

The little-known Fraser's dolphin *Lagenodelphis hosei* in the North Atlantic: new records and a review of distribution

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Abstract The distribution of the poorly known Fraser's dolphin *Lagenodelphis hosei* Fraser (Sarawak Mus J 7:478–503, 1956), is revised for the northern Atlantic (NA), with new records for temperate and subtropical oceanic islands. Fraser's dolphins are reported for the first time in the Azores, from a pod of approximately 50 individuals observed in August 2008, and for the Madeira Archipelago, where a pod of circa 80

individuals is described from opportunistic observations in August 2010. Observations in the Azores occurred during a period of regional increase in seawater temperature (23.5 °C; >1 °C for circa 15 days), revealing the species potential as a bio-indicator of climate change. The occurrence of Fraser's dolphins in the NA is characterized by an equally small number of stranding events and sightings at sea which have been accumulating since 1972. A compilation of 47 occurrences from publications, reports and online databases (plus one report with 123 sightings in the Lesser Antilles), was used to comment on the species ecology in the region. Stranding events are often of a single specimen, occurring on both western and eastern margins. Sightings at sea are scattered throughout the NA, with most observations from the Gulf of Mexico, and the Caribbean Sea, where year-round sightings have been reported in the Lesser Antilles (off Guadeloupe). Observations are mostly confined to open waters over 200–2,200 m depth areas, approaching the coasts of oceanic islands. Pod sizes vary between 50 and 80 in the Caribbean Sea, with smaller pods observed in the Gulf of Mexico (15–30), only rarely exceeding 100 individuals per group (20 %, $n=5$), in contrast to large aggregations reported in the Pacific. Captures have been reported from St. Vincent (Lesser Antilles) and more recently from Ghana. Mixed-species groups have been observed, such as with *Peponocephala electra* and *Globicephala macrorhynchus*. Knowledge of Fraser's dolphin ecology in the NA is expected to grow with increasing surveys in the Caribbean area and tropical latitudes. Reports on the species occurrence, such as data from opportunistic platforms, should continue to reach the scientific community, including with associated environmental data.

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Introduction

Fraser's dolphin *Lagenodelphis hosei* Fraser 1956 is distributed worldwide in tropical and sub-tropical waters (Jefferson and Leatherwood 1994; Dolar 2009). It is a poorly known deep-water delphinid described by Fraser (1956) from a specimen stranded in Borneo (in 1885), and rediscovered in the 1970s from stranded and captured specimens (Perrin et al. 1973; Dolar et al. 2003). Its normal range extends between 30°N and 30°S (Perrin et al. 1994), occasionally occurring in temperate regions (Leatherwood et al. 1993; Barlow 2006).

Sightings of Fraser's dolphins are not frequent, and most records are from the tropical Pacific (Dolar 2009). It is often observed in deep off-shore waters (e.g. Wade and Gerrodette 1993), also occurring near the coast of oceanic islands surrounded by steep topographies (Dolar et al. 2003; Kiszka et al. 2011).

In the Atlantic, most records derive from stranding events (Leatherwood et al. 1993; Torda et al. 2010). Since the Atlantic review by Leatherwood et al. (1993), knowledge about Fraser's dolphin has been slowly accumulating. South Atlantic records are limited to stranded animals in the western margin, from 1991 to 1997 in southern Brazil, Uruguay and Argentina (Praderi et al. 1992; Moreno et al. 2003) and localized sightings of large pods in the eastern Atlantic (off Angola; Weir 2008; Weir et al. 2010). In the North Atlantic (NA), sightings have been more frequent in the western side (Leatherwood et al. 1993; Mignucci-Giannoni et al. 1999; Dolar 2009), including the Gulf of Mexico and the Caribbean Sea, where the species was first reported from a stranded individual (Caldwell et al. 1976). Even though sightings are not frequent, with several surveys during the 1990s reporting none in certain Caribbean areas (Palacios et al. 1995, 1996; Jefferson and Lynn 1994; Mignucci-Giannoni et al. 1999), the Lesser Antilles, particularly off Guadeloupe, is actually the only North Atlantic area where year-round observations have been reported (from 15 years of observations; Rinaldi et al. 2006; Rinaldi and Rinaldi 2011). In the Northeast Atlantic, there have been sporadic scattered stranding events, in contrast with a very small number of sightings at sea (Leatherwood et al. 1993; Weir 2008; Torda et al. 2010).

We report the northernmost sightings of Fraser's dolphin schools in the Atlantic, from the Azores and Madeira archipelagos, interpreted in the light of regional oceanography. In the interests of achieving a better understanding of the distribution of Fraser' dolphin in the North Atlantic, we provide a bibliographic review covering more than 35 years of records of this little-known delphinid (Hill and Lackups 2010).

Materials and methods

New records

New records of Fraser's dolphin are reported from observations made onboard whale-watching boats operating near Pico Island, in the Azores in 2008, and at Madeira Island in 2010.

