

DOUBLE WHITE LINES ON THE BILL OF THE  
RAZORBILL *ALCA TORDA*: REMNANTS OF AN  
ASSOCIATION WITH THE EXTINCT  
GREAT AUK *PENGUINUS IMPENNIS*?

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Lavers J.L., Muzaffar S.B. & Jones I.L. 2006. Double white lines on the bill of the Razorbill *Alca torda*: remnants of an association with the extinct Great Auk *Pinguinus impennis*? *Atlantic Seabirds* 7(3): 103-108. One of the diagnostic features of the Razorbill *Alca torda* is the distinct white line running vertically across the bill. Here we report the presence of two white bill lines in 10 wintering Razorbills from Newfoundland, Canada in addition to a small number of unreported birds from museum collections and personal records. Populations of Razorbills across their range have been divided into two major subspecies based on morphological variation, although molecular studies do not support such a subdivision. Molecular phylogeny of the auks place Razorbills as the closest relatives of the extinct Great Auk *Pinguinus impennis*. Multiple white bill lines were a characteristic of the Great Auk and we speculate that this variation in the bill marking in the Razorbill is an atavism, reflecting their common ancestry.

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INTRODUCTION

Two subspecies of Razorbill are currently recognized: the larger nominate *A.t. torda*, breeding in eastern North America, Greenland, Norway, northwestern Russia, Denmark and the Baltic; and the smaller *A.t. islandica*, breeding in Iceland, the Faeroe Islands, Britain, France, and Germany (Cramp 1985; Hipfner & Chapdelaine 2002). Breeding distributions are fairly well known, with most colonies being located on offshore islands and mainland cliffs, but there is limited information on the winter distribution of both subspecies (Hipfner & Chapdelaine 2002). The plumage of both subspecies is indistinguishable and clinal variation along a latitudinal gradient does not reveal a clear pattern (Jones 1990; Barret *et al.* 1997, Hipfner & Chapdelaine 2002).

The number of vertical grooves on the bill has previously been used to subdivide *A.t. torda* into two subspecies: *A.t. torda* and *A.t. pica* (Salomonsen 1944). However, the number of grooves in Razorbills is variable and is related to the age of the bird (Lloyd 1976; Jones 1988). The Razorbills closest relative,

the extinct Great Auk *Pinguinus impennis*, had 6-12 grooves (Montevecchi & Kirk 1996). Only one of the several grooves in Razorbills (located proximal to the base of the bill) is normally white in color. The Great Auk in comparison had all or most of its grooves white (Montevecchi & Kirk 1996). Here we report on 10 Razorbill specimens with two vertical, prominent white, bill lines collected (accidental by-catch) from various localities around Newfoundland.

