

Stranded beaked whales in France: 1970-2010

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KEYWORDS: beaked whales, stranding NE Atlantic, NW Mediterranean, unusual mortality event

ABSTRACT

This paper is a compilation of 130 beaked whale stranding events recorded by the French stranding scheme over the period 1970-2010. Totals of 101 *Ziphius cavirostris*, 9 *Hyperoodon ampullatus*, 15 *Mesoplodon bidens*, 4 *M. densirostris* and 1 *M. europaeus* were found. The southern part of the Bay of Biscay is the main stranding area for Ziphiids in France, both in terms of numbers and diversity, possibly as a result of the relative proximity of the shelf break to the coast. No long term trend was shown, but a seasonal pattern of occurrence was found for *Ziphius* in the bay of Biscay, with a higher frequency in winter, as well as two period of unusual stranding frequency in the years 1979-1982, and 2007-2008. A closer examination of the stranding time series suggests that several events that were initially thought to be unrelated could be reconsidered as being unusually close to one another both in time and space and would deserve more attention in the context unusual mortality event (UME) associated to sound exposition.

INTRODUCTION

Despite recent research efforts, beaked whale are still suffering lack of basic data for their appropriate conservation. Many factors, such as their low densities, long and deep dives, inconspicuous surface behavior, preferential habitats in slope and oceanic waters, make conducting dedicated studies on these animals one of the most difficult challenge in cetacean research. Basic information on numbers, distribution, biology and interaction with human activities are still fragmentary. In this context, even if the scientific exploitation of stranded cetaceans is better fitted to monitoring coastal species than oceanic ones, the analysis of long stranding data time series reveal species composition and spatio-temporal patterns that can be compared to the limited data available to date. Here we compile stranding data of beaked whale along the coast of France (excluding over-seas territories) during the period 1970-2010 in the aim to determine spatio-temporal patterns and, in particular, investigate if unusual mortality events could be suspected.

MATERIAL AND METHODS

The French stranding scheme was established by Dr. Raymond Duguy in the late 1960s early 1970s (e.g. Duguy 1990). One considers that by 1980 its current organization was in place. The general objectives of the network changed with time. Initially designed as a tool to determine general faunistic composition for marine mammals in French waters (in the 1970s), the network then provided scientific material for natural history museums (mostly osteological collections) and studies in comparative anatomy, biology and ecology of marine mammals (1980s to early 1990s) and finally became a tool for monitoring the condition of marine mammal populations from 2000 onward. As a result, protocols for examining carcasses of stranded marine mammals changed over time. In this compilation, we used only baseline information constituted of species, date and location of the stranding events that have been collected since the beginning.

RESULTS

General

From 1970-2010, a total of 130 beaked whales belonging to 5 different species have been reported stranded along the North Sea and English Channel, the Atlantic (Bay of Biscay) and the Mediterranean coasts of France, over-seas territories being excluded, (Table 1); this represents c. 1% of all cetacean stranding events reported over the period. The Cuvier's beaked whale *Ziphius cavirostris* accounts for about three quarters of these records (101 individuals), whereas northern bottlenose whale *Hyperoodon ampullatus* (9 individuals), Sowerby's beaked whale *Mesoplodon bidens* (15 ind.), Blainville's beaked whale *M. densirostris* (4 ind.) and Gervais' beaked whale *M. europaeus* (1 ind.) constituted the rest of the records. Usual numbers of beaked whale stranding events are 0-2 along the Channel and Mediterranean coasts and 0-4 in the Bay of Biscay (Figure 1).

Table 1: Records of stranded beaked whales in France by broad maritime regions, 1970-2010.