Study area

The Archipelago of Madeira lies in the subtropical zone between 32°22'–33°07'N and 16°16'–17°16'W. The Azores Archipelago is located on the Mid-Atlantic Ridge, in a temperate zone between 36–39°N and 25–29°W. Madeira Island is at the top of a large volcano, on a submarine mountain range along the northern edge of the African Plate.

Survey methods

In both sightings, the dolphins were detected from land and approached by two small 6-m boats with outboard engines, while directed via VHF radio, as described previously (e.g. Pereira 2008a). Fraser's dolphins were identified from their typical coloration pattern and morphological characteristics: a well-defined but short beak, characteristic stocky body, and small dorsal and pectoral fins (Perrin et al. 1973). Group size and behaviour were recorded at sea-level by cetologists onboard. In the Azores, sea surface temperature was measured with a hand held calibrated CRISON 638 Pt thermometer. Sighting locations were registered by GPS and photographic material was collected. These were used to distinguish males from females and juveniles, as only the first carry a distinct broad lateral black stripe (Jefferson et al. 1997). The field notes did not include any visual clues to sexual dimorphism hampering any detailed inference about the social structure of the group. Depths were obtained *a posteriori* from NOAA ETOPO1 Global Relief Model (Amante and Eakins 2009) using ArcMap (ESRI).

Oceanographic context

The oceanographic context of these occurrences was analysed by obtaining Level-2 MODIS/AQUA1.1 km resolution sea surface temperature (SST) from the Ocean Color Level 1/2 browser (<http://oceancolor.gsfc.nasa.gov/cgi/browse.pl>) for the Azores and Madeira regions. Images were mapped (Level2-map) at the Department of Oceanography and Fisheries at the University of the Azores (DOP/UAZ) with version SeaDAS 5.2 with I2gen5.8.3 developed by NASA. The downloading and mapping process is automated within the HAZO system developed by the



Fig. 1 *Lagenodelphis hosei* in the Azores archipelago: breaching female in front of Pico Island (right), and (from the top left) adult, female with calf, and juvenile (the last two photographs by João Quaresma)

Oceanography team at DOP/Uaz (Figueiredo et al. 2004). Monthly averages were calculated for both regions for a period of nine years (1993–2011). Concurrently, all in situ surface temperature data obtained daily for Horta harbour during a period of 14 years (1993–2008) by DOP/Uaz were also analysed to infer possible relationships between sighting periods and local/regional daily (in situ) or average (satellite) surface temperature distributions.

Review of North Atlantic records

A bibliographic review of North Atlantic (above 0° N) records of Fraser's dolphins was carried out. Record type

(sighting at sea/stranding/taken by local fishery), date, location (approximate/exact), depth, group size, SST and data source were recorded. The survey included peer-reviewed and other material: technical reports and datasets available online at OBIS database (Ocean Biogeographic Information System; Halpin et al. 2009). Results were organized by region: Eastern Atlantic (to 42°W), Western Atlantic, Gulf of Mexico and Caribbean Sea. The Caribbean Sea was considered to be the body of water located between approximately 8°N and 22°N latitude and 60°W and 89°W longitude (Gallegos 1996), adjacent to the Atlantic Ocean and south of the Gulf of Mexico, with the eastern and northern boundaries formed



Fig. 2 *Lagenodelphis hosei* Fraser 1956 in Madeira Archipelago: two adults and one juvenile (above), and one calf (below)

by the Lesser Antilles and the Greater Antilles Islands, respectively.

Results

New records

Observations in the Azores archipelago

On 22 August 2008, a pod of Fraser's dolphins was carefully approached around 10:30 am and observed closely by two whale-watching boats. The pod was composed of approximately 50 animals, including females,

males and calves. They were observed 1.2 nm south of the Pico coast (38°22'50"N, 28°20'10"W), over 691 m depth. The animals were travelling in a tight pod in a west to east direction. Generally the pod reacted evasively, avoiding the boats when approached, with the whole group diving for approximately 10 s periods before surfacing. During 30 min of observation, this behaviour was maintained, shifting to increasing dive periods and surfacing at farther distances. The MODIS SST-derived average for August 2008 in the Azores region was high (approximately 24 °C), and the in situ temperature was 25–26 °C. A group of the same size was sighted the following day, again south of Pico Island, at a distance of 5 nm from the previous location (4.7 nm from

Ribeiras, 38°18'53"N, 28°10'56"W), over depths of 1,613 m. The group behaviour differed drastically from that of the previous day (Fig. 1; no images available from 22 August). The animals were interacting with the boats, approaching, bow riding, and breaching frequently. After 20 min, the entire group dived and surfaced far away from the boats, and the observations were intentionally terminated.

