

een toename in aanspoelingen. In totaal zijn er 516 vogels waargenomen, het leeuwendeel komt voor rekening van de zeetrekwaarnemers (379). Zo'n 125 vogels werden op het strand gevonden, ondanks het feit dat vermoedelijk een aanzienlijk deel verdween door predatie. De aangespoelde vogels waren, zonder uitzondering zeer mager, maar vertoonden geen tekenen van olie besmeuring. Tot eind februari aan toe werden oude kadavers van Kleine Alken gevonden op verborgen plekken in de duinen. De invasie van afgelopen winter was groter dan alle voorgaande. Een speurnocht naar oude data in literatuur toonde aan, dat Kleine Alken eigenlijk elke winter wel werden gezien in de afgelopen 150 jaar, maar steeds in kleine aantallen. Dit veranderde in de winter van 1977/78, toen de eerste aanzienlijke toename werd vastgesteld. Sindsdien zijn er verschillende invasies geweest (>20 vogels per winter, waarvan >50% binnen enkele dagen). Een significante toename in aangespoelde vogels tussen 1962 en 1996 kon worden vastgesteld aan de hand van BBS. Alle invasies (1981, '86, '88, '89, '90, '91, '92 and '96) hebben gemeenschappelijk dat zij samengaan met slecht weer. De werkelijke reden voor de toename in waarnemingen is nog onduidelijk.

SOMMAIRE

Après une tempête dans la Mer du Nord, fin octobre 1995, grands nombres de Mergule nain ont été observés devant la côte Belge. Cette première invasion du 2-3 novembre a été suivie d'une deuxième le 13-19 novembre. Au total 516 oiseaux ont été défectés, en majeure partie par les observateurs de la migration d'oiseaux de mer. Ces invasions résultaient en un grand nombre d'oiseaux échoués sur la plage, au total 125. L'invasion de l'hiver 1995/96 était la plus importante en Belgique jusqu'à ce jour. Une étude de la littérature a démontré que les Mergules nains ont été observés toujours devant la côte Belge, mais en petit nombre. Dès l'hiver 1977/78 une augmentation importante des présences a été observée. Un nombre d'influxes se sont suivies dès lors, et chaque invasion était plus importante que la précédente. Entre 1962 et 1996 une augmentation significative d'oiseaux échoués sur la côte belge peut être démontrée. Toutes les invasions (1981, '86, '88, '89, '90, '91, '92 et '96) se produisent pendant des périodes de tempête sur mer. La vraie cause de l'augmentation des observations n'est pas encore claire.

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WINTER DISTRIBUTION AND WRECKS OF LITTLE AUKS (DOVEKIES) *ALLE A. ALLE* IN THE NORTHWEST ATLANTIC HET WINTERVOORKOMEN EN INVASIES VAN KLEINE ALKEN IN DE WESTELIJKE ATLANTISCHE OCEAAN

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ABSTRACT

The general winter distribution of Little Auks in the Northwest Atlantic is described with reference to recoveries of ringed birds from NW Greenland. It is generally concluded that birds from NW Greenland colonies winter mainly in Newfoundland waters, while birds from Svalbard colonies winter mainly in SW Greenland waters. Details were collated of flights and wrecks in the northwest Atlantic region, of which the 1932/33 influx was clearly the most impressive example. Some 27 years in which notable flights or wrecks occurred off the east coast of Canada and/or the U.S. are listed (Table 2, 3). While the cause of wrecks remains obscure, further investigation in related areas (e.g. weather patterns and body condition) may help to identify the driving forces.

The numbers and distributions of breeding seabirds in the North Atlantic are relatively well documented. There is, however, very little information available regarding seabird distributions at sea, particularly direct observation in winter. Offshore coverage, albeit irregular, has increased slightly in recent years. The Little Auk (Dovekie) *Alle a. alle* is the smallest of the Atlantic auks, and the most abundant seabird in the North Atlantic. We describe the general winter distribution of Little Auks, with reference to recoveries of ringed birds, and present details of flights and wrecks in the northwest Atlantic region.