Species	North Channel	Sea	Bay of Biscay	Mediterranean	TOTAL
Northern bottlenose whale	5		4		9
Cuvier's beaked whale	1		77	23	101
Sowerby's beaked whale	8		7		15
Blainville's beaked whale			4		4
Gervais' beaked whale			1		1
TOTAL	14		93	23	130

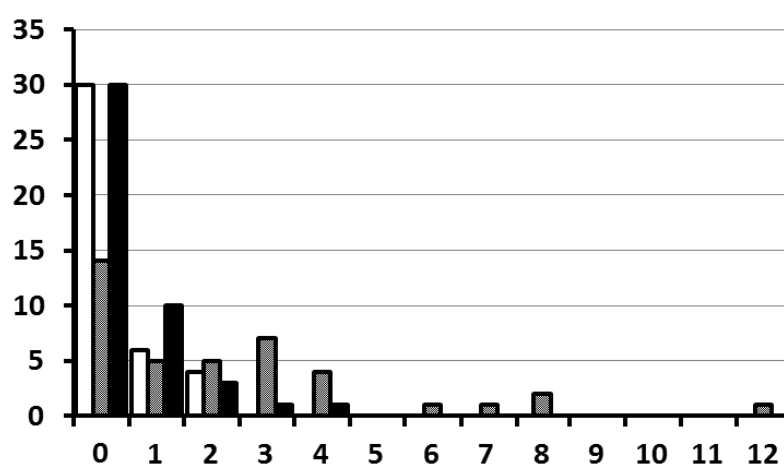


Figure 1: Frequency distributions of reported stranded beaked whales by broad maritime regions (white bars for North Sea-English Channel; grey bars for Bay of Biscay; black bars for Mediterranean).

With one exception, the Cuvier's beaked whale was only found along the Atlantic and Mediterranean coasts while the northern bottlenose and the Sowerby's beaked whales were found in equal share along the Channel and Atlantic coasts (Figure 2a,b). Overall, the southern part of the Atlantic coast corresponds to the highest occurrence of beaked whale stranding events.

Long term and seasonal patterns

There is no obvious long term trend in the number of stranded beaked whales reported by the French stranding network over the period 1970-2010, irrespective of the species or maritime regions (Figure 3). Nonetheless, the number of stranded beaked whales, mostly Cuvier's, peaked at 6 to 12 individuals per year, well above usual figures of 0-4, in the Bay of Biscay during two distinct periods, 1979-1982 and 2007-2008.

In terms of seasons, only the Cuvier's beaked whale show a clear pattern in the Bay of Biscay, with maximum figures from December to March, and minima from July to October. Low numbers of stranding events for the other species/maritime regions did not allow any seasonal pattern to be revealed (Figure 4).

Unusual events

Single stranding events are the norm within the whole data set, as a majority of these stranding events involved only one individual at a time (Appendix 1). However, in several instances stranded beaked whale occurred by pairs or even larger numbers over a restricted period and coastal range. As many as 8 pairs of individuals were found at intervals of less than 15 days and 80 kilometers apart (Figure 5; appendix 2); similarly 4 trios of beaked whales were found within intervals of less than a month and at distance shorter than 80 km apart; finally, 2 events, which involved 4 and 8 individuals, occurred within periods of no longer than 6 and 40 days and were spread over 7 and 100 kilometers of coastline respectively. These putatively unusual stranding events occurred throughout the study period, as early as 1971 (Appendix 2).



Figure 2: Stranding locations of beaked whales in France, over the period 1970-2010. Black circles and white stars are Cuvier's beaked whales and northern bottlenose whales respectively (Figure 2a); black, grey and white diamonds are Sowerby's, Gervais' and Blainville's beaked whales respectively (Figure 2b).

