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FIRST RECORDED MASS STRANDING OF SHORT-FINNED PILOT WHALES (*GLOBICEPHALA MACRORHYNCHUS* GRAY, 1846) IN THE NORTHEASTERN ATLANTIC

Pilot whales are distributed throughout the world's temperate and tropical oceans, near shore and in the mid-ocean (Bernard and Reilly 1999). The short-finned pilot whale is distributed in the tropical and warm temperate waters of the Atlantic, Pacific, and Indian Oceans. It rarely moves towards latitudes higher than 35° in the eastern Atlantic (Leatherwood and Reeves 1983). To date, there has been no evidence of the presence of short-finned pilot whales off the northwestern coast of the Iberian Peninsula (Galicia), as indicated by the complete absence of sightings or strandings in this area among the 1,200 strandings of marine mammals recorded for the period 1990–1999 (González, unpublished data). There are just two records from the northern coast of Spain, where strandings were reported in Asturias and the Bay of Biscay (Nores and Pérez 1988).

Mass strandings of cetaceans are not frequent on the Galician coast; only three were reported during the last fifteen years: 25 *Stenella coeruleoalba* (Patiño and Seage 1989), 20 *Delphinus delphis* (Vázquez *et al.* 1995), and 5 *Grampus griseus* (González, unpublished data). The long-finned pilot whale, *Globicephala melas,* is a common cetacean in Galician waters; thirty-three strandings have been reported since 1990 (González, unpublished data). However, only one mass stranding, of 20 in the early 1970s, has been reported (Nores and Pérez 1982).

We describe here the first recorded mass stranding of short-finned pilot whales in the northeastern Atlantic. Observation and rescue of the surviving animals are described, and hypotheses of the possible causes of the mass stranding are discussed.

A group of about 100 pilot whales was observed on 6 September 1998 dispersed in an area of about 5 km^2 in the proximity of the Estaca de Bares Cape (Fig. 1). Three days after this sighting, a mass stranding of twelve short-finned pilot whales occurred in the Ría of O Barqueiro (Fig. 1). Searching for the stranded animals and rescue of the live whales were undertaken from 9 September to 21 September. Twenty-four measurements were made on eleven animals (six females and five males; Table 1), according to Norris (1961), to the nearest cm. Ten animals were sexed and the dead whales were dissected. Video recording and photographs were made of the whole operation while the live cetaceans stayed in the proximity of the Ría.

On 9 September 1998, three females and one male (specimens A, B, C, and H), were found dead on a beach located in the inner part of the Ría of O Barqueiro. Another eight whales swam nearby, presumably trying to enter the innermost part of the Ría. These animals were herded together and taken to the mouth of the Ría with the aid of several inflatable boats, other boats, and

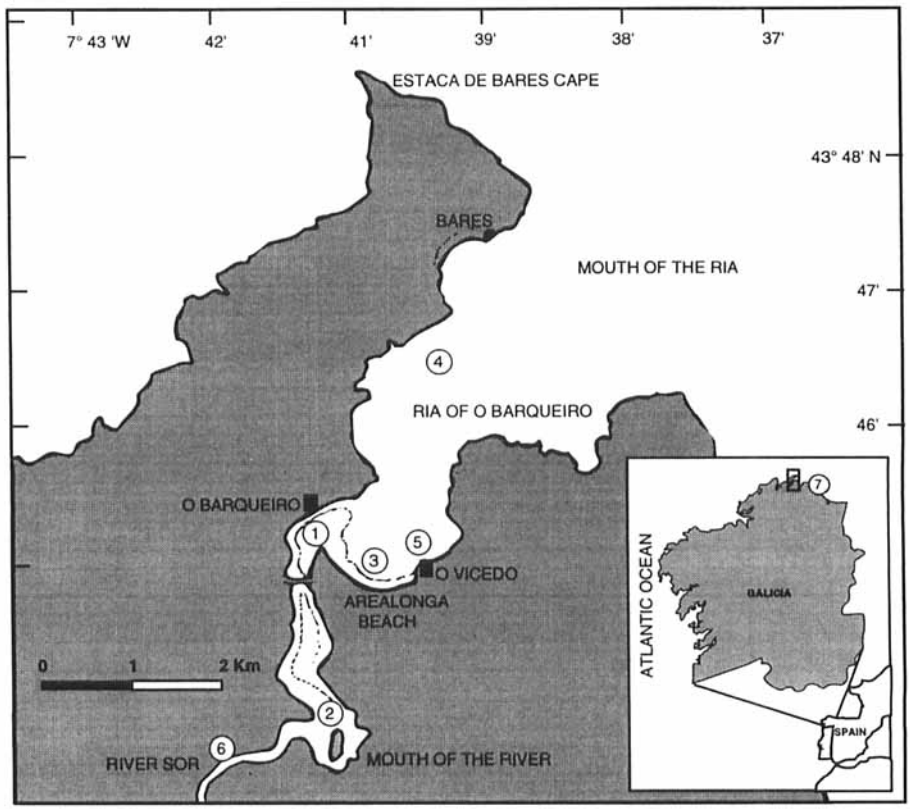

Figure 1. Location of mass stranding in northwestern Iberian Peninsula. (1) Dead animals (A, B, C, and H) on 9 September; (2) Location reached by surviving animals; (3) Stranding of animal D; (4) Area where animals I, J, and K located on 10 September; (5) Animals E, F, and G found dead; (6) Animals M and N found dead; (7) Animal O found dead (Burela).