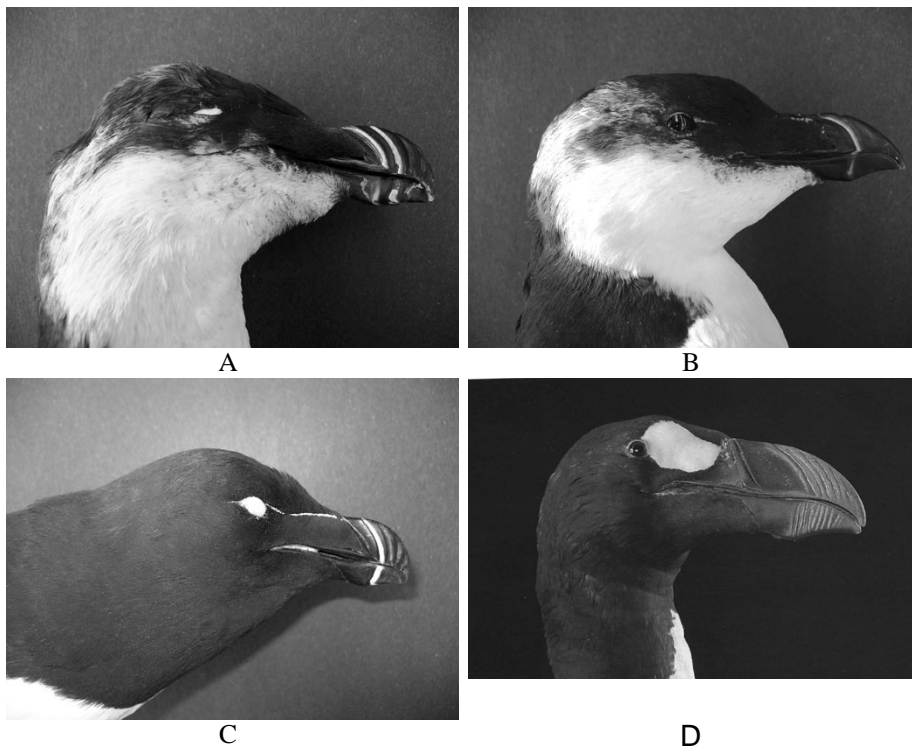


Figure 1. Adult Razorbills (a) winter plumage bird with two vertical white bill lines recovered in Newfoundland in 1997, (b) winter plumage bird with one vertical white bill line, (c) breeding plumage bird with one vertical white bill line recovered in Newfoundland in 1969, (d) extinct Great Auk (photo courtesy of E. Fuller).

Figuur 1. Adulte Alken (a) winterkleed met twee witte, verticale snavelgroeven, Newfoundland 1997, (b) winterkleed met een witte, verticale snavelgroef, (c) broedkleed met een witte, verticale snavelgroef, Newfoundland in 1969, (d) uitgestorven Reuzenalk (foto E. Fuller).

## METHODS

We measured the head, bill, and wing of ten Razorbills collected in Newfoundland which exhibited two vertical, white, bill grooves and compared their measurements to those for other populations in Atlantic Canada. In addition, we contacted several museums (American Museum of Natural History, British Museum of Natural History, Cornell Museum, Provincial Museum of Newfoundland, and Tromsø University Museum) with substantial collections of Razorbills to determine if any of their specimens had this variation in bill grooves. We also contacted 13 seabird researchers from around the world to determine whether anyone else had observed or reported this double white line condition.

*Table 1. Biometrics (mm) of wintering and breeding adult Razorbills in North America. Data shown as mean  $\pm$  SD (n).*

*Tabel 1. Biometrische gegevens (mm) van overwinterende en broedende volwassen Alken in Noord-Amerika. De gegevens zijn gemiddelden  $\pm$  SD (n).*

Colony, year(s)	Plumage	Culmen Length	Bill Depth at Gonys	Bill Length	Head Bill	Wing Chord	Ref
Twillingate, Newfoundland 1997-2005	Winter	32.8 $\pm$ 1.2 (10)	21.8 $\pm$ 1.2 (10)	54.3 $\pm$ 3.8 (5)	95.0 $\pm$ 1.6 (10)	204 $\pm$ 14.1 (10)	1
Gannet Is., Labrador 1996-2005	Breeding	33.6 $\pm$ 1.5 (243)	23.0 $\pm$ 0.9 (253)	53.2 $\pm$ 2.7 (239)	94.7 $\pm$ 2.9 (42)	204 $\pm$ 6.0 (271)	2
Is. Ste.-Marie, Quebec 1986-1996	Breeding	32.8 $\pm$ 1.4 (474)	23.0 $\pm$ 1.0 (473)	Not available	Not available	208 $\pm$ 4.9 (470)	3
Newfoundland* 2000-2004	Breeding	33.8 $\pm$ 1.4 (23)	23.1 $\pm$ 1.4 (23)	Not available	94.4 $\pm$ 2.7 (23)	206 $\pm$ 5.0 (23)	4
Machias Seal Is., New Brunswick 1995-2005	Breeding	34.7 $\pm$ 1.6 (184)	22.7 $\pm$ 0.9 (247)	54.3 $\pm$ 2.0 (23)	95.0 $\pm$ 3.1 (243)	202 $\pm$ 5.5 (248)	5
Bay of Fundy, New Brunswick 2003	Winter	33.4 $\pm$ 1.6 (22)	22.2 $\pm$ 1.7 (22)	Not available	96.3 $\pm$ 2.4 (22)	203 $\pm$ 5.4 (22)	4

\* Gull Island, Small Islands, Wadham Islands, and Musgrave Harbor (all locations are on the Avalon Peninsula) References: <sup>1</sup>Present study; <sup>2</sup>L. Jones unpublished data; <sup>3</sup>Hipfner & Chapdelaine (2002); <sup>4</sup>Canadian Wildlife Service unpublished data; <sup>5</sup>A.W. Diamond, unpublished data.