WINTER DISTRIBUTION

Due to the southerly flow of Arctic water, the Labrador Current, down the east coast of Canada, the southern limit of the Low Arctic zone (Salomonsen

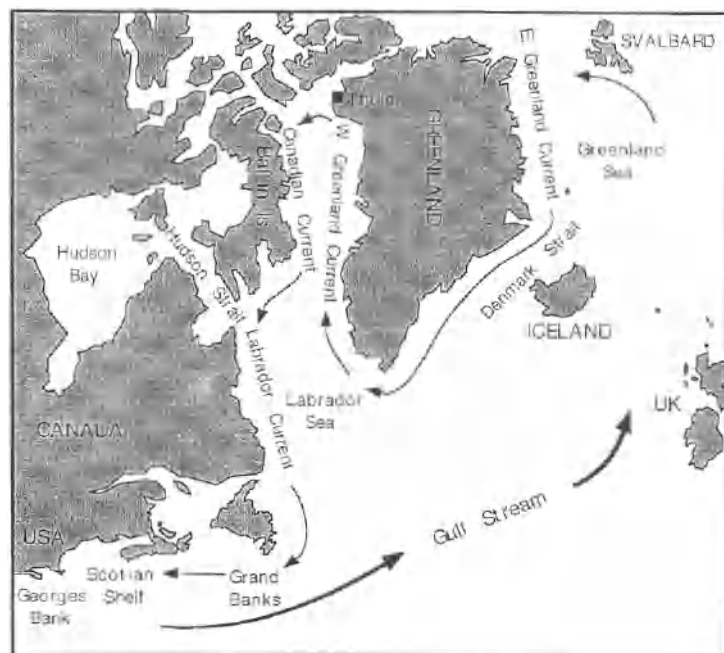


Figure 1. Ocean currents involved in the southern migrations of Little Auks from Greenland and Svalbard colonies.

Figuur 1. Oceaanstromingen die betrokken zijn bij het 'transport' van Kleine Alken vanuit kolonies in Groenland en op Spitsbergen.

1972) is approximately 46°N in the western Atlantic, compared to approximately 71°N off Norway. The band of temperate, ice-free water between Newfoundland (46°N) and the northern edge of the Gulf Stream ($40\text{--}43^{\circ}\text{N}$), is therefore the western equivalent of the Norwegian Sea (Brown 1984). The majority of the world population of Little Auks, estimated at 8-18 million pairs (Nettleship & Evans 1985), breed in the northwest Atlantic. The bulk of these birds breed in a few massive colonies in the Thule district (NW Greenland), estimated at 7-15 million pairs (Freuchen & Salomonsen 1958, Renaud *et al.* 1982, Nettleship & Evans 1985). Small numbers also breed in Home Bay, Baffin Island (Finley & Evans 1984), the only known North American colony. Colonies are abandoned during the last week of August (Freuchen &

Salomonsen 1958). The birds leave Thule waters and northwest Baffin Bay in September, remaining at the edge of pack-ice in Baffin Bay and the Davis Strait, as far as the eastern entrance to Hudson Strait (see fig. 1). By October, Little Auks are rare in northern Baffin Bay but are still common in the Davis Strait, and have dispersed south to the Labrador Sea and eastern Newfoundland waters (Brown 1986). They remain extremely abundant on the Grand Banks of Newfoundland throughout the winter (Tuck 1971). In 1971, they were found to be particularly concentrated around the western slope of the Southern Grand Bank (Brown 1980). They reach the Scotian Shelf and the Georges Bank in November-December (Brown 1986), and from this time small numbers may be seen off the northeast coast of the United States, particularly Maine and Massachusetts.

The northerly migration starts in April, when birds begin to depart from the Scotian Shelf and the Grand Banks, although precise timing varies with access to Labrador waters being limited by the break up of pack-ice in spring. Little Auks breeding in the Thule District move through the deep water east of the Labrador Shelf in May and reach northwest Baffin Bay from mid to late May (Renaud *et al.* 1982). Some birds are found on the Grand Banks until June, and these are mostly sub-adults (Rankin & Duffey 1948, Brown 1986), although there have been a few rare sightings of birds in breeding plumage around the Newfoundland coast in spring.

RINGING RECOVERIES

Large numbers of Little Auks have been ringed in the Thule District, and there have been a few recoveries outside colony areas (Table 1). These have all been recovered around eastern Newfoundland in November to January (Salomonsen 1952, 1979). Little Auks have also been ringed in Svalbard (Salomonsen 1971), and 17 of these birds have been recovered in southwest Greenland (Isaksen & Bakken 1996) as a result of the winter hunt. Based on ringing recoveries, Salomonsen (1967) concluded that the Thule population winters in the western Atlantic, mainly on the Grand Banks, and that the Svalbard population winters in the northeast Atlantic, with some reaching the southwest coast of Greenland. This pattern seems highly probable. Given that Little Auks moult, and are therefore flightless, immediately after breeding (Evans 1981), each of these populations need only drift with the respective prevailing current to reach their suspected wintering areas. Little Auks are also known to concentrate around shelf-break fronts and tidal upwellings (Brown 1988), feed on plankton associated with the edges of ice floes

Table 1. Recoveries in Newfoundland of Little Auks ringed in Greenland (Salomonsen 1952, 1979).

