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External Body Conditions in Cetaceans from La Gomera, Canary Islands, Spain

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Abstract

We report on externally visible pathological and natural conditions in free-ranging cetaceans off La Gomera, Canary Islands, in the period 1995 -2018. Photographic records of Atlantic spotted dolphins (*Stenella frontalis*), bottlenose dolphins (*Tursiops truncatus*), short-finned pilot whales (*Globicephala macrorhynchus*), rough-toothed dolphins (*Steno bredanensis*), common dolphins (*Delphinus delphis*), Cuvier's beaked whales (*Ziphius cavirostris*), Blainsville's beaked whales (*Mesoplodon densirostris*) and Bryde's whales (*Balaenoptera edeni*) were screened for the presence of pathological and natural body conditions. External conditions were classified according to their characteristics. A total of 279 individuals were found presenting skin disorders, injuries, emaciation, deformations or parasitism. Epidermal conditions including tattoo skin disease, focal skin disease, cutaneous nodules, pale skin patches and abnormal pigmentation were detected in 76 delphinids and seemed common in *T. truncatus*. Cases of emaciation were observed in 25 *T. truncatus* and in one *G. macrorhynchus* in 2010 and 2014. The dorsal fin of 76 dolphins and whales was bent, collapsed, injured or amputated. Traumata of possible anthropogenic origin affected the dorsal fin, tailstock and head of 24 delphinids and two *B. edeni*. The obligate cetacean barnacle *Xenobalanus globicipitis* infested 23 individuals of five species. Scars and wounds attributed to *Petromyzon marinus* and *Isistius* sp. occurred in most species, including *B. edeni*. Lesions possibly caused by *Pennella balaenoptera* were seen in two *T. truncatus* and one *Z. cavirostris*. This study provides a preliminary insight into externally visible skin disorders, traumata, body conditions and parasites occurring in cetaceans south of La Gomera, Canary Islands. [JMATE 2019;11(2):4-17]

Keywords: cetaceans, skin disease, body condition, injuries, epizoa

Introduction

Skin diseases, body traumata and deformations are increasingly reported in free-ranging cetaceans, causing growing concern worldwide (6, 31, 52). Viruses, bacteria, fungi and protozoans may cause a variety of cutaneous diseases (7). However, in many cases, the etiology of these conditions is unknown (8, 39, 49). Though several skin diseases resolve over weeks or months, some are chronic and progress over time (31, 33, 52). Depending on their severity, traumata and deformations may affect fitness, reproduction, feeding and welfare and, in extreme cases, can lead to premature death (9, 57).

Approximately 400 km east of the African continent in the Northeast Atlantic Ocean, the Western Canary Islands represent a major tourist destination in Europe. The waters in the Archipelago are home to 30 cetacean species that are increasingly exposed to anthropogenic threats (14). High speed ferry traffic has expanded during the last 20 years with a subsequent increase of ship strikes (1, 10). The whale watching industry has developed rapidly, and cetaceans off Tenerife are among the most intensely watched populations in the world, causing suspected long-term negative impacts (30). Other significant anthropogenic threats include fisheries interactions and marine debris as well as chemical pollution and underwater noise (1, 14, 17). The marine ecosystem south of La Gomera, one of the Western Canary Islands, was declared a Special Area of Conservation (SAC) under the EU Habitats Directive in January 2002. In this study, external evidence of pathological and natural conditions were assessed in cetaceans from La Gomera using photographic records taken in the period from 1995 until 2018.

Methods

The survey area covered the coastal waters south and southwest of La Gomera, an area characterized by usually calm waters, created by the lee side of the prevailing north-eastern trade winds. The study area is also characterized by deep waters (with depths up to 2,000-3,000 meters below sea level) within 10 km from the coast. The water temperature is around 18°C to 19°C in winter and varies between 22°C to 25°C from late summer to autumn.

Photographs were taken regularly between September 1995 and November 2015 from several whale watching boats used as platforms of opportunity and operating from the harbor of Vueltas in the municipality Valle Gran Rey. Additional photographs from three sightings made in May 2017 and April and November 2018 were included in the analysis. The boat trips lasted an average of 3-4 hours with a maximum of 8 hours and reached up to 5 nautical miles (9.3 km) from the shore, depending on weather and sea state. Vessels included an 11 m open wooden former fishing boat and a 14 m steel ketch (max. 12 passengers each), as well as a 24 m motor yacht carrying up to 60

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passengers. Boat operators hold a whale watching license to conduct commercial whale watching trips once or twice a day. On each survey trip, the sea was visually scanned by experienced observers. Cetaceans were approached according to the Canary Island whale watching regulations (22).

Photographs were taken with different SLR cameras, equipped with zoom lenses ranging from 80mm to 400mm. Some high-quality photographs taken by other trip participants were evaluated as well. All photographs were screened for the presence of species-specific features and distinctive markings on the dorsal fin and on the body, as described in Würsig & Jefferson (59). High quality images were sharp, bright, and well exposed. Medium quality images were sharp and bright enough to allow cetacean identification and the detection of pathological versus natural conditions. Photographs of medium to high quality were selected for the analysis of skin disorders. Low quality images that appeared blurry or underexposed but showed the full dorsal fin for identification were only used to detect injuries.

Species were identified following criteria described in Shirihai and Jarrett (42). Individuals were classified into three age categories (calves, immatures, adults) based on body length, coloration pattern as well as group dynamics, as described in Perrin & Reilly and Wells et al. (35, 56).

Classification of external conditions:

Photographs were examined for the presence of externally visible pathological conditions, traumata, abnormal pigmentation and parasites, as previously described (2, 3, 39, 45). External factors that could have caused morphological abnormalities (e.g., vessel propellers, fishing gear, parasitism, etc.) were documented for each individual. Based on their macroscopic appearance and current literature, the external conditions were categorized as follows:

-Skin disorders: Skin conditions were classified into the following categories: a) Cutaneous nodules (CNO): abnormally or normally pigmented small skin elevations (6, 46); b) Pale skin patches (PSP): irregular or rounded light grey or whitish marks on the skin (39); c) Focal skin disease (FSD): characterized by small, black or white dot lesions that may be spread over the whole body and may present a small hole in their center (6, 8, 39, 49); d) Tattoo skin disease (TSD): irregular, grey or black stippling of the skin (20, 51); e) Anomalous pigmentation (ANP): modification of the species-specific pigmentation pattern described for the species (45); f) Other skin disorders (OSD): all other unusual cutaneous pathological findings where classification and morphology could not be assigned to the above categories.