Observations in the Madeira archipelago

On 23 August 2010, a pod was observed at 13:25 pm, 4.8 nm south of Garajau-Funchal (32°33.394"N, 016°51.537"W, Fig. 2), over a depth of 2,194 m. Beaufort sea-state was at 2 and the MODIS SST-derived average for August 2010 in Madeira was 22.9 C. The pod was composed of about 80 individuals, including females, males, and younger individuals, travelling in small but tight groups of 3–6 individuals. Calves were identified by a very small size and swimming synchronously with an adult (Tayler and Saayman 1973). They were travelling from NW to SE, swimming fast with active surface displays, including surfing waves. Upon arrival of the boats, some individuals approached and rode the bow, sometimes avoiding the boats but returning a few minutes later. After circa 25 min, the dolphins started making longer dives and changing direction very often, and observations were terminated. At the same location, a pod of about 30 short-finned pilot whales, *Globicephala macrorhynchus*, was also observed. This group was composed of individuals of both sexes and different ages. They were travelling slowly in a close formation. There was no observation of direct interaction between the two species.

The Fraser's dolphin pod was followed by look-outs on land, and at 17:45 pm it was approached by the same boats at 0.8 nm from the first sighting (32°33.888"N, 16°50.746"W; 4.3 nm from land, Garajau – Funchal), over a depth of 2,176 m. The group was dispersed over a large area and reacting evasively. Some individuals, especially juveniles, approached the boat and rode the bow, but most of the time the dolphins avoided the vessels, making long dives, changing direction underwater and surfacing again further away from the boat. Very high breaches were observed about 500 m away from the boats (approximately 2–4 m high). After 20 min, both vessels left the area.

Oceanographic interpretations

Sightings occurred during August, generally the period of the year with the highest mean sea surface temperatures at both archipelagos (Martins et al. 2007; Hydrographic

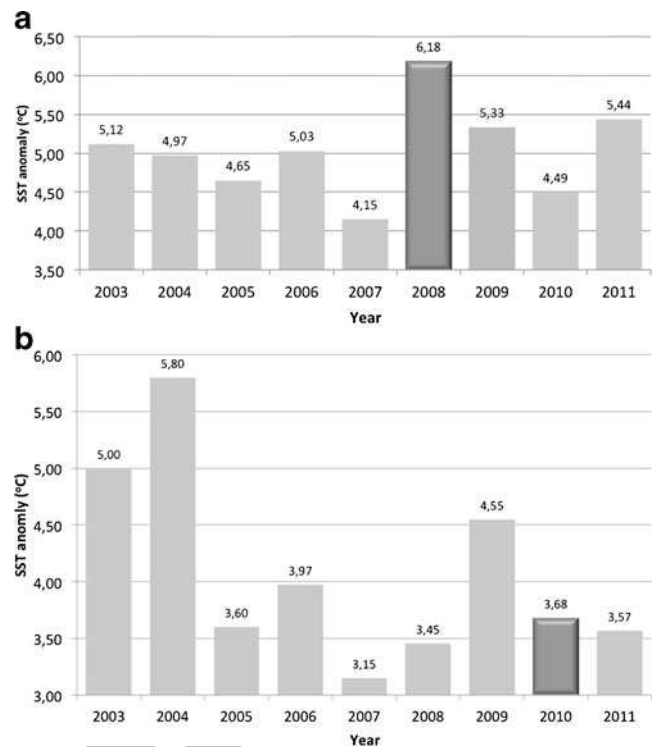


Fig. 3 MODIS/AQUA SST-derived August mean sea surface temperature anomalies for Azores, and Madeira (below) regions, from 2003 to 2011. Anomalies were estimated by subtracting for each year its August maximum SST mean from the overall 9-year August SST mean. Therefore, all anomalies are positive

Institute 2009). Regional SST MODIS derived anomalies for the period 2003 to 2011 (Fig. 3, left) show a temperature maximum anomaly exceeding by more than 6 °C the overall 9-year average temperature. Compared with other years, 2008 presents the highest SST positive anomaly. In the Madeira archipelago, a similar association was not verified (Fig. 3, right).

Daily in situ data obtained from Horta harbour at the Faial Island (Azores) for a period of 12 years (1993–1998, 2000, and 2002–2008) (Fig. 4a) clearly show that with the exception of August 1998 when the daily surface temperature reached almost 24 °C (11 August 1998), the second highest daily temperatures were attained in August 2008, 10 years later, exactly during the month and year of the sighting of Fraser's dolphin in the Azores. In particular, August 2008 daily surface temperature anomalies (calculated against a 12-year overall in situ August average) clearly show a significant positive temperature anomaly of approximately 1 °C from mid-August to the end of the month (i.e. reaching 23.5 °C within a period of less than 15 days), exactly the period of sighting of Fraser's dolphins (Fig. 4b).