Tabel 1. Terugmeldingen in Newfoundland van in Groenland geringde Kleine Alken (naar Salomonsen 1952, 1979).

Ringed	Recovered
24/07/49 Savigssavik, Thule 76°00'N 65°70'W	15/1/59 Twillingate, Newfoundland 49°32'N 54°58'W
08/06/69 Igdluuarssuit Thule 77°47'N 70°52'W	23/11/71 Exploits, Newfoundland 49°32'N 54°05'W
08/06/69 Qanaq, Thule 77°27'N 69°15'W	30/12/69 Happy Adventure Newfoundland 48°38'N 53°45'W

(Wynne-Edwards 1935), drift with the prevailing wind (Murphy & Vogt 1933), and avoid warm waters (Rankin & Duffey 1948).

The Thule population may simply drift around the northern end of Baffin Bay with the West Greenland Current, then south with the Canadian Current, arctic waters flowing out of the polar basin, down the east coast of Baffin Island (fig. 1). At this point, the waters of Davis Strait and Hudson Strait merge to form the Labrador Current, which flows south along the Labrador coast and eastern Newfoundland, eventually dissipating in the warm waters of the Gulf Stream, beyond the southern edge of the Grand Banks (Tuck 1960). The Svalbard population may drift southwest across the Greenland Sea and through the Denmark Strait, with the Greenland Current carrying them down the east coast of Greenland, and around Cape Farewell to southwest Greenland (fig. 1). It is not known whether there is any exchange between these populations. Although they appear to be in close proximity to one another, there is likely to be a temporal separation, with the Svalbard birds arriving in southwest Greenland waters later, and departing earlier, than the passage of Thule birds.

FLIGHTS AND WRECKS

Reports of Little Auk flights and wrecks (invasions) on the east coast of North America go back well over a century. Fisher & Lockley (1954) provided a list of records from 1860 to 1950 (Table 2). Flights and wrecks occur irregularly, are extremely variable in scale, and are not necessarily associated with incidents on the west coast of Europe, although they may coincide in some years (Fisher & Lockley 1954, Camphuysen & Leopold 1996).

The wreck of 1932/33, the largest recorded wreck in North America, is truly legendary! A series of severe southeasterly storms drove vast

Table 2. Historical records of Little Auk flights and wrecks (from Fisher & Lockley 1954).

Tabel 2. Overzicht van historische invasies van Kleine Alken (naar Fisher & Lockley 1954).

Winter	Month	Location	Description
1860/61 ?		New England	Some inland
1871/72 Nov		Maine & Massachusetts	'Inundation' with 100s driven ashore by E. storm
1878/79 ?		Maine	Many on coast after storm
1891/92 Nov		Massachusetts	Notable flight
1901/02 Nov		Maine	Abundant
1902/03 Dec		Maine	Many
1913/14 Dec		Maine	Many
1917/18 Nov		Maine	Flights
1930/31 Nov-Dec		New Jersey & Virginia	Small invasion
1931/32 Nov-Jan		Maine & Massachusetts	Invasions
1932/33 Nov-Dec		whole eastern seaboard	Influx Canada-Florida, unusual easterly winds
1936/37 Dec-Jan		whole eastern seaboard	Flights & wrecks, less than 1932/33
1939/40 Nov-Feb		North Carolina	Small invasion
1945/46 Dec		Maine	Flight
1950/51 ?		New England	Notable flights & wrecks

numbers of Little Auks onto shore and far inland, birds 'rained down' from Nova Scotia to New York, and many more washed up along the entire length of the eastern seaboard, from Nova Scotia to Florida (Murphy & Vogt 1933). Birds continued to move southward after the worst of the weather had passed, and were recorded as far south as Cuba (Murphy & Vogt 1933). We have collated records of flights and wrecks in the northwest Atlantic since 1950 (Table 3), although this compilation is by no means complete. It is interesting to note the number of wrecks confined to the northern end of this region, and their later occurrence, in the early 1990s.