Skin lesions were classified as small, medium-sized or large, on the basis of their relative size to the eye or blowhole diameter and to the dorsal fin as follows: i) small - lesions appearing smaller than the diameter of the eye or blowhole; ii) medium - lesions smaller than twice the size of the eye or blowhole diameter, and iii) large - lesions bigger than a quarter of the dorsal fin base length (39, 48).

-External injuries: This category includes scars, fresh wounds and amputations of miscellaneous origin. To determine if lesions were of anthropogenic origin, criteria and case definitions for serious injury and death of cetaceans from anthropogenic trauma defined by George *et al*., Azevedo *et al*., Dwyer & Visser, and Moore *et al.* were used (2, 13, 18, 32). Four types of injuries were distinguished: a) Traumata: Fresh wounds and scars of non-predatory and non-parasitic origin that could be observed on all body parts except the dorsal fin; b) Disfigurement of the dorsal fin: nicks, scars and wounds resulting in significant damage of the fin and including partial or complete amputation, bending or total collapse (3, 54); c) Parasitic wounds: round or oval-shaped, crater-like lesions with a diameter of approximately 6 cm were attributed to cookie cutter shark (*Isistius* sp.) bites (13). Circular fresh and healed lesions, with greyish or pale coloration that may bear a dentition pattern were regarded as bites by the sea lamprey *Petromyzon marinus* (34). Thin white scars that may present a central pit were classified as lesions induced by the large parasitic copepod *Pennella balaenopterae* (6); d) Predation marks: Three to four tooth rakes separated by spaces measuring more than 25mm and within the range of inter-dental measurements for killer whales.

-Masses: Masses are abnormal tissue growths that may be tumors or abscesses and can occur on any part of the body (21).

- Deformations: This category describes alterations in the shape and/or structure of a body part, e.g. the dorsal fin, beak or vertebral column (3, 5, 54).

-Thinness and emaciation: Dolphins and whales showing a loss of body mass were considered thin or emaciated (25, 36). Specific anatomical indicators to identify the body condition were restricted to the epaxial body section. Thin individuals showed mild to moderate concavity ventrolateral to the dorsal fin and a moderate depression posterior to blowhole, and visibility of ribs. Emaciated individuals showed a severe concavity and deeper depression posterior to the blowhole, as well as visible ribs (25).

Table 1: Numbers of individuals analyzed for the presence of abnormal skin and body conditions per year (1995-2018), off La Gomera, Canary Islands

Year Data Collected	# Individuals analyzed	*S. frontalis*	*T. truncatus*	*G. macrorhynchus*	*S. bredanensis*	*D. delphis*	*B. edeni*	*Z. cavirostris*	*M. densirostris*
1995	1	0	1	0	0	0	0	0	0
1998	3	1	1	1	0	0	0	0	0
2000	7	0	1	3	3	0	0	0	0
2001	13	2	2	9	0	0	0	0	0
2002	5	0	4	1	0	0	0	0	0
2003	10	1	5	4	0	0	0	0	0
2004	3	1	0	0	0	2	0	0	0
2005	5	2	0	1	1	1	0	0	0
2006	5	1	1	3	0	0	0	0	0
2007	28	5	6	9	1	4	1	1	1
2008	2	0	0	2	0	0	0	0	0
2009	4	1	1	0	1	1	0	0	0
2010	19	1	6	10	1	0	0	1	0
2011	22	0	14	6	1	0	0	1	0
2012	16	2	7	5	2	0	0	0	0
2013	32	10	13	5	4	0	0	0	0
2014	80	11	33	35	0	0	1	0	0
2015	21	5	8	4	0	4	0	0	0
2017	1	0	0	0	0	0	1	0	0
2018	2	0	0	0	1	0	1	0	0
TOTAL	**279**	**43**	**103**	**98**	**15**	**12**	**4**	**3**	**1**

Results

There were 1,218 cetacean photographs of seven species, presenting externally visible pathological and natural conditions collected during 54 whale watching trips from 1995 until 2018. Most whale watching trips occurred in the spring (41%, March-May) and fall seasons (33%; September-November). The highest number of images was taken in 2014 (N=748), followed by 2011, 2013 (N=76) and 2015 (N= 70). A total of 279 cetaceans exhibited conditions that were evaluated in the present study. Of these, 271 individuals belonged to the five species most commonly observed in these waters: the Atlantic spotted dolphin (*Stenella frontalis*, N=43*),* bottlenose dolphin *(Tursiops truncatus*, N=103*),* short-finned pilot whale *(Globicephala macrorhynchus*, N=98*),* rough-toothed dolphin (*Steno bredanensis*, N=15) and common dolphin *(Delphinus delphis*, N=12). Additionally, three Cuvier's beaked whales (*Ziphius cavirostris*), one Blainville's beaked whale (*Mesoplodon densirostris*) and four Bryde's whales (*Balaenoptera edeni*) also presented skin anomalies, traumata or deformities (Table 1). Forty-four cetaceans had more than one condition (*S. frontalis*, N=2; *T. truncatus*, N=27; *G. macrorhynchus*, N=7; *S. bredanensis,* N=5*; D. delphis,* N=2 *and B. edeni,* N=1). Progression of the traumata could be monitored in four *T. truncatus,* one of which was re-sighted seven times over a 13-year period.

External injuries and disfigurement:

Vessel propellers (N= 19) and fishing gears (N=7) likely caused wounds and scars in 25 individuals from five species (Table 2, Figures 1A, 1B, 1C, 2B, 2D). Linear, parallel deep cuts suspected to have been caused by propellers (9, 19, 53) occurred on the body or fins of seven *G. macrorhynchus*, five *S. frontalis*, three *T. truncatus* and two *S. bredanensis* (Table 2). One *B. edeni* sighted in 2018 presented a minimum of three parallel straight, deep healed slashes on the back and DF that were also likely the result of a propeller strike (Figure 1A). One *B. edeni* photographed in May 2017 presented a deep V-shaped cut on the trailing edge of the dorsal fin (Figure 1B).