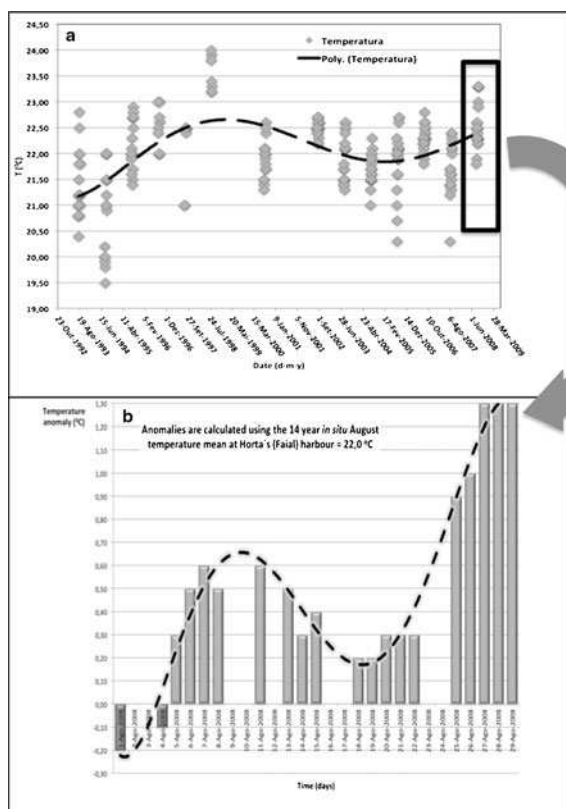


Fig. 4 In situ August surface temperatures obtained daily at Horta harbour (Faial Island, Azores) by DOP/UAz for a period of 12 years (1993–1998, 2000, and 2002–2008). **a** August temperature values (the years 1999 and 2001 are not included since these data are not available). For best visualization, a fifth-degree polynomial fit is overlaid (*black dashed curve*); **b** August 1998 daily in situ surface temperature anomalies. Anomalies were estimated by subtracting each daily temperature value from the overall 12-year in situ August temperature mean at Horta harbour. For best visualization, a sixth degree polynomial fit is overlaid (*black dashed curve*)

Review of earlier records

A list of records including 170 occurrences of Fraser's dolphins in the North Atlantic is provided in Table 1 (Appendix). Observations span from 1972–2011 and from 3.2 to 57.24°N and 97°W to 6.1°E. Since the first articles on captured or stranded specimens (Caldwell et al. 1976; Duguay 1985; van Bree et al. 1986), records have been spread through conference proceedings, reports (e.g. IWC) and a lesser number of peer-reviewed articles. We had difficulty in accessing older manuscripts. Also, many recent articles lacked environmental data, such as precise location of sightings (in coordinates) or sea-water temperature. Exact stranding locations are also rarely given. A total of 23 publications and reports include 37 events, with additional 10 events from databases available online (OBIS). The majority of sources refers to a single event (stranding or

observation at sea), with one report in particular including 123 sightings (Lesser Antilles; Rinaldi and Rinaldi 2011). Excluding the report from Rinaldi and Rinaldi (2011), stranded animals comprise 42 % ($n=20$) of the events and were mostly of a single animal (82 %). Three stranding events of several individuals (10–26) occurred above 24.8°N, both in the Western (Florida, US) and in the Eastern Atlantic (Britanny, France). Sightings at sea comprise 46 % of the records, with higher number of sightings in the Gulf of Mexico (29 %) and the Caribbean Sea (33 %; 89 % if all the 123 sightings by Rinaldi and Rinaldi (2011) in the Lesser Antilles are considered). Fishing events have been reported in Ghana and St. Vincent in the Lesser Antilles, but only indication of the fishing area is given (12 %, $n=6$; see Table 1).

Discussion

The occurrence of Fraser's dolphin in the Azores and Madeira archipelagos is a very rare event. Cetacean research has grown exponentially in the Azores in the last four decades (Pereira and Gonçalves 2009) and during the last 15 years in Madeira (Freitas et al. 2004). In parallel, a 20-year-old local whale-watching industry has increased the number of people and boats in search of cetaceans in the Azores (Oliveira et al. 2007), with tourism-based opportunistic records also existing for more than 10 years in Madeira (Ferreira 2007). This enhances the chances of sighting rare, less frequent or evasive species (Pereira 2008b). Therefore, Fraser's dolphin should be considered at present a vagrant species in these archipelagos.

An updated summary of NA occurrences is provided in Table 1 and Fig. 5. Above 38° north, only stranded individuals have been reported in the Atlantic, making the Azores the northernmost observation at sea of this tropical delphinid. Residency is expected in the Caribbean Sea, near Guadeloupe (Lesser Antilles), where Rinaldi and Rinaldi (2011) reported year-round sightings for more than 10 years. Currently, there has been no population, or site-fidelity assessment in the area. The number and time span of records, also suggests the existence of a population in the Gulf of Mexico, with observations occurring on all seasons, but insufficient data hampers population estimates (Waring et al. 2011, and references therein). In comparison with Pacific reports (Dolar 2009), the overall low number of sightings in the North Atlantic (cf. Fig. 5) can derive from smaller populations but also from current low survey effort at tropical latitudes (Weir 2008), where Fraser's dolphins are more abundant in other oceans (Wade and Gerrodette 1993).