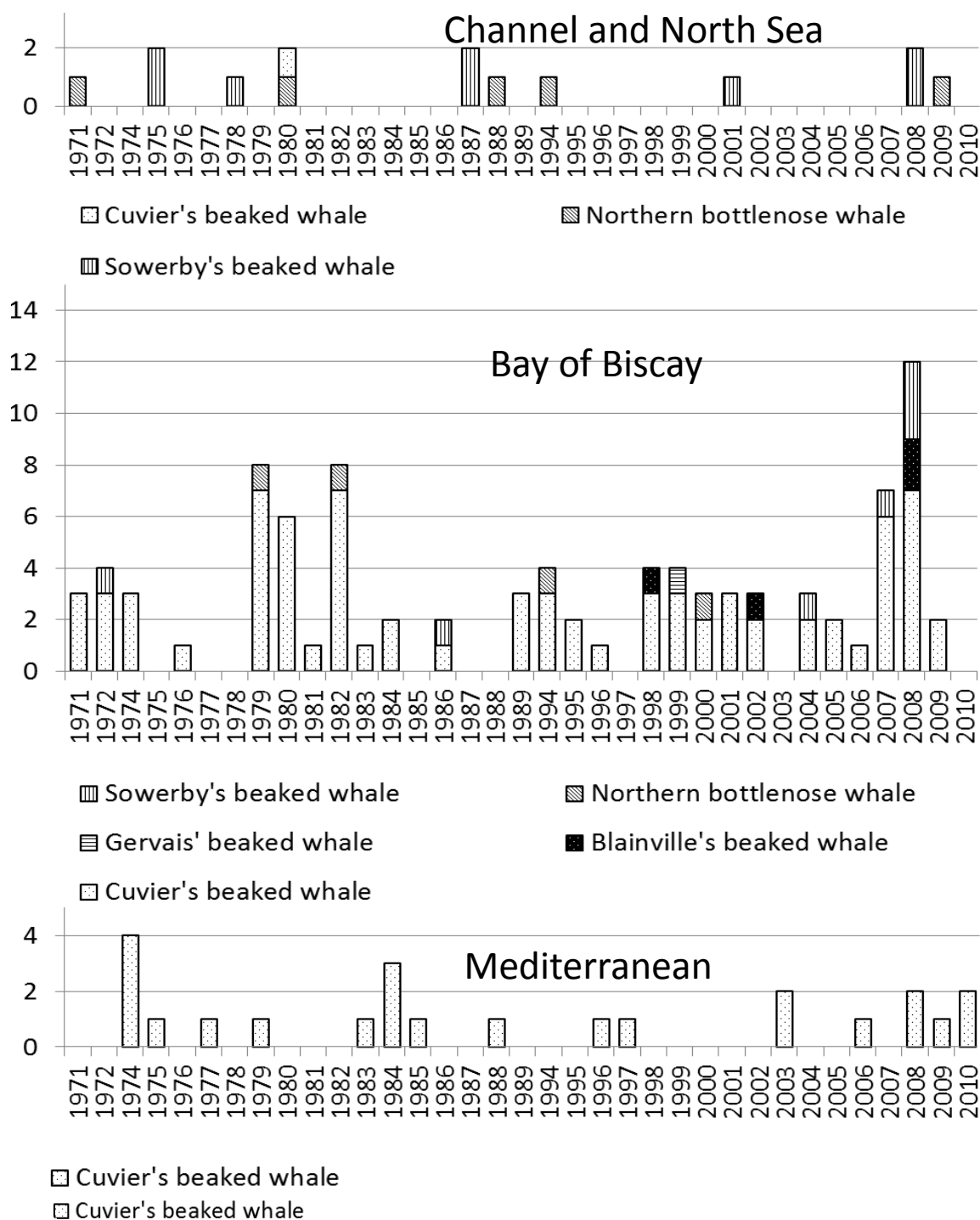


Figure 3: year-to-year variations in the numbers of stranded beaked whales by broad maritime regions (French Stranding Network, 1070-2010). Only years with at least 1 stranding event recorded in any one of the maritime regions are shown; no stranding event of beaked whales was recorded in 1973 as well as over the period 1990-1993.