The dorsal fin of 76 individuals was injured, bent or collapsed. In eight *T. truncatus*, seven *G. macrorhynchus*, three *S. bredanensis*, one *D. delphis*, five *S. frontalis* and one *Z. cavirostris* the tip of the dorsal fin was missing or severely injured. In four *S. frontalis*, two *T. truncatus*, two *G. macrorhynchus* and

Table 2: Natural and pathological conditions observed in seven species of cetaceans off La Gomera, Canary Islands in the period 1995 till 2018. ANP = Anomalous skin pigmentation.

	Natural conditions				Pathological conditions			Anthropogenic injuries	
	Predation	Conspecifics	Parasites	ANP	Skin lesions	Masses	Emaciation	Boat propellers	Fishing gear
S. frontalis	2	3	3	2	9	2	0	5	1
T. truncatus	0	44	5	6	29	1	25	3	3
G. macrorhynchus	4	15	4	4	5	0	1	7	2
S. bredanensis	0	2	1	2	2	1	0	2	1
D. delphis	0	0	1	1	3	0	0	0	0
B. edeni	0	0	2	0	0	0	0	2	0
Z. cavirostris	0	0	2	0	0	0	0	0	0
M. densirostris	0	0	0	0	0	0	0	0	0
TOTAL	**6**	**64**	**18**	**15**	**48**	**4**	**26**	**19**	**7**

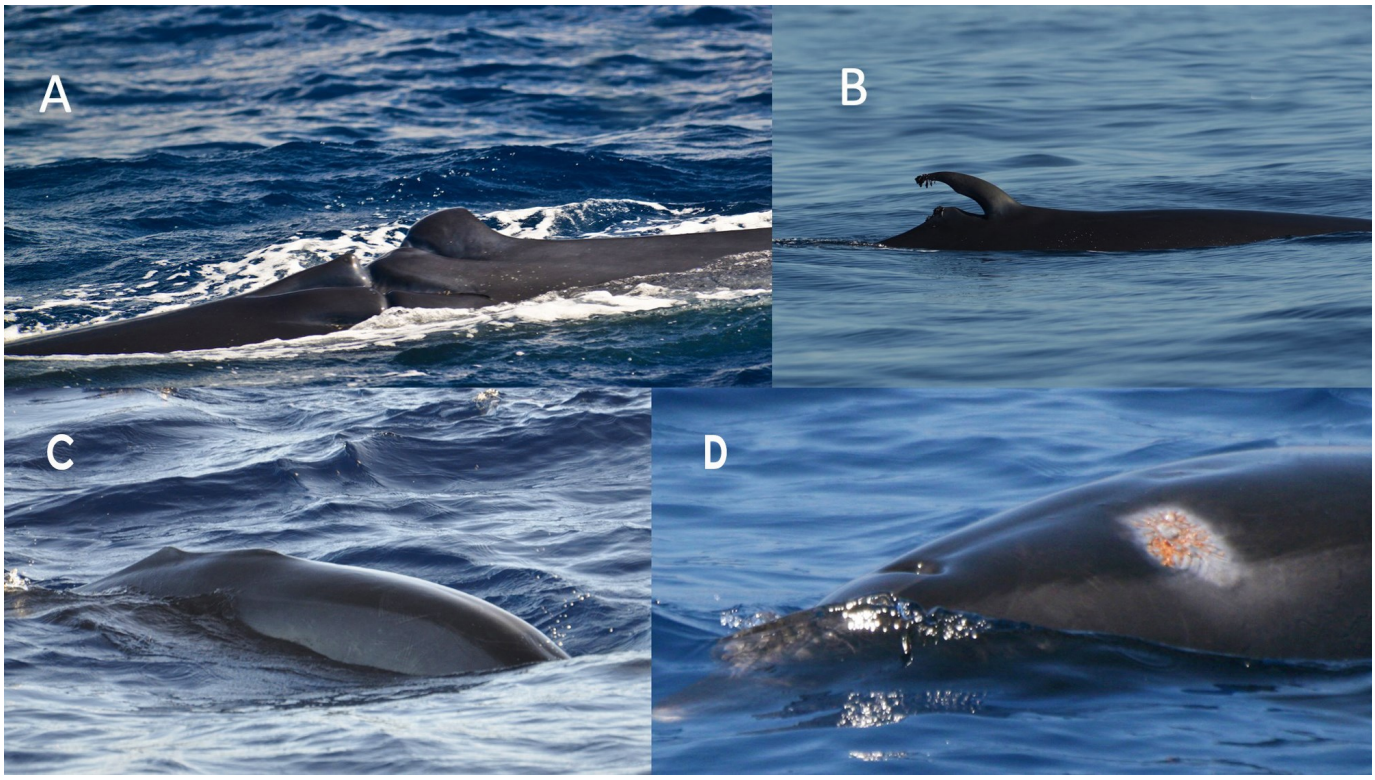

Figure 1: External injuries in cetaceans photographed between 2010 and 2018 off La Gomera, Canary Islands: A, B) Traumata on the back and dorsal fin of a Bryde's whale (Balaenoptera edeni). C) Complete amputation of the dorsal fin in a bottlenose dolphin. D) Open wound on the back of a bottlenose dolphin (Tursiops truncatus).

one *B. edeni* the dorsal fin had been partially amputated. In a *T. truncatus* photographed several times between 1998 and 2014 it had been completely severed (Figure 1C).

The dorsal fin of one *S. frontalis* had collapsed (Figure 2A), while in one *T. truncatus* and in one *S. bredanensis* it was partially bent to one side. All affected dolphins were adults. Collapse of the dorsal fin was associated with a cut in the trailing edge of the *S. frontalis*. Cuts and large scars were also seen on the side of the bent dorsal fin of the *T. truncatus*. The trauma that caused these injuries may have been at the origin of the bent dorsal fin.