Sighting locations

The occurrence of Fraser's dolphin in insular regions and its proximity to the coast as reported here is not surprising. The dolphins have been observed in the vicinity of oceanic islands, such as the Philippines (Dolar et al. 2003), the Maldives (Anderson 2005) and the Lesser Antilles (Yoshida et al. 2010). In both the Madeira and Azores archipelagos, the shelf width is narrow or almost non-existing (considering the theoretical >200 m depth range), and steep topographies provide depths over 1,500 m close to shore, where coastal and oceanic cetaceans can be detected from land (in certain locations less than 1.8 km from shore; Freitas et al. 2004; Pereira 2008b). The four sightings reported here (two groups) agree with other North Atlantic records, where the species has been observed over between 200 and 2,000 m depth (cf. Table 1 in Appendix for references).

Fraser's dolphins in temperate waters

Sightings of Fraser's dolphin in temperate areas of the world have been related to periodic events of warm water

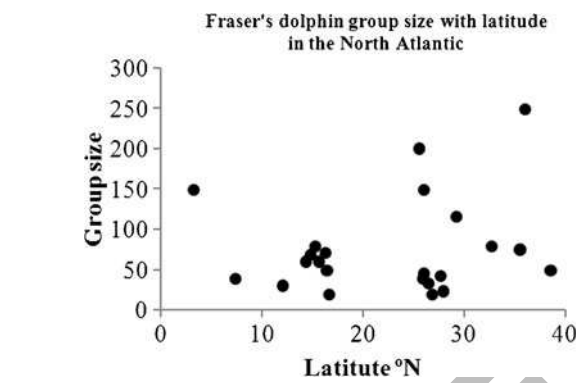


Fig. 6 Group sizes of Fraser's dolphin sighted at sea in the North Atlantic as a function of latitude ($n = 23$) (see Table 1 for references)

currents. South African records are exclusive to the summer months and have been related to the Agulhas Current (Perrin et al. 1994). Records in Uruguay correlate with the influence of the tropical waters of the Brazil Current, which move south during summer (Praderi et al. 1992). Similarly, a number of Fraser's dolphin mass strandings in temperate regions have been associated with