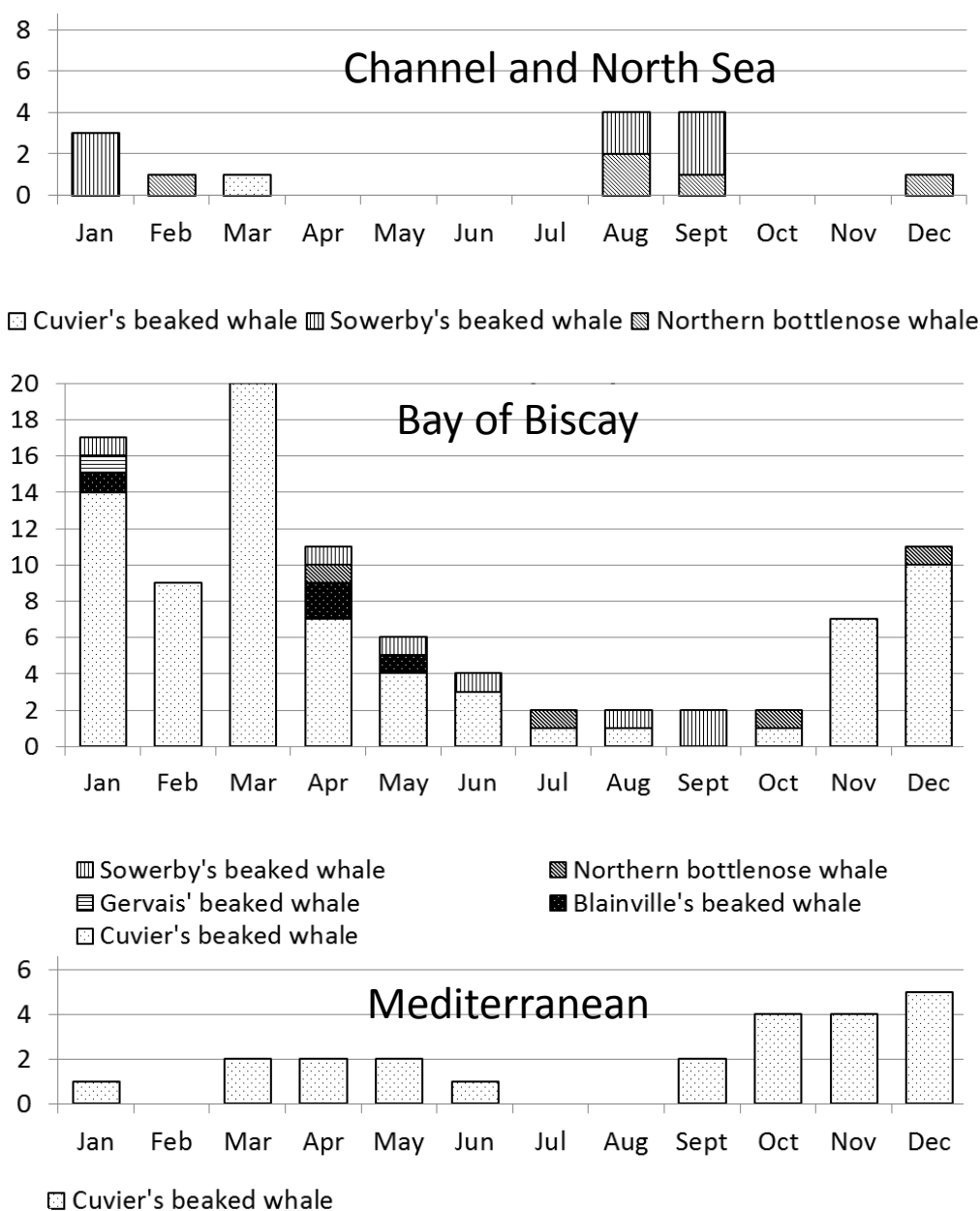
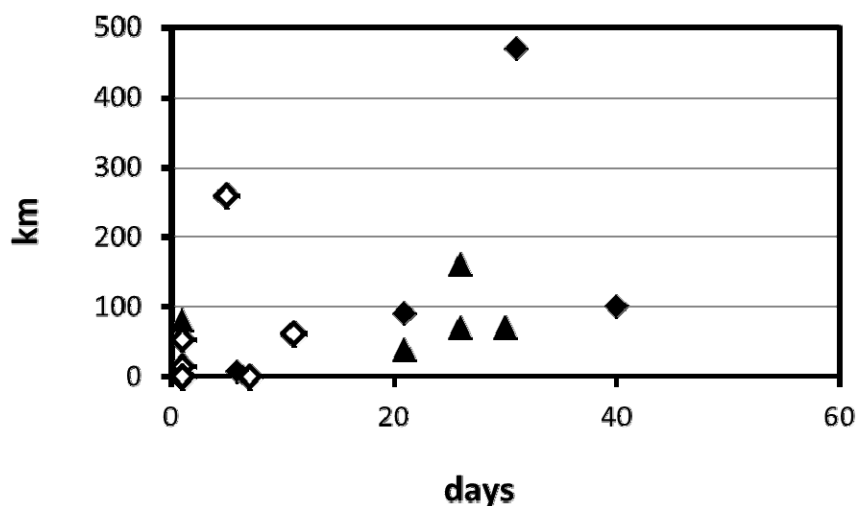