DISCUSSION

The winter distribution of Little Auks may have undergone some fluctuation in the northwest Atlantic in recent decades. Reports suggest that, at least until the early 1930s, small numbers were regularly observed along the east coast of the United States as far south as Virginia (Murphy & Vogt 1933). Bent (1946) described them as 'generally common and sometimes abundant on the Maine coast' but as 'rare or irregular' south of Massachusetts. In the winter of 1982/83, Little Auk numbers were reported to be up off the northeastern United States and Canadian Maritime Provinces, after several seasons of 'attenuation' (Heil 1983). However, Forster (1984) wrote 'a decade ago ocean storms would have produced Little Auks in surprising numbers but

Table 3. Little Auk flights and wrecks in the northwest Atlantic since 1950 (see Fig. 2).
Tabel 3. Invastes en 'wrecks' van Kleine Aken in het Noordwestelijke deel van de Atlantische Oceaan sinds 1950 (zie voor plaatsnamen figuur 2).

Winter	Month	Incident	Location	Scale	Source
1950/51	Nov	flight	Massachusetts	1000s	Snyder 1953
1952/53	Oct	wreck	Newfoundland	1000s	Tuck <i>unpubl.</i>
1957/58	Nov	flight	Massachusetts	1000s	Snyder 1960
	Jan	wreck	New Brunswick	<10	Squires 1958
1959/60	Oct-Nov	wreck	S New Brunswick	100-1000s	Squires 1959
	Nov	wreck	Massachusetts	1000s	Snyder 1960
1962/63	Dec	-	Grand Bahama	1 oiled	Brudenell-Bruce 1975
1970/71	Nov	wreck	Maine & New Brunswick	10s	Finch 1971, Christie 1970
1971/72	Nov	wreck	S New Brunswick	100s	Christie 1971
	Dec	flight	S New Brunswick	1000s	Christie 1972
1973/74	Oct	two found 161 km inland	Oley & Pikeville, Pennsylvania	<10	Scott & Cutler 1974
1974/75	Dec	flight	Newfoundland	100s	Mactavish <i>unpubl.</i>
1982/83	Dec	flights	Maryland, Newfoundland	100s	Heil 1983 Armistead 1983
1987/88	Dec	wreck	Nova Scotia	<10	Nentleship & Haynes 1988
1990/91	Nov	flight	New Brunswick	100s	Nikula 1991
			Nova Scotia		Christie 1991
	Nov-Dec	wreck	Maine, Massachusetts New Brunswick	10s	Macravish 1991
			Nova Scotia, Maine, New Hampshire New Jersey		
1991/92	Feb	wreck	New Brunswick	10s	McLaren 1992
			Prince Edward Island		
1992/93	Nov	1 beached	Plantation Key, Florida	<10	Warner & West 1993
	Feb	wreck	New Brunswick		Majka 1992
			Prince Edward Island	100-1000s	

recently they have proved very scarce', with regard to the same region.

So far, the 1990s have shown some interesting records. Duncan (1990) reported few alcids in the New England region in 1990, 'thereby polishing off a decade of autumnal weakness for this group'. However, in January and February 1990, numbers of alcids generally were reported to be up off the east coast of the mid to southern United States. Alcids were recorded as far south as New Jersey (Boyle *et al.* 1991), Maryland (R. Blom *pers. comm.*), and North Carolina (Armistead 1991), where this was described as 'the best alcid invasion in the regions history'. Blom *et al.* (1993) reported 1993 as the third consecutive year of large alcid flights, and large numbers of Little Auks, Puffins *Fratercula arctica* and Razorbills *Alca torda* were observed on pelagic trips off Virginia (LeGrand 1993). In 1995, a feeding flock of 733 Little Auks was recorded off Cape May, New Jersey in



Figure 2. The Provinces, States and Countries of eastern North America, from Canada to Cuba.

Figuur 2. Plaatsnamen, landen en staten aan de oostkust van het Noordamerikaanse continen (Canada-Cuba).

LB = Labrador, NF = Newfoundland, PEI = Prince Edward Isl., NS = Nova Scotia, NB = New Brunswick, ME = Maine, MA = Massachusetts, NY = New York, PA = Pennsylvania, NJ = New Jersey, VA = Virginia, NC = North Carolina, SC = South Carolina, FL = Florida.

mid-February, an area where none had been recorded at this time of year, despite regular visits since the mid-1980s (P.A. Guris *pers. comm.*). The cause of these southerly occurrences, however, is still unclear. There have

been suggestions that irruptions of this type, both flights and wrecks, are related to changes in the distribution or abundance of food (Murphy & Vogt 1933, Salomonsen 1972, Gaston 1988), although specific weather conditions obviously play a major role in precipitating wrecks.

