een vergelijkbare wijze te doen, wordt voorgesteld de registratietechniek voor ruiscores uit te breiden met scores voor nieuwe pennen per serie volgens tabel 1: A = nieuw eerste serie, B = nieuw tweede serie en C = nieuw derde serie. Voor oude pennen kan dit doorgevoerd worden volgens: E = oud eerste serie, F = oud tweede serie en G = oud derde serie. In deze optiek blijven 5 en 0 gereserveerd voor situaties waarin onderscheid niet mogelijk is of wanneer onderzoekers geen onderscheid willen of kunnen maken. In een aantal voorbeelden van ruiscores van zwarte sterns uit de gehele jaarcyclus wordt de voorgestelde score toegepast (fig 1 t/m 4).

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