Figure 4: seasonal variations in the numbers of stranded beaked whales by broad maritime regions (French Stranding Network, 1070-2010).



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APPENDIX 1

Number of beaked whale stranding event per year and month, all species combined

[illegible]

Mediterranean sea																											Total
	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1996	1997	2003	2006	2008	2009	2010		
Jan																				1						1	
Feb																										2	
Mar																										2	
Apr																					2					2	
May																		1						1		2	
Jun																						1				1	
Jul																											
Aug																1											
Sept									1																	2	
Oct							1							1										2		4	
Nov					1								1	2												4	
Dec			4																	1						5	

English channel												Total
	1971	1975	1978	1980	1987	1988	1994	2001	2008	2009		
Jan			1						2		3	
Feb							1				1	
Mar				1							1	
Apr												
May												
Jun												
Jul												
Aug	1				2					1	4	
Sept		2		1				1			4	
Oct												
Nov												
Dec						1					1	

APPENDIX 2

Details of the 63 beaked whale stranding events occurring in ‘small series’

Events	Years	Date	Areas	Location	Species	Numbers of individuals	Temporal span (in days)	Spatial span (in km)
A	1971	24-jan-71	A	LA ROCHELLE	Cuvier's	3	1	80
	1971	24-jan-71	A	LE BOIS-PLAGE-EN-RE	Cuvier's			
	1971	24-jan-71	A	BRETIGNOLLES-SUR-MER	Cuvier's			
B	1972	15-mar-72	A	MOELAN-SUR-MER	Cuvier's	2	1	53
	1972	15-mar-72	A	PENMARCH	Cuvier's			
C	1972	21-apr-72	A	BIARRITZ	Sowerby's	2	5	260
	1972	26-apr-72	A	SAINT-TROJAN-LES-BAINS	Cuvier's			
D	1979	11-mar-79	A	LEGE-CAP-FERRET	Cuvier's	7	21	322
	1979	11-mar-79	A	SAINT-PIERRE-D'OLERON	Cuvier's			
	1979	15-mar-79	A	MIMIZAN	Cuvier's			
	1979	27-mar-79	A	PENMARCH	Cuvier's			
	1979	30-mar-79	A	ARCACHON	Cuvier's			
	1979	30-mar-79	A	LA TESTE	Cuvier's			
	1979	02-apr-79	A	LEGE-CAP-FERRET	Cuvier's			
E	1980	10-mar-80	A	BANC-D'ARGUIN	Cuvier's	3	26	160
	1980	28-mar-80	A	SEIGNOSSE	Cuvier's			
	1980	06-apr-80	A	HOURTIN	Cuvier's			