## RESULTS

All double white bill groove Razorbills collected in Newfoundland were in winter plumage (Figure 1a) and were collected between August and November, 1997-2005. Morphometric comparisons of these birds with other Razorbills in Atlantic Canada indicate little variation in these double line birds from other Razorbills (both in winter and breeding plumage, Table 1). Through our communications with museums, we were able to locate two additional double white bill groove specimens: one in the British Museum of Natural History (BMNH) and one in Cornell Museum. Of 100 Razorbills in the collection at BMNH, only one, a male, had the double white line condition. Of seven adult Razorbills at Cornell Museum, one bird (sex unknown) exhibited one and half white lines (instead of two full lines). A small number of Razorbills with two white bill lines were observed but never reported in Skaggerak, Norway (Tycho Anker-Nilssen and Rob Barrett, pers. comm.). A Razorbill banded in Iceland in 1996, recovered on the Faeroe Islands in December 2005, exhibited the double white line condition (Edward Soldaat, pers. comm.).

## DISCUSSION

The presence of the second white bill line is seemingly inconsistent with all existing descriptions of the Razorbill (Glutz von Blotzheim & Bauer 1982; Cramp *et al.* 1985, Gaston & Jones 1998, Barrett *et al.* 2000). The frequency of this condition seems to vary by locality with approximately 1-2% of the population in Norway exhibiting double white vertical grooves (Tycho Anker-Nilssen and Rob Barrett, pers. comm.). However, in Newfoundland, of 29 adult Razorbills (winter and breeding plumage) examined, 10 had two vertical white grooves on their bills. The frequency of this trait in the rest of Atlantic Canada is not known as no records exist of such Razorbills in any other parts of their range. Monitoring of Razorbills further north is minimal, thus reducing the opportunity to detect double white line birds, we believe that these birds may be from further north, perhaps Greenland, and have migrated down into Newfoundland waters (all birds were collected in early fall; Lyngs 2003).

Molecular methods segregate the auks into five distinct lineages (Friesen *et al.* 1996) with Little Auks *Alle alle*, Razorbills, guillemots *Uria* spp. and the Great Auk occurring within the same lineage (Moum *et al.* 2002). Great Auks are regarded as the closest relative of Razorbills. Since Great Auks had a large number of vertical white grooves (Montevecchi & Kirk 1996, Figure 1) and no other member within that lineage has any grooves, we speculate that the presence of white grooves is an ancestral trait that emerged independently within this lineage. The Razorbills retained only one white groove, whereas the

Great Auks retained many. The observed additional white groove in the Razorbills in this study could be a case of atavism (the reappearance of an individual trait after several generations of absence), that has been documented in traits in other bird species (Raikow *et al.* 1979; Berman *et al.* 1990).

Traits observed in extant auks are a reflection of a complex evolutionary history involving changes in ecology, behavior, and biogeography (Hoberg 1992). Genetic methods have added significantly to our understanding of evolutionary relationships within the Alcidae, although major gaps still remain (Gason & Jones 1998; Moum *et al.* 2002). Further genetic studies, incorporating Razorbills from across their distribution (Moum *et al.* 2001), would shed more light on traits, such as the double white lines, and help us elucidate the phylogeny of these seabirds.

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#### DUBBELE WITTE SNAVELGROEVEN BIJ DE ALK ALCA TORDA; OVERBLIJFSELEN VAN REUZENALK *PENGUINUS IMPENNIS*?

Het verticale witte lijntje over de snavel is één van de opvallendste kenmerken van de Alk Alca torda. In dit artikel worden tien Alken beschreven die zelfs twee witte verticale groeven hadden. De vogels waren allemaal in winterkleed en werden in Newfoundland (Canada) gevangen. Spuurwerk in een aantal grote musea leverde nog enkele exemplaren op en Noorse onderzoekers wisten zich kleine aantallen te herinneren die zij nog niet eerder gerapporteerd hadden. Tegenwoordig worden bij de Alk twee ondersoorten onderscheiden. Dit onderscheid is gemaakt op grond van de gemiddelde afmetingen; moleculair werk heeft tot dusverre deze onderverdeling niet kunnen ondersteunen. De naaste verwant van de Alk is de inmiddels uitgestorven Reuzenalk *Penguinus impennis*. Deze soort had een flink aantal witte, verticale snavelgroeven en de auteurs speculeren dan ook dat de gevonden variatie in het aantal witte groeven bij de Alk een atavisme is, een terugval naar kenmerken van een gemeenschappelijke voorouder.

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