Long, linear, white scars on the anterior body, tail and tailstock, likely caused by entanglement in fishing gears, were seen in three *T. truncatus*, two *G. macrorhynchus*, one *S. bredanensis* and one *S. frontalis*.

Scars and wounds affecting other body parts than the dorsal fin were seen in five species. Scars were more frequent than open wounds. Their size varied from about 2 cm to about 125 cm and were observed on the dorsal part of the back (69%) and on the tailstock (37%). Predation by killer whales (*O. orca*) was suspected in six cases (Table 2). Three to four parallel tooth rakes occurred on the back of three immature and and one adult *G. macrorhynchus* and two immature *S. frontalis*. The spaces between the tooth rakes marks were estimated to be over 20mm, and were within the range of inter-dental measurements for *O. orca* (Figure 2C, 2D, Table 2).

Wounds possibly caused by parasitic fishes (*Isistius sp*. and *Petromyzon marinus*) and the large copepod *P. balaenopterae* were seen in 18 individuals (Table 2). Fresh wounds were observed in 13 individuals of six species. In two *S. frontalis* they resembled the marks inflicted by *P. marinus*. In one *S. frontalis*, three *T. truncatus* (Figure 1D), four *G. macrorhynchus*, one *S. bredanensis*, one *D. delphis* and one *B. edeni* they were likely caused by *Isistius* sp., as described in other species (13, 32). Numerous, short linear scars surrounded by a pale halo, possibly caused by *P. balaenoptera*, occurred on the flank and back of two adult *T. truncatus*. Several light gray marks, some with a central pit, were present on the back of an adult *Z. cavirostris*. Two of them were seen close to the attachment site of a cluster of possible but unconfirmed *P. balaenoptera*. Four *G. macrorhynchus* had linear wounds of unknown origin on their back and dorsal fin, varying between approximately 10 to 30 cm in length.

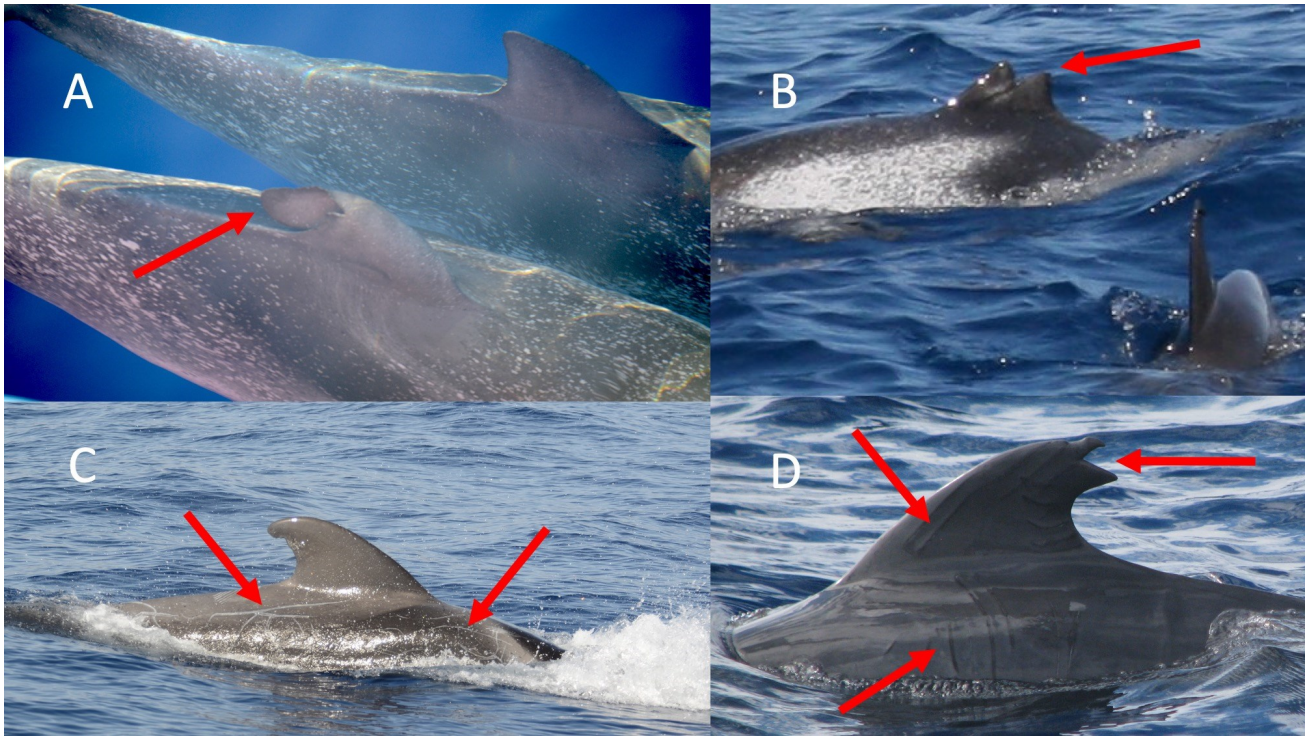

Figure 2: External injuries in cetaceans photographed between 2010 and 2018 off La Gomera, Canary Islands: A, B) Bent and cut dorsal fin in Atlantic spotted dolphins (Stenella frontalis). C, D) Scars on the body of short-finned pilot whales (Globicephala macrorhynchus).