scuba divers. However, before the animals reached open waters, they decided to return and swam back until they arrived at the beach where the dead animals were stranded. At this point the whales separated into smaller groups, and most of them swam towards the inner part of the Ría. Most of the animals stranded repeatedly while the tide was falling. At the end of the day, at high tide, the whole group of surviving animals was taken to the mouth of the Ría, and they apparently reached offshore waters. Specimen H was measured, but it could not be dissected because it was removed by the tide. The behavior of animal D was completely different from that of the remaining surviving animals. It had difficulty maintaining a normal position (sometimes it turned upside-down), and it seemed to be disoriented. During the following three weeks, from 10 September to 24 September, four other males (specimens D, E, F, and G) and two females (specimens M and N; not totally dissected due to the advanced stage of decomposition) died in the proximity of the area.

Table 1. Measurements (in cm) made according to Norris (1961); measurement numbers from his table. Other abbreviations: M = male; F = female, MS = maturity stage; Mt = mature; I = immature; F = fetus; * = pregnant.

Specimen	A	B	B′	C	D	E	F	G	H	M	N	O
SEX	F	F*	M	M	M	M	M	M	F	F	F	F
MS	Mt	Mt	F	Mt	Mt	I	I	Mt	Mt	Mt	Mt	Mt
1 TL	370	380	135	415	427	270	276	345	391	384	357	450
2 UJCE	37	40	20	—	35	—	—	40	36	35	35	38
4 UJAG	—	—	19	34	—	33	25	30	30	—	—	—
5 UJEAM	—	—	26	61	45	—	—	—	—	—	—	—
6 CEAM	—	—	6	7	13	—	—	—	—	—	—	—
9 UJB	34	34	23	50	30	—	35	41	38	40	33	—
10 UJIF	60	61	30	68	63	—	50	60	64	63	63	—
11 UJDF	170	167	79	194	204	133	144	171	173	196	165	213
12 UJMU	—	—	70	180	165	—	—	—	—	—	—	—
13 UJMGA	205	220	88	245	236	160	160	203	233	260	235	265
14 UJCA	225	250	96	277	261	190	188	230	239	273	255	280
24 EH	1.2	1.2	1	1.8	—	—	—	1	2	—	—	—
24 EL	3	2.8	2	3	—	—	—	5	3	—	—	—
26 LGS	—	—	—	—	32	—	—	—	—	—	—	—
26 LAO	—	—	—	—	9	—	—	—	—	—	—	—
27 BW	8	9	4	6	—	—	—	9	7	—	—	—
27 BL	5	4	2	4	—	—	—	2	3	—	—	—
29 LFAIT	70	70	28	65	79	45	44	59	60	72	63	80
30 LFAT	53	55	20	46	62	32	33	41	44	50	40	75
31 WF	22	20	9	21	23	13	16	20	17	18	16	20
32 HDF	30	33	11	29	36	20	22	23	18	25	20	—
33 LDFB	—	80	25	88	88	43	44	57	77	67	—	—
34 WFL	100	98	33	100	122	64	70	90	90	92	—	95
35 DABFN	26	27	14	28	32	—	—	28	29	23	18	30

Another specimen was found dead in Burela (Fig. 1) on 2 November. The remaining four whales were rescued and finally returned to offshore waters.

Observations made during the necropsies are summarized in Table 2. Only one animal completely lacked teeth (specimen H). Most of them had froth in their lungs. All the stomachs were empty, clearly indicating that the group had not fed recently. All had ulcers in the pyloric portion of the stomach. Nematodes (*Anisakis* sp.) in the stomach, *Phyllobotrium delphini* in the blubber of the genital area, and *Stenurus* sp. in the pterygoid sinus were observed in all dissected animals. Only one (specimen H) carried the commensal barnacle *Xenobalanus* sp.

Mitchell (1975) reviewed the status and distribution of the long-finned pilot whale in the North Atlantic. This species is common from Northwest Africa, including the Mediterranean, to Cape Hatteras and north of Greenland, Iceland, and the Barents Sea. Its congener, the short-finned pilot whale, has a more southerly distribution and is rarely seen north of Cape Hatteras in the west or north of Madeira in the east. In the northeastern Atlantic the distributions of the two species appear to overlap off the southern Iberian Peninsula and in the Azores (Clarke 1981, Nores and Pérez 1988). The occurrence of *Globicephala macrorhynchus* in Galician waters could be explained in different ways: it could be related to the movement northwards of water masses that the group moves with, to the search for food in suitable areas, or to illness or disorientation of lead animals in the group.

