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True´s beaked whale (Mesoplodon mirus) in Macaronesia

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The True´s beaked whale (Mesoplodon mirus, True 1913) is a poorly studied member of the speciose Ziphiidae family. Its distribution in the North Hemisphere is thought to be restricted to the temperate or warm temperate waters of the North Atlantic, while a small number of stranding records from the Southern Hemisphere suggest a wider distribution, extending from the Atlantic coast of Brazil to South Africa, Australia and the Tasman Sea coast of New Zealand. Here we i) report the first molecular confirmation of the occurrence of True´s beaked whales around the Azores and Canary Islands (Macaronesian ecoregion), the species' southern limit in the northeast Atlantic; ii) describe a new colouration for this species; and iii) contribute to the sparse worldwide database of live sightings, including the first underwater video, of this species. In November 2012, a 390 cm male True's beaked whale stranded in El Hierro, Canary Islands. In July 2004, a subadult male True's beaked whale was found floating dead near Faial, Azores. Species identification was confirmed in both cases using mitochondrial DNA control region and cytochrome b gene markers. The whale that stranded in the Canary Islands had a clearly delimited white area on its head, extending posteriorly from the tip of the beak to cover the blowhole dorsally and the gular grooves ventrally. This colouration contrasts with previous descriptions for the species and it may be rare, but it demonstrates that True´s beaked whales show variable colourations in the North Atlantic. This is confirmed by sightings data. Given the presence of this species around the Azores and the Canary Islands, it would be expected that True´s beaked whales also occur in the area between these archipelagos, including the islands of Madeira.

True´s beaked whale (*Mesoplodon mirus*) in Macaronesia

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ABSTRACT

The True´s beaked whale (*Mesoplodon mirus*, True 1913) is a poorly studied member of the speciose Ziphiidae family. Its distribution in the North Hemisphere is thought to be restricted to the temperate or warm temperate waters of the North Atlantic, while a small number of stranding records from the Southern Hemisphere suggest a wider distribution, extending from the Atlantic coast of Brazil to South Africa, Australia and the Tasman Sea coast of New Zealand. Here we i) report the first molecular confirmation of the occurrence of True´s beaked whales around the Azores and Canary Islands (Macaronesian ecoregion), the species' southern limit in the northeast Atlantic; ii) describe a new colouration for this species; and iii) contribute to the sparse worldwide database of live sightings, including the first underwater video, of this species. In November 2012, a 390 cm male True's beaked whale stranded in El Hierro, Canary Islands. In July 2004, a subadult male True's beaked whale was found floating dead near Faial, Azores. Species identification was confirmed in both cases using mitochondrial DNA control region and cytochrome b gene markers. The whale that stranded in the Canary Islands had a clearly delimited white area on its head, extending posteriorly from the tip of the beak to cover the blowhole dorsally and the gular grooves ventrally. This colouration contrasts with previous descriptions for the species and it may be rare, but it demonstrates that True´s beaked whales show variable colourations in the North Atlantic. This is confirmed by sightings data. Given the presence of this species around the Azores and the Canary Islands, it would be expected that True´s beaked whales also occur in the area between these archipelagos, including the islands of Madeira.

Keywords: Ziphiidae, phenotype, genetics, North Atlantic, colouration patterns, mtDNA, cytochrome b

INTRODUCTION

Studies of animal distribution rely on the correct identification of the targeted species during surveys. This can be challenging for marine mammals that are present at the sea surface for short time periods, particularly when they share colouration patterns and morphology with closely related species. Such challenges are exemplified by members of the family Ziphiidae, which encompasses 22 species of beaked whales. Members of this family of deep diving whales display short breathing intervals at the sea surface (Aguilar de Soto et al., 2012). Also, this speciose family shows large intraspecific variability in colouration and interspecific similarities in general morphology, including in colour patterns (Mead, 2002). Due to the inherent difficulties in identifying beaked whales to species level at sea, sighting survey data for different ziphiid species are often pooled for analyses (Moore & Barlow, 2013), resulting in a loss of precision in our knowledge about the distribution of individual species.

Beaked whales are broadly distributed in all oceans of the world. Six species of three genus can be found regularly in the North Atlantic: Cuvier´s beaked whales and northern bottlenose whales (*Ziphius cavirostris* and *Hyperoodon ampullatus*, respectively), and four species of the genus *Mesoplodon*: Blainville´s, Sowerby´s, Gervais' and True´s beaked whales (*M. densirostris*, *M. bidens*, *M. europaeus* and *M. mirus*, respectively) (MacLeod et al., 2006). The large size and distinctive head morphology of Cuvier´s beaked whales and bottlenose whales facilitate their recognition at sea. In addition, adult *Z. cavirostris* often show white patches and this colour pattern provides a further identification cue (examples at www.cetabase.info). Mesoplodonts are similar in size and often difficult to identify at sea to species level, although teeth location in males, as well as beak and melon size and shape can be used as defining characteristics. Both Blainville´s and Sowerby´s beaked whales have very long beaks. These species can be distinguished by the arched lower jaw with protruding teeth, often covered in barnacles, of the males of *M. densirostris*, and the bulky melon and thin long beak of *M. bidens*. In addition, the

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distribution of these two species seems to only partially overlap, with the former preferring warmer waters than the latter (MacLeod et al., 2006). True´s and Gervais' beaked whales can share a general grey colouration, including a dark eye patch and a pale ventral area in some cases, and both have shorter, mostly straight beaks. These species are very difficult to distinguish at sea. The position of the teeth in the jaw of males provide the most definite cue, but teeth are not always easy to observe at sea, even when present. A defining characteristic is the melon, which is bulbous and well defined in True´s, albeit less so than in Sowerby´s beaked whales. In contrast, the melon of Gervais´ and Blainville´s beaked whales slopes gently towards the beak (Weir et al., 2004).