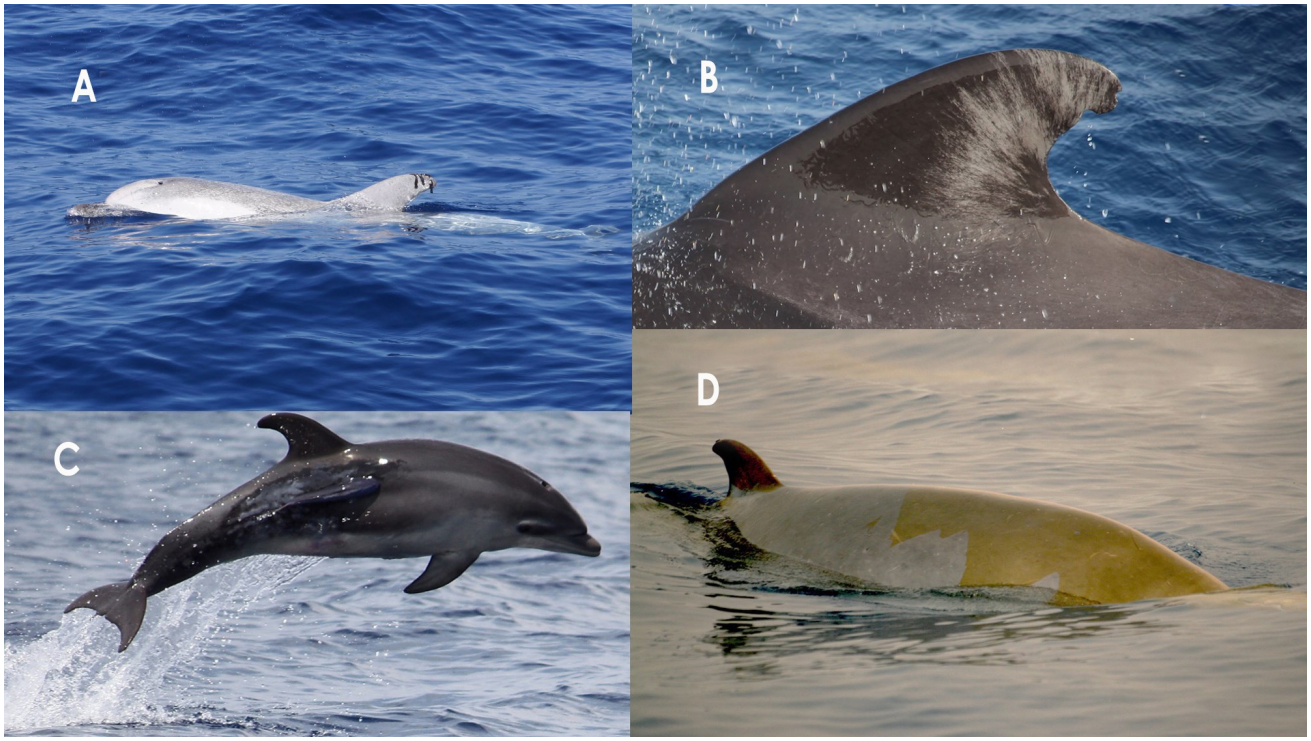

Figure 3: Skin disorders in cetaceans photographed between 1995 and 2018 off La Gomera, Canary Islands: A, B) Abnormal pigmentation in an Atlantic spotted dolphin (S. frontalis) and a short-finned pilot whale (G. macrorhynchus). C) Hypopigmentation associated with the presence of a remora in a bottlenose dolphin (T. truncatus). D) Yellow film on the back of a Blainsville's beaked whale (Mesoplodon densirostris).

Skin disorders:

Five types of skin disorders were observed in 76 individuals belonging to the seven species (Table 3). One *S. frontalis* and four *T. truncatus* individuals had at least two types of skin conditions. Cutaneous nodules and anomalous pigmentation were the conditions most frequently detected, followed by focal skin disease and tattoo skin disease. The majority of the 16 animals presenting cutaneous nodules were *T. truncatus* (N=11), of which 77% were adults and 23% immatures. Cutaneous nodules were additionally seen in two immature *S. frontalis*, two adult *G. macrorhynchus* and in one adult *D. delphis*. Abnormal pigmentation affected the dorsal fin, back, flank or beak of two *S. frontalis*, six *T. truncatus*, four *G. macrorhynchus*, two *S. bredanensis* and one *D. delphis*. One *S. frontalis* was mostly white, but as its eyes were not visible, it was not possible to determine if it was affected by leucism or albinism (Figure 3A). Pigmentation on the dorsal fin and side of another *S. frontalis* and of a *D. delphis* was lighter than in the other individuals of these species. Three *T. truncatus* and two *G. macrorhynchus* (Figure 3B) presented piebaldism, a condition characterized by the absence of pigmentation on the beak or the dorsal fin (Table 3).

Focal skin disease (FSD) characterized by black or white dots occurring on the back and flanks, evenly distributed or grouped in small clusters, was detected in nine *T. truncatus* (Figure 4D), one *S. frontalis*, one *G. macrorhynchus* and one *D. delphis* (Table 3). One *T. truncatus* also exhibited a white mark of unknown etiology on its neck. Most affected *T. truncatus* were adults.

Small to medium-sized tattoo skin lesions were seen on the back, head and flippers of three *S. frontalis*, two *T. truncatus*, two *S. bredanensis* (Figure 4B) and one *D. delphis*. Among these individuals a *S. frontalis* and a *T. truncatus* also presented pale skin patches (PSP). Tattoo number was generally low (<10). PSP affected the back and dorsal fin of two immature *S. frontalis*, one adult and one immature *T. truncatus* as well as of two adult *G. macrorhynchus* (Table 3).

Other skin disorders of unknown etiology were detected in 11 *T. truncatus,* one *G. macrorhynchus,* one *S. bredanensis,* one *Z. cavirostris* and one *M. densirostris* (Table 3). An irregular, dark and light grey patch was present on the right flank of an immature *T. truncatus,* close to the attachment site of a remora (Family Echeneidae) (Figure 3C). An extensive area of the dorsal fin and back of a mature female *M. densirostris* was covered by a yellow film (Figure 3D).

Table 3: Number of individuals with skin disorders in seven species of odontocetes observed off La Gomera, Canary Islands in 1995-2018 (N= total number; CNO= cutanous nodules; TSD= tattoo skin disease; FSD= focal skin disease; PSP= pale skin patches; ANP= anomalous pigmentation; OSD= other skin disorders; Mult. SDs=Multiple skin disorders (i.e. any combinations of the previous skin disorders).