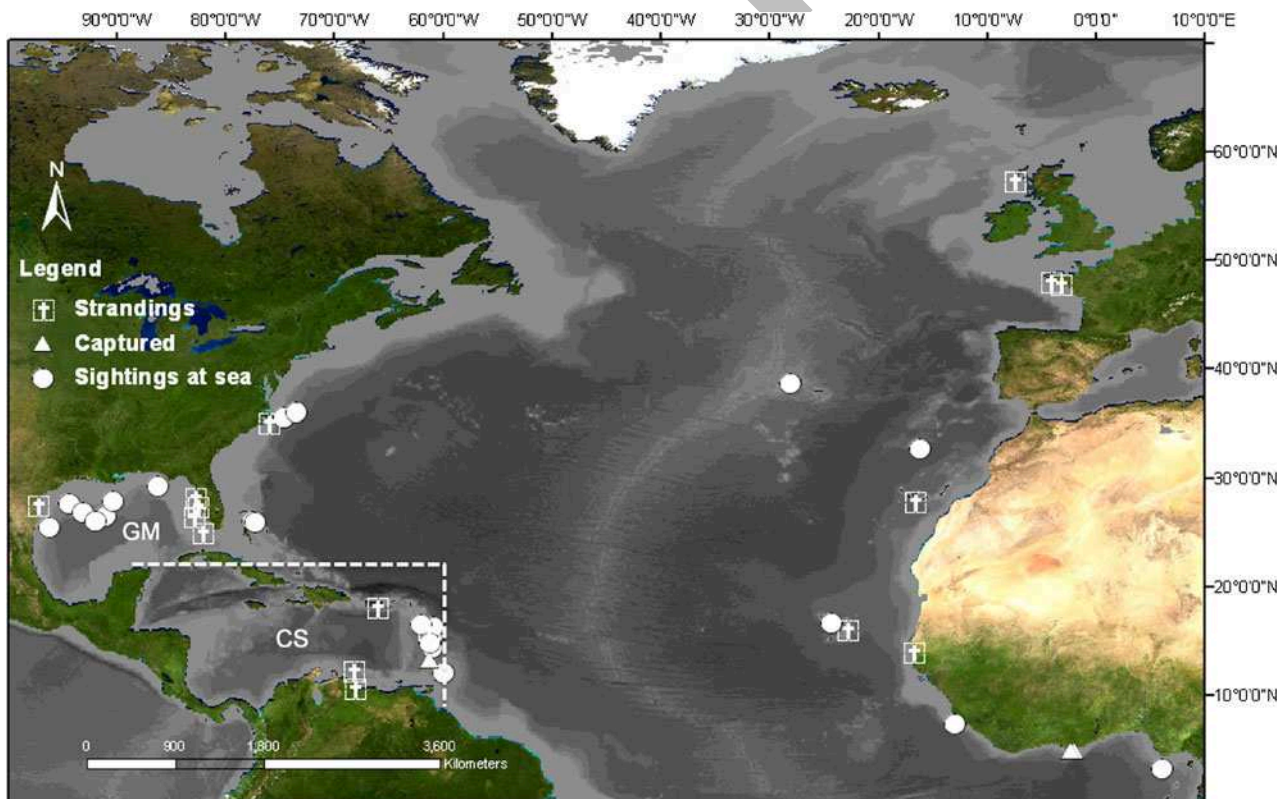


Fig. 5 Records of Fraser's dolphin in the North Atlantic from 1972 to 2011; see Table 1 for references; CS Caribbean sea and GM Gulf of Mexico are indicated

the influence of oceanographic anomalies. Van Bree et al. (1986) suggested the influence of “El Niño” on the mass stranding occurred in Brittany, in 1984, and Moreno et al. (2003) also ascribed a series of stranding events in the Southwestern Atlantic in 1997 to El Niño.

The Azores region is located at the northern edge of the North Atlantic Subtropical Gyre (SG) and is characterized by rather high horizontal temperature gradients. The temperature spatial variability is enhanced mainly by two eastward branches of the Gulf Stream: the colder southern branch of the North Atlantic Current (that crosses the Mid-Atlantic Ridge at 45–48 N), and the warmer Azores Current (that crosses MAR at 34–36 N; Bashmachnikov et al. 2004). In this sense, large-scale surface water temperature variability observed in the region is mostly a response of flows converging and their effect on meridional temperature gradients in the region (Bashmachnikov et al. 2004). A sudden intensification of these seasonal/inter-annual dynamics could explain temperature oscillations providing favourable conditions for the presence of such tropical species. For instance, the warm temperate to tropical delphinid *Stenella frontalis* is a seasonal-resident species, reaching the Azores only during summertime (Pereira 2008b). Such association between Fraser’s dolphins and extreme sea-surface values in the Azores indicates the species as potential regional bio-indicator of global climate change.

The Madeira observations can be related to long-lived eddies which have been reported moving from north-west Africa towards the Canary Islands, Madeira and the Azores (Sangrà et al. 2009); there is, however, no evidence that free-ranging dolphins use such eddies for their locomotion and/or feeding.

Behaviour and social ecology

Evasive behaviour, with the pod in a tight formation, has often been observed in large groups in the Pacific (Perrin in Watkins et al. 1994). It seems to be a rather common behaviour (Leatherwood et al. 1993; Jérémie et al. 2006). These are fast swimmers with interactive behaviours occurring only occasionally, sometimes with exuberant displays (Watkins et al. 1994; Rinaldi et al. 2006; Rinaldi and Rinaldi 2011). Encounter durations can reach up to an hour (Oswald et al. 2007), but there are several reports of evasive behaviours during observations (e.g. Torda et al. 2010). Information on sighting duration is often not available, and should be presented with sighting reports, as well as collected systematically for management purposes.

The presence of *Globicephala macrorhynchus* in the same area as the Fraser’s dolphins in Madeira is not unexpected, even though no interactions were observed.

Fraser’s dolphins have been reported in mixed groups both in the Pacific (Jefferson and Leatherwood 1994) and in the Atlantic, such as with *Peponocephala electra* in the Gulf of Mexico (Mullin et al. 2004), or *G. macrorhynchus* in the Lesser Antilles (Yoshida et al. 2010) and Cape Verde (Torda et al. 2010).

Fraser’s dolphins are known to form large groups reaching several hundred in the Pacific (Barlow 2006; Dolar et al. 2009), with the smallest groups having 40–50 individuals (e.g. Oswald et al. 2007). In the NA, pods up to 50 individuals comprise circa 50 % of the records ($n=11$), while pods with more than 100 individuals were only observed on 20 % of the reports (Table 1; Fig. 6). Throughout the northeastern Atlantic area, observed pods have been of variable size. In the western NA, Caribbean records average 50–80 individuals, while smaller groups have been reported from the Gulf of Mexico (15–30), as shown by two clusters of data in Fig. 6. Rinaldi and Rinaldi (2011) reported an average group size of 72 individuals off Guadeloupe ($N=123$), being the most robust estimates available.