Little Auks are known to seek out dense concentrations of prey, and select the largest available prey species (Bradstreet & Brown 1985). Other planktivorous species have also been shown to seek out dense concentrations of prey, otherwise the energy costs of collection outweighs the gain in consumption (Brodie *et al.* 1978). If Little Auks fail to find high concentrations of zooplankton, however, they may be forced to move outwith their normal wintering range, and therefore exacerbate an already weakened state. Under such circumstances, they are perhaps more vulnerable to being driven inland and wrecked by severe weather conditions. A careful investigation of the weather conditions preceding each wreck event may reveal specific patterns and provide further clues to the underlying cause of wrecks. Murphy & Vogt (1933) reported that the stomachs of a few dissected individuals were empty, or contained remains of small crustaceans, fish, and bits of seaweed, and that no visible fat remained under the skin of salvaged birds. However, very few data exist regarding the stomach contents or subcutaneous fat scores of wrecked birds, and further effort in this area may help to provide some clues as to the likelihood of whether unavailability of prey is a driving force behind these incidents.

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SAMENVATTING

De winterspreiding van Kleine Alken in het westelijke deel van de Noordatlantische Oceaan is beschreven, met aandacht voor terugmeldingen van op de broedplaatsen geringde vogels. Op grond van een aantal terugmeldingen van vogels uit NW Groenland (Thule district) op de kust van Newfoundland (tabel 1), wordt geconcludeerd dat de enorme aantallen overwinteraars op de Grands Banks vooral van die broedplaatsen afkomstig zullen zijn. Bekend is, dat vogels afkomstig van Spitsbergen veelvuldig in ZW Groenland werden teruggemeld, terwijl hier geen vogels van Thule werden aangetroffen. Een overzicht wordt gepresenteerd van invasies en 'wrecks' van Kleine Alken in Amerika en Canada, waarbij duidelijk wordt dat de invasie van 1932/33 de meest indrukwekkende is geweest. In totaal werden 27 'invasiejaren' onderkend (tabellen 2 en 3). Ondertussen blijft de achterliggende oorzaak van deze invasies onduidelijk, maar gesuggereerd wordt dat verder onderzoek in deze en vergelijkbare gebieden, onderzoek naar de heersende weersomstandigheden en de conditie van de betrokken vogels kunnen helpen om de drijvende kracht achter deze fenomenen te leren kennen.

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MIGRATION ROUTES AND WINTERING AREAS OF LITTLE AUKS *ALLE ALLE* RINGED IN SVALBARD

TRÉKROUTES EN OVERWINTERINGSGBIEDEN VAN KLEINE ALKEN GERINGD OP SPITSBERGEN

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ABSTRACT

Ringed of Little Auks in Svalbard took place during 1962-96, mainly in Hornsund, Bellsund and in NW Spitsbergen. Ringing effort varied considerably, and most birds were ringed 1962-65 (11 012), 1976-78 (800), 1983-88 (1950), and 1990-94 (1300). A total of 19 Little Auks have been recovered outside Svalbard, 17 of which were found or shot in Greenland and two in Ireland (Table 1). It is concluded that at least part of the Svalbard population is wintering off SW Greenland. However, most recoveries were from areas in which extensive hunting has increased the chances for recovery, whereas in much of its (presumed) wintering range the chance of recovery is only remote. Despite the fact that some work has been done on Little Auks in Russian colonies, none of these projects included ringing activities. Further studies are needed to more fully clarify migration patterns of Little Auks and particularly the origin of birds wintering off Norway and in the North Sea remains rather obscure.

The Little Auk *Alle alle* is the smallest in size of the auks in the Atlantic, and it is also the most numerous (Nettleship & Evans 1985). It breeds in rock crevices and screes in the arctic areas from eastern Baffin Island, Canada in the west to Severnaya Zemlja, Russia in the east. There are only rough estimates of population size available; a reasonable very rough mean estimate of the world population is about 15 million pairs (Nettleship & Evans 1985, Isaksen & Gavrilov 1996). The Thule region in northwest Greenland seems to be the most important breeding area with estimates of the population size ranging 7-15 million pairs for this area alone (Nettleship & Evans 1985). Also the Scoresby Sound area in central east Greenland is an important area with at least a few million breeding pairs (Kampp *et al.* 1987). Svalbard and Franz Josef Land are the main breeding areas in the Barents Sea, with probably about one million and 250 000 pairs respectively (Isaksen & Gavrilov 1996). Despite the high number of individuals, there has been relatively little research on Little Auks. The knowledge on migration and wintering areas is,