	N	CNO	TSD	FSD	PSP	ANP	OSD	Mult. SDs
S. frontalis	10	2	3	1	2	2	0	1
T. truncatus	46	11	2	10	2	6	11	4
G. macrorhynchus	10	2	0	1	2	4	1	0
S. bredanensis	5	0	2	0	0	2	1	0
D. delphis	4	1	1	1	0	1	0	0
Z. cavirostris	1	0	0	0	0	0	1	0
M. densirostris	1	0	0	0	0	0	1	0
TOTAL	**76**	**16**	**8**	**12**	**6**	**15**	**14**	**5**

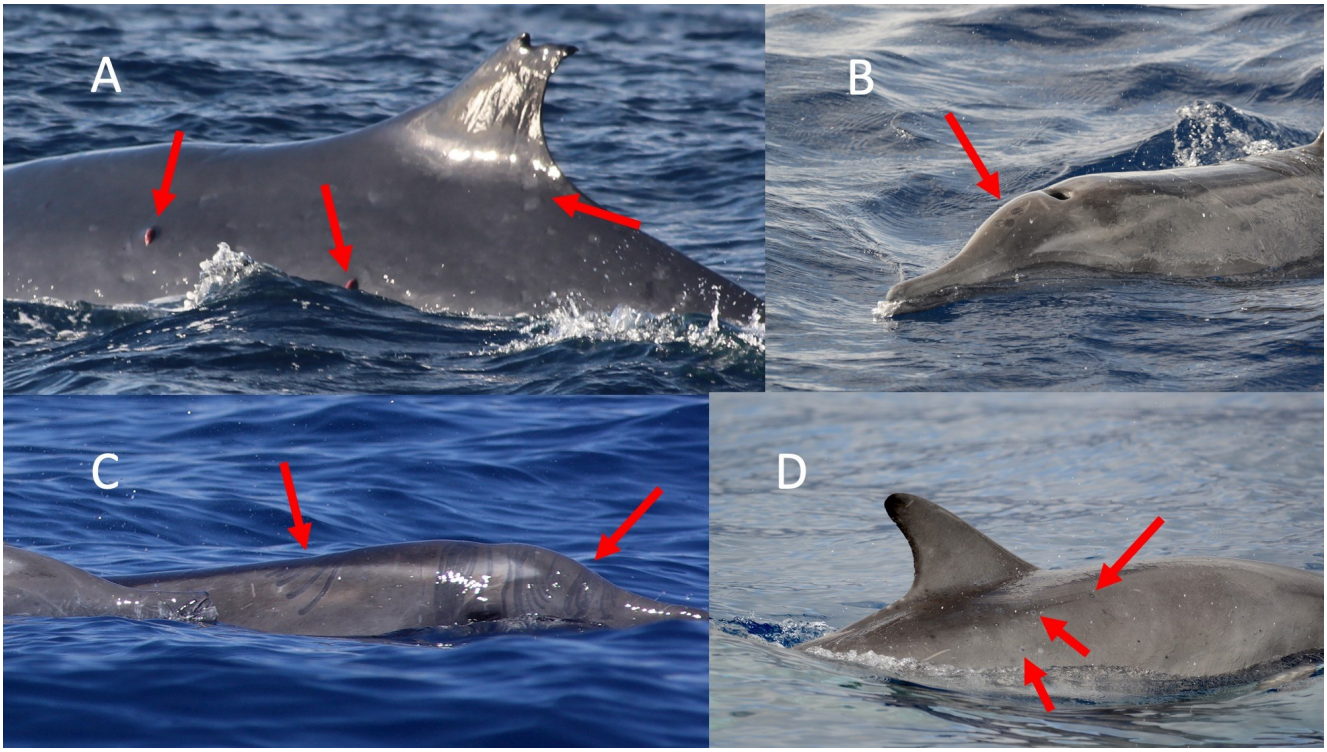

Figure 4: Skin conditions in cetaceans photographed between 1995 and 2018 off La Gomera, Canary Islands: A) Grey oval patches and unidentified parasite on the flank and back of a Bryde's whale (B. edeni). B) Tattoo skin disease in a rough-toothed dolphin (Steno bredanensis). C) Possible Physalia physalis marks in a rough-toothed dolphin. D) Focal skin disease in a bottlenose dolphin (T. truncatus).