The Atlantic occurrence of this oceanic species has intrigued scientists over time. The understanding about Fraser’s dolphin ecology is expected to grow with increasing survey efforts in the Caribbean area and lower latitudes, potentiated by the advent of ocean biodiversity informatics (Costello and Berghe 2006). Interpreting present and historical records shall benefit from increasing knowledge on regional/large scale atmospheric and oceanographic processes, mainly through evaluation/comparison of concurrent time series data. Reports on the species occurrence, including data from opportunistic platforms, should continue to reach the scientific community with associated environmental data.

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Appendix

Table 1 Fraser's dolphin *Lagenodelphis hosei* in the North Atlantic

	Record Date	No.	Group size	Record Type	ID	lat II	lon II	Precision	Depth (m)	°C	Source	Location
Eastern NA	1980	1	40	Sighting	Not confirmed	7.3	-12.9	3	-	-	Tormosov et al. 1980 in Mignucci-Giannoni et al. 1999	Sierra Leone, Off Sierra Leone
	01-08-1983	1	1	Stranding	OK	27.8	-16.6	3	-	-	Vonk and Martel 1990	Spain, Canary Islands
	29-05-1984	1	10	Stranding	OK	47.7	-3.2	3	-	-	van Bree et al. 1986	France, Brittany
	26-06-1984	1	1	Stranding	OK	47.9	-4.1	3	-	-	Duguy 1985	France, Brittany
	03-09-1996	1	1	Stranding	OK	57.24	-7.44	2	-	-	Bones et al. 1998	Scotland, Western Isles, South Uist, Bornish
	1997	1	1	Stranding	OK	13.83	-16.76	2	-	-	Van Waerebeek et al. 2000	Senegal, beach of Sangomar Island (Skull on a beach)
	2000	1	2	Captured	OK	4.79	-1.94	2	-	-	Weir et al. 2008	Ghana, Dixcove
	10-09-2000	1	1	Captured	OK	4.86	-2.24	2	-	-	Debrah 2000	Ghana, Axim
	21-06-2000	1	1	Captured	OK	4.86	-2.24	2	-	-	Ofori-Danson et al. 2003	Ghana, Axim
	31-08-2003	1	20	Sighting	OK	16.58	-24.31	2	500	-	Torda et al. 2010	Cape Verde, c. 5 nm southwest of São Nicolau
	08-03-2004	1	150	Sighting	Probable	3.17	6.12	2	1,286	-	Weir et al. 2008	Nigeria (130 km south of), in the Gulf of Guinea
	10-03-2006	1	1	Stranding	OK	15.98	-22.77	2	-	-	Torda et al. 2010	Cape Verde, Near Curral Velho, southern coast of Boavista
	Eastern NA	22&23-08-2008	1	45-55	Sighting	OK	38.598056	-28.046389	1	691-1,613	25-26	this study
23-08-2010		1	80	Sighting	OK	32.659444	-16.165833	1	2,176-2,194	-	this study	Portugal, Madeira, Madeira Island
Western NA	11-03-1993	1	1	Stranding	OK	34.972222	-76.055556	1	-	-	MME 8536. National Museum of Natural History, Smithsonian Institution, Washington DC.	US, North Carolina, Carteret District, North Core Banks, Mm 2.6
	11-07-1997	1	40	Sighting	OK	25.910283	-77.33845	1	1,247 ^a	-	Bahamas Marine Mammal Research Organization	Northwest Atlantic Northwest Atlantic
	19-09-1999	1	250	Sighting	OK	36.0138	-73.5158	1	3,375	-	NOAA Southeast Fisheries Science Center (SEFSC)	Northwest Atlantic
	03-06-2001	1	150	Sighting	OK	25.974417	-77.465133	1	1,451 ^a	-	Bahamas Marine Mammal Research Organization	Northwest Atlantic
	27-05-2011	1	75	Sighting	OK	35.562988	-74.604346	1	2,031 ^a	-	University of North Carolina Wilmington	Northwest Atlantic
Caribbean Sea	02-10-1972	1	1	Captured	OK	13.17	-61.23	4	-	-	Caldwell et al. 1976	Lesser Antilles, St. Vincent
	15-10-1972	1	1	Captured	OK	13.17	-61.23	4	-	-	Caldwell et al. 1976	Lesser Antilles, St. Vincent
	18-05-1976	1	1	Captured	OK	13.17	-61.23	4	-	-	Caldwell et al. 1976	Lesser Antilles, St. Vincent
	26-10-1991	1	60	Sighting	OK	15.616814	-61.000053	1	200-500	-	Watkins et al. 1994	Dominican Republic, 4 km northwest of Prince Rupert Bluff; within 2 km of the northern part of Dominica
	28-10-1991	1	80	Sighting	OK	15.216786	-61.000094	1	2,000	-	Watkins et al. 1994	Dominican Republic, 5 km west of Scott Head
	22-05-1994	1	1	stranding	OK	17.966667	-66.066806	1	-	-	Mignucci-Giannoni et al. 1999	Puerto Rico, Guanica, Bahia Gaunica, Area El Farito