Rough seas that occurred during the days previous to the mass stranding might have contributed to the cause of the event. The shallow waters of the Ría, the slope of the littoral shelf, and the influence of the tide may have complicated the possibility of escaping for the surviving members of the group. The Ría of O Barqueiro is greatly influenced by the tide and in some inner parts reaches depths of only 0.5 m or less at low tide.

The group was composed of mature males and mature females, as well as juveniles. The maximum size of the animals was similar to that for the southern form of *G. macrorhynchus* inhabiting the waters off Japan (Kasuya and Marsh 1984). The length of the fetus found in the pregnant female was also similar to the mean length at birth noted by these authors. The expected month of birth, due to the advanced development of the fetus, would probably be September/October, which coincides with that observed in long-finned pilot whales off the Faeroe Islands (Martin and Desportes 1987). As noted by Bernard and Reilly (1999), the offspring reach sexual maturity in their mother's herd and probably remain there for life. This might explain the insistence of the surviving animals on remaining close to their dead herd mates and trying to strand repeatedly near the beach where the adults died the first day of the mass stranding.

There was parasitism by nematodes (*Stenurus* sp.) in the pterygoid sinus. The infestation varied among different animals with a maximum number of worms ranging from 50 to 500. These nematodes were sometimes found also in the ear openings. The high infestation of nematodes in the pterygoid sinus might produce disorientation and weaken ability to maintain equilibrium.

Table 2. Observations made during necropsies. A = absence; BGA = blubber of genital area; C = complete; E = empty; L = lacking any teeth; P = presence; PCP = pyloric and cardiac portion; PP = pyloric portion; PS = pterygoid sinus; St = stomach.

Specimen	A	B	C	D	E	F	H	M	N	O
Dentition	C	C	C	C	C	C	L	C	C	C
Froth in lungs	P	P	P	P	P	P	A	—	—	—
Stomach content	E	E	E	E	E	E	E	E	—	—
Ulcers	PP	PP	PP	PP	PP	PCP	PP	—	—	—
Anisakis sp.	St	St	St	St	St	St	St	—	—	—
Monorhygma grimadii	A	A	A	A	A	P	A	—	—	—
Phyllobotrium delphini	BGA	BGA	BGA	BGA	BGA	BGA	BGA	—	—	—
Stenurus sp.	PS	PS	PS	PS	PS	PS	PS	PS	PS	—
Xenobalanus sp.	A	A	A	A	A	A	P	—	—	—

"Stenurosis" is a widespread disease among some species of dolphins and causes great damage (Delaymure 1955, Geraci *et al.* 1976). Animals with heavy ear infestations apparently respond poorly to noise. From the point of view of strandings, *Stenurus* might be considered as a possible contributor to echo-confusion (Delaymure 1955).

We found no evidence of interaction with humans (marks from fishing gear, *etc.*).

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ANGEL F. GONZÁLEZ and ALFREDO LÓPEZ, Instituto de Investigaciones Marinas, Eduardo Cabello 6, E-36208 Vigo, Spain; e-mail: afg@iim.csic.es; XULIO VALEIRAS, CEMMA, Apdo 771, A Coruña, E-15080 Spain. Received 1 April 1999. Accepted 9 December 1999.

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"KERPLUNKING": SURFACE FLUKE-SPLASHES DURING SHALLOW-WATER BOTTOM FORAGING BY BOTTLENOSE DOLPHINS

In Shark Bay, Western Australia, bottlenose dolphins (*T. aduncus,* following LeDuc *et al.* 1999) commonly forage on or near the bottom in shallow water (<4 m). While foraging in the shallows, individuals often engage in "bottom grubbing," in which they orient toward, and poke their rostra into, the sea grass. Dolphins foraging in this manner are sometimes observed to chase, surface with, or throw a fish. While foraging over offshore flats (1.5–2.5 m), bottom-grubbing individuals sometimes perform peculiar fluke-slaps that produce a 1–3.5 m high splash of water and an audible "kerplunk" sound in air. Observations made during 1994–1995 suggest that such "kerplunks" may aid in the location or capture of fish by eliciting a startle response in hiding fish, revealing their location to the dolphin above.

The kerplunks and associated behavior were videotaped from a 4.5-m fiberglass runabout. Simultaneous behavioral commentary and underwater sound recordings were made onto the two audio channels of the videotape. In 1995 an underwater camera was employed to document the underwater component of kerplunking.

Dolphins kerplunking during bottom foraging were located on three days and filmed for eight hours during 1994–1995. We recorded over 300 ker-