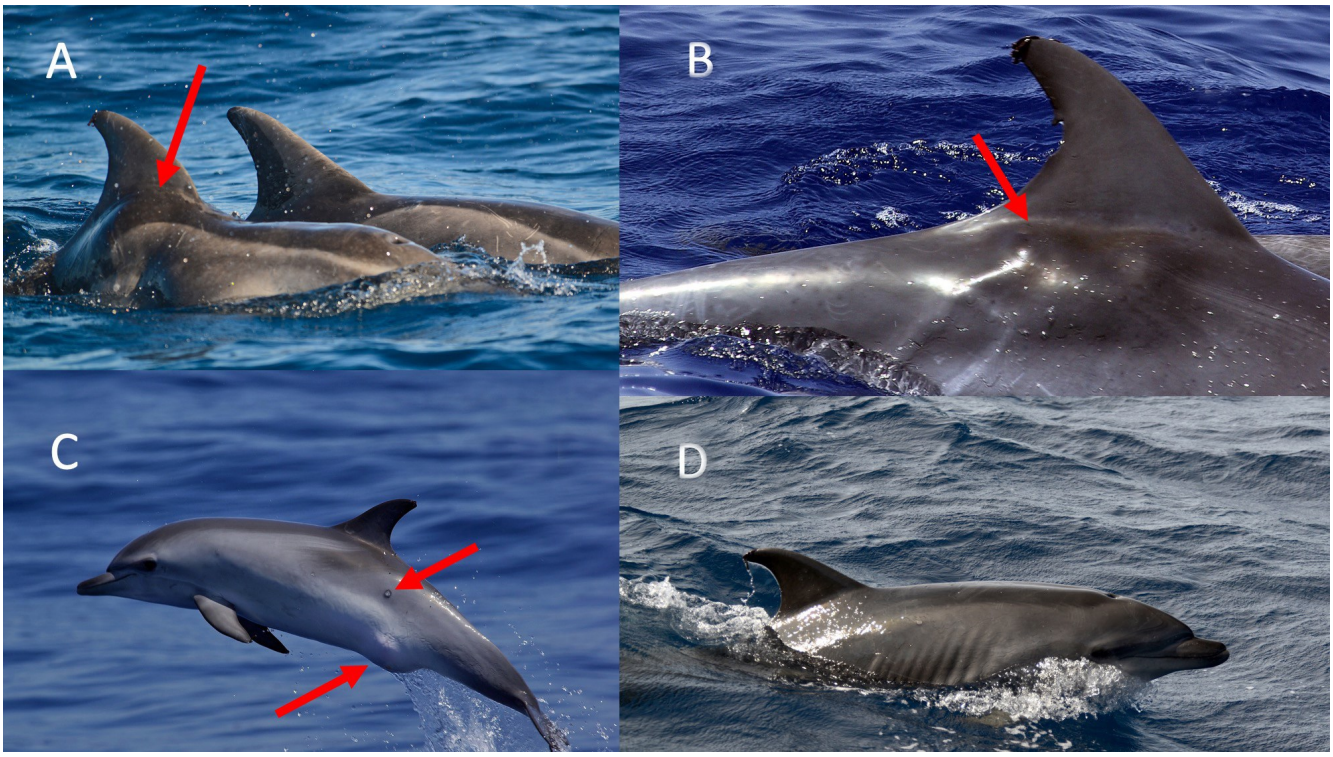

Figure 5: Pathological conditions in small cetaceans photographed off La Gomera, Canary Islands, between 1995 and 2018. A, B) Masses on the back of a rough-toothed dolphin (S. bredanensis) and a bottlenose dolphin (T. truncatus). C) Mass in the genital area of an Atlantic spotted dolphin (S. frontalis). D) Emaciated T. truncatus with ribs visible.

Some small to medium, light gray oval marks with a black outline occurred on the back and flank of three adults and one immature *T. truncatus*. Light gray blotches of varying size occurred on the back and dorsal fin of two adult *G. macrorhynchus*. Several linear, dark grey marks, possibly caused by the tentacles of a Portuguese Man-O-War (*Physalia physalis*), were present on the back and head of an adult *S. bredanensis* (Figure 4C).

Masses and deformations:

Masses were detected in two immature *S. frontalis*, one *T. truncatus* of unknown maturity and in one immature *S. bredanensis* (Table 2, Figure 5A, 5B, 5C). The *S. bredanensis* had a large mass extending on both sides of the dorsal fin base (Figure 5A). Fist-size lumps were seen on the right side of the back, below the dorsal fin in a *T. truncatus* photographed on 12 May 2011 (Figure 5B). When re-sighted on 15 October 2011, the lumps were no longer visible. One *S. frontalis* had a melon-sized lump around the genital region while the other presented a fist-sized lump on the lateral side of the flank (Figure 5C). The beak of an adult *T. truncatus* was abnormally curved upwards.

Body condition and *Xenobalanus sp.*:

Thinness and emaciation were seen in 25 *T. truncatus* of all age classes (2 calves, 4 immatures, 19 adults) and in one adult *G. macrorhynchus* (Table 2, Figure 5D). The ribs were visible in all individuals. One of them also presented an additional concavity of the epaxial musculature. Five *T. truncatus* and the *G. macrorhynchus* were sighted in April 2010. The other ten emaciated bottlenose dolphins were photographed from October to December 2014.

The coronulid barnacle *Xenobalanus* sp. was seen on the fins of eight *T. truncatus*, nine *G. macrorhynchus*, one *S. bredanensis*, four *S. frontalis,* one *Z. cavirostris* and one *B. edeni*, predominantly on the trailing edge of the dorsal fin.

Discussion

This study is based on photographs taken during whale watching trips from 1995-2018. It reports on the presence of skin diseases, injuries, anomalous pigmentation, masses and deformations in 8 cetacean species from the waters of La Gomera. Traumata characterized by partial or complete amputation of the dorsal fin, deep wounds and incisive cuts affected several individuals of each species. Entanglement in fishing gear and boat propeller strikes were suspected to have caused these injuries in six *T. truncatus*, nine *G. macrorhynchus*, three *S. bredanensis,* six *S. frontalis* and two *B. edeni.* Fishing activities occur year-round off the Canary Islands, regularly contributing to cetacean mortality (1, 12, 43). Vessel strikes are another significant cause of injuries and mortality in dolphins and whales from these waters (1, 10, 12). During the study period, several cetacean strandings were reported in the Canary Islands, of which a large proportion was caused by ship collisions and fishing activities (1, 12). Because of their regular, prolonged resting periods close to the surface, *G. macrorhynchus* may be prone to vessel strikes, which may explain the presence of these lesions in five individuals. In smaller dolphins, propeller strikes may occur when animals approached boats to bow-ride. Though dolphins and whales may survive entanglement in fishing gear and vessel strikes, the inflicted lesions and traumata likely increase stress and affect fitness, longevity and reproduction (57). Non-lethal injuries of anthropogenic origin are increasingly reported in cetaceans worldwide and are considered a threat to the survival and welfare of several species and populations (10, 18, 53).

The dorsal fin of one *S. frontalis* had completely collapsed and, in one *T. truncatus* and one *S. bredanensis*, it was partially bent to one side. Traumata may be at the origin of this condition. Collapsed and bent dorsal fins have been observed in a white-beaked dolphin (*Lagenorhynchus albirostris*) photographed off northern Newfoundland, Canada, in false killer whales (*Pseudorca crassidens*) from Hawaii and Aruba, and in killer whales from New Zealand, Norway and British Columbia, Canada (3, 24, 54). In a false killer whale (*Pseudorca crassidens*) from Hawaii, the dorsal fin collapse was associated with interactions with the tuna and swordfish long-line fishery (3). In one *L. albirostris* dorsal fin collapse was likely related to a gunshot wound on the anterior flank of the body. Other reported causes for these conditions in free-ranging odontocetes include intra- and inter-specific interactions, boat strikes and scarring from tags (3).