F	1982	30-nov-82	A	SAINT-CLEMENT-DES-BALEINES	Cuvier's	8	40	100
	1982	11-dec-82	A	VENDAYS-MONTALIVET	Cuvier's			
	1982	13-dec-82	A	SAINT-TROJAN-LES-BAINS	Cuvier's			
	1982	14-dec-82	A	SAINTE-MARIE-DE-RE	Cuvier's			
	1982	18-dec-82	A	SAINT-JULIEN-EN-BORN	Cuvier's			
	1982	19-dec-82	A	SAINT-PALAIS-SUR-MER	Cuvier's			
	1982	30-dec-82	A	VENDAYS-MONTALIVET	Cuvier's			
	1983	10-jan-83	A	LA TREMBLADE	Cuvier's			
G	1999	19-jan-99	A	BISCARROSSE	Gervais'	3	30	70
	1999	30-jan-99	A	BISCARROSSE	Cuvier's			
	1999	18-feb-99	A	SOUSTONS	Cuvier's			
H	2007	28-feb-07	A	QUIBERON	Cuvier's	4	31	470
	2007	01-mar-07	A	LA COUARDE-SUR-MER	Cuvier's			
	2007	26-mar-07	A	GUETHARY	Cuvier's			
	2007	31-mar-07	A	BIDART	Cuvier's			
I	2007	24-dec-07	A	LES SABLES-D'OLONNE	Cuvier's	3	26	70
	2008	16-jan-08	A	SAINT-DENIS-D'OLERON	Cuvier's			
	2008	21-jan-08	A	SAINT-PIERRE-D'OLERON	Cuvier's			
H	2008	07-mar-08	A	MIMIZAN	Cuvier's	7	96	240
	2008	14-mar-08	A	SEIGNOSSE	Cuvier's			
	2008	12-apr-08	A	SOUSTONS	Blainville's			
	2008	14-apr-08	A	SOUSTONS	Blainville's			

	2008	20-apr-08	A	BOURCEFRANC-LE-CHAPUS	Cuvier's			
	2008	04-may-08	A	VIELLE-SAINT-GIRONS	Cuvier's			
	2008	13-jun-08	A	MIMIZAN	Sowerby's			
I	2008	19-sept-08	A	LA FLOTTE	Sowerby's	2	1	14
	2008	20-sept-08	A	LES PORTES-EN-RE	Sowerby's			
J	1974	16-dec-74	M	ILE-ROUSSE	Cuvier's	4	6	7
	1974	18-dec-74	M	CENTURI	Cuvier's			
	1974	22-dec-74	M	ALGAJOLA	Cuvier's			
	1974	22-dec-74	M	ALGAJOLA	Cuvier's			
K	1984	02-oct-84	M	BORMES-LES-MIMOSAS	Cuvier's	3	21	39
	1984	06-nov-84	M	HYERES	Cuvier's			
	1984	23-nov-84	M	LA SEYNE-SUR-MER	Cuvier's			
L	2003	17-apr-03	M	CARGESE	Cuvier's	2	7	0
	2003	24-apr-03	M	CARGESE	Cuvier's			
M	2008	13-oct-08	M	HYERES	Cuvier's	2	11	61
	2008	14-oct-08	M	SAINT-RAPHAEL	Cuvier's			
N	2010	25-mar-10	M	ANTIBES	Cuvier's	2	1	0
	2010	25-mar-10	M	ANTIBES	Cuvier's			
O	1975	04-sept-75	N	COLLEVILLE-SUR-MER	Sowerby's	2	1	0
	1975	04-sept-75	N	COLLEVILLE-SUR-MER	Sowerby's			
P	1987	28-aug-87	N	SAINT-VAAST-LA-HOUGUE	Sowerby's	2	1	0
	1987	29-aug-87	N	SAINT-VAAST-LA-HOUGUE	Sowerby's			
Q	2008	19-jan-08	N	SANGATTE	Sowerby's	2	1	0
	2008	19-jan-08	N	SANGATTE	Sowerby's			