Table 1 (continued)

	Record Date	No.	Group size	Record Type	ID	lat II	lon II	Precision	Depth (m)	°C	Source	Location
	06-05-1997	1	1	Stranding	OK	17.966722	-66.100083	1	–	–	Mignucci-Giannoni et al. 1999	Puerto Rico, Ponce, Playa Carenero, Playa Carenero, Behind Ponce Hilton
	1998-2009	123	72	Sighting	OK	16.23	-60.90	–	–	–	Rinaldi and Rinaldi 2011	Guadeloupe (FWI) the leeward side of the waters on Guadeloupe FWI
	06-06-1999	1	2	Stranding (live)	OK	10.483333	-68.116667	3	–	–	Bolaños and Villarroel-Marín 2003	Venezuela, El Palito Beach, state of Carabobo
	03-04-2003	2	50–70	Sighting	OK	14.30	-61	2	755–2,159	–	Jérémie et al. 2006	Lesser Antilles, Martinique
	05-2004	1	30	Sighting	OK	12	-60	2	2,000	27.7	Yoshida et al. 2010	Lesser Antilles, in the Grenada and Tobago Basin
	12-06-2009	1	1	Stranding	OK	15.88	-61.30	3	220	–	Van Canneyt et al. 2011	Guadeloupe (FWI) ("les Basses" Gd Bourg Marie Galante)
	07-05-2010	1	50	Sighting	OK	16.45	-62.00	2	964	–	Weir et al. 2011	Lesser Antilles, Montserrat (13 km east of Montserrat)
	01-08-2011	1	1	Stranding (live)	OK	12.15	-68.27	2	–	–	Witte et al. 2012	Lesser Antilles, Bonaire
	21-02-2000	1	70	Sighting	OK	14.769	-61.2558	1	597	–	NOAA Southeast Fisheries Science Centre (SEFSC)	Caribbean Sea
Gulf of Mexico	24-11-1981	1	+17	Stranding	OK	24.84	-82.10	2	–	–	Hersh & Odell 1986	US, Florida, Marquesas Keys, 5 km north of Eastern Harbor, NE Corner Outer Beach
	24-05-1992	1	180–220	Sighting	OK	25.488333	-96.204444	1	1,750	26.4	Leatherwood et al. 1993	US, Gulf of Mexico
	04-06-1992	1	34	Sighting	OK	26.461111	-91.022222	1	2,057	26.5	Leatherwood et al. 1993	US, Gulf of Mexico
	23-02-1993	1	1	Stranding	OK	28.08	-82.80	2	–	–	Leatherwood et al. 1993	US, Florida (Gulf Coast), Pinellas County, Honeyon Island
	16-05-1993	1	15–30	Sighting	OK	27.894444	-90.400000	1	835	–	Leatherwood et al. 1993	US, Gulf of Mexico
	01-06-1993	1	30–55	Sighting	OK	27.630556	-94.413889	1	596	–	Leatherwood et al. 1993	US, Gulf of Mexico
	04-09-1993	1	20	Sighting	Not confirmed	26.786111	-93.063889	1	–	–	Leatherwood et al. 1993	US, Gulf of Mexico
	13-07-1994	1	26	Stranding (some released)	OK	26.4	-82.88	2	–	–	MME11992. National Museum of Natural History, Smithsonian Institution, Washington DC.	US, Florida, Lee District, Marco Island, Big Marco Pass
	22-03-1994	1	1	Stranding	OK	27.43	-97.28	2	–	–	MME 11738. National Museum of Natural History, Smithsonian Institution, Washington DC.	US, Texas, Nueces, Padre Island, Padre Island Natl Seashore, Mi 6.
	1994-04	1	1	Stranding	OK	NA	NA	NA	–	–	MME10114. National Museum of Natural History, Smithsonian Institution, Washington DC.	US, Texas, Gulf Of Mexico
	17-06-1995	1	1	Stranding	OK	27.32	-82.57	2	–	–	Smithsonian Institution (MME12359)	US, Florida, Sarasota, Coon Key NE Corner, behind Sarasota Condo
	03-06-1997	1	117	Sighting	OK	29.2068	-86.2443	1	251	25.3–26.5	Maze-Foley and Mullin 2006	US, Gulf of Mexico
	02-05-2000	1	45	Sighting	OK	25.9988	-91.9707	1	2,140	25.3–26.5	Maze-Foley and Mullin 2006	US, Gulf of Mexico

No. number of sightings, *Record type* includes sightings at sea/stranding/captured (taken by local fishery); *OK* refers to positive identification; *Precision* (of coordinates) includes 1 exact location, 2 available only as approximate location, 3 manuscript not available to the authors, and 4 taken by local fishery (for 2 to 4, coordinates were obtained from site description); *Depth* (m), ^a indicates exact locations where depths were not given by sources but obtained from GEBCO 08

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