Skin diseases were observed in seven species of odontocetes and seemed common in *T. truncatus*, with a minimum of 29 individuals affected. Caused by cetacean poxviruses, TSD is endemic in several species worldwide with prevalence levels varying broadly between species and populations (16, 20, 51). Its epidemiological pattern is a potential general health indicator for cetaceans (47). Very large tattoos

suggestive of immune suppression were not seen during this study, and relatively few cases (one to five) were documented for each delphinid species. FSD was regularly seen in *T. truncatus* but rarely in the other species. Though herpesvirus-like particles were detected in FSD skin lesions sampled in dusky dolphins (*Lagenorhynchus obscurus*) from Peru, its origin is generally unknown (8, 39, 49). FSD has regularly been reported in several species of small cetaceans from the Americas, Europe and Australasia (8, 39, 58). Of unknown aetiology, pale skin patches affected a low number of *T. truncatus*, *S. frontalis* and *G. macrorhynchus.*

Epibiont diatoms are suspected as the aetiological agent of the extensive yellow film that covered the dorsal fin and back of a mature female *M. densirostris* (37). Anomalous pigmentation was detected in all five delphinid species. An immature *S. frontalis* was white on most of the visible body with a noticeably light grey cape. As its eyes were not visible, we could not determine if it represented a case of leucism (pigmented eyes) or albinism (unpigmented eyes). It could also have been a case of pseudo-albinism, as seen in Chediak-Higashi Syndrome, an inherited disorder characterized by diluted pigmentation patterns, white blood cell abnormalities, and a shortened life span that has been observed in a captive killer whale (15). Cost of abnormal colouration may include reduced heat absorption in colder waters, skin damage and increased conspicuousness to predators (15). In the eastern Atlantic, a white pigmented *S. bredanensis* calf was reported off the coast of Gabon, West Africa in 2009 (11). During the present study, one *T. truncatus* and two *G. macrorhynchus* displayed piebaldism, a condition characterized by the lack of pigmentation in some body areas (45). Caused by mutations in genes responsible for the production of melanin, albinism, leucism and piebaldism have been documented in several cetacean species (15, 27, 29, 45). Their frequency seems to increase with genetic isolation (27).

Emaciation and thinness were detected in 25 *T. truncatus* and one *G. macrorhynchus* and seemed to affect *T. truncatus* more severely during some years than during others, possibly because of lower prey availability, as a result of reduced productivity or overfishing. The fact that this condition almost exclusively affected *T. truncatus* and was observed in all age classes suggests that this population does not always catch enough food. The tuna fishery off La Gomera fluctuates according to the occurrence and abundance of its target species, which supposedly has the same prey as dolphins with which tunas form large aggregations (40). Emaciation was indeed observed during years of poor tuna catch (2011 and 2014) indicating that the strong inter-annual variability in primary and secondary productivity is affecting bottlenose dolphins. Prey limitation is one of the main anthropogenic threats affecting *O. orca* off the coast of Vancouver, limiting their reproduction and recovery (55).

Masses of unknown aetiology were detected in two immature *S. frontalis*, one adult *T. truncatus* and one immature *S. bredanensis*. In other cetaceans, swelling and masses were found to be abscesses, tumors and scarification tissue (23, 41). Obstruction of the urethra may have caused the mass in the genital region of a *S. frontalis.*

Fresh and healed bite marks, likely due to cookie -cutter sharks, occurred in *S. frontalis*, *T. truncatus* and *D. delphis*. The cookie-cutter shark *Isistius sp*. inhabits oceanic subtropical and tropical waters of the Atlantic, including the central eastern tropical Atlantic off North-West Africa (28, 44). *Isistius* sp. bites have been reported in fin (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*) and melon-headed whales (*Peponocephala electra*) from the waters of Cape Verde Islands (53) as well as in cetaceans from the Gulf of Guinea (11). A remora possibly caused a large cutaneous reaction around its attachment site in an immature *T. truncatus*. Small tooth-like projections of mineralized tissue known as spinules protrude from the suction disc of remoras, increasing their resistance to slippage and, possibly also causing abrasion and irritation of the host skin (4). Numerous, short linear scars surrounded by a pale halo occurred on the flank and back of two adult *T. truncatus* and a *Z. caivirostris.* Their origin remains unknown but similar scars have been observed in minke whales (*Balaenoptera acutorostrata*) following *P. balaenoptera* infestation (6, 37). The linear, dark grey marks observed on the back and head of an adult *S. bredanensis* may have been marks caused by the tentacles of Portuguese Man-O-War (*Physalia physalis*), a poisonous hydrozoan abundant off La Gomera in springtime and capable of inflicting painful stings. Though cetaceans were repeatedly sighted approaching Portuguese Man-O-Wars during this study, they were never seen in to be in direct physical contact with them. Nonetheless, it is possible that a dolphin can be accidentally hit by the tentacles when surfacing.

The coronulid barnacle *Xenobalanus* sp.

attached to the fins of *T. truncatus*, *G. macrorhynchus, S. bredanensis, S. frontalis, D. delphis* and *B. edeni*, predominantly on the dorsal fin trailing edge. This epibiont infests at least 34 cetacean species in both coastal and offshore waters from the Arctic to Antarctic (26) and is regularly seen in cetaceans off La Gomera. Two unidentified, short, pink, suspected parasites were attached to the left flank of an adult *B. edeni* (Figure 4A) together with several oval light grey scars, corresponding to the diameter of the organism's anterior body. Though the literature on external parasites and parasitic fishes in cetaceans was extensively reviewed, no similar observation could be found. In summary, these results indicate that a broad variety of parasites and commensals infest cetaceans in the waters around La Gomera.

Conclusion

During this study, several natural and pathological conditions were externally detected in cetaceans from La Gomera, with traumata, emaciation and skin diseases causing particular concern, especially in *T. truncatus* where they seem common. This study further confirms that visual health assessments are valuable, non-invasive tools to monitor pathological and natural conditions in cetaceans (6, 33, 58). Combined with studies on the pathology and toxicology of stranded whales and dolphins (1, 12, 17, 38, 43), visual health assessments provide a more complete picture of the threats affecting these marine mammals.

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