Live sightings of many beaked whale species are rare events, and few have been made of True´s beaked whales, with only three live sightings reported in the North Atlantic (Weir et al., 2004). The distribution of this species was thought to be restricted to temperate or warm-temperate waters of the North Atlantic until strandings in South Africa (Ross, 1969, 1984), Australia (Dixon & Frigo, 1994), New Zealand (Constantine et al., 2014) and Brazil (Mead, 1989; de Souza et al., 2004), revised in MacLeod et al., (2006), extended its known range to temperate waters of the Southern Indian and South Atlantic Oceans and the Tasman Sea. This shapes our current understanding that the species is unique among ziphiids in having an anti-tropical distribution (Mead, 1989; MacLeod et al., 2006). In the North Atlantic, the southernmost limit of True´s beaked whales is Macaronesia. The Macaronesian ecoregion contains, from north to south, the Azores, Madeira and Canary Islands archipelagos (Spalding et al., 2007): it has also been proposed to include the more southern Cape Verde archipelago for highly migratory species (Hernández, 2010). In the Azores, only one stranding of True´s beaked whale has been recorded: a subadult male 370 cm long, teeth not yet erupted. This whale was found floating at sea on 11 July 2004 close to Faial island (Silva et al., 2014). In the Canary Islands, a 500 cm long male beaked whale stranded in 1984 on the island of Lanzarote and was preliminarily identified as *M. mirus* due to its

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general morphology (Vonk & Martin, 1988). The species has never been recorded in the archipelagos of Madeira (Freitas et al., 2012) and Cape Verde (Hazevoet et al., 2010).

This paper reports the first occurrence of True´s beaked whales in the Canary Islands and in the Azores confirmed using molecular markers. Furthermore, the whale that stranded in the Canary Islands showed a colouration pattern not previously described for this species. These data are augmented with new records on live sightings of True´s beaked whales off the Azores and the Canary Islands, adding to the scarce number of records of this species at sea. These sightings are supported with video and photographic material, including the first underwater video of the species in the wild.

METHODS

Strandings and genetic analysis.

A 390 cm long beaked whale stranded at Timijiraque, El Hierro, Canary Islands, on the 30th of November 2012 (Figure 1). Observers at the beach reported that the animal might have been alive at the time of the stranding. The whale was identified as an immature male True´s beaked whale during the necropsy due to its external morphology, no teeth were present in the lower jaw. In the Azores, a subadult male stranded in 2004 (Silva et al., 2014) (Figure 2) and was identified to species by its general morphology and the presence of two small non-erupted teeth in the tip of the lower jaw.

Skin samples were taken from both carcasses of these two stranded whales and preserved in 95% ethanol. Total genomic DNA was isolated using standard proteinase K digestion and phenol/chloroform methods (Sambrook et al., 1989) or a DNeasy kit (Qiagen). Sex was confirmed by amplification of the male-specific *SRY* gene, multiplexed with an amplification of the *ZFY/ZFX* region as a positive control (Aasen & Medrano, 1990; Gilson et al. 1998). In order to confirm species identification, we amplified regions of both the mitochondrial DNA (mtDNA) control region and cytochrome *b* gene. Approximately

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300 bp of the mtDNA control region were amplified using primers M13dlp1.5 (Baker et al., 1998) and Dlp4-H (Dalebout et al., 2005) and approximately 200 bp of the cytochrome *b* gene using CYBMF-L and CYBMR-H primers (Dalebout, 2002) using standard protocols. These short fragments were targeted because the tissue, and hence DNA, was degraded, as samples were collected sometime after death. Polymerase chain reaction products were purified for sequencing with AMPURE^{XP} (Agilent) and sequenced with BigDyeTM Dye Terminator Chemistry (Applied Biosystems) on an ABI 3130 XL. Resulting sequences were edited in Geneious v7 (Biomatters, 2012). Species identification was made using the DNA surveillance website, constructing of a neighbour joining tree with the support of 1000 bootstraps (Ross et al., 2003), and by comparing the target sequences with other True's beaked whale sequences, available from GenBank (http://www.ncbi.nlm.nih.gov/genbank/) (Dalebout, 2004).

Live sightings

A live sighting at sea was recorded in the Azores on the 5th July 2013 offshore the island of Pico. During a field cruise of the educational program Master Mint (www.master-mint.de), a group of 3 beaked whales surfaced near a drifting small inflatable boat (Fig. 3). The animals were milling around the boat for about 10 min and breathed every 9.7 s on average. This allowed the observers to film the animals underwater (see Supporting Information – SI Video 1), providing high-quality images for species identification.

Shorter sightings were recorded in the Azores by Whale Watch Azores (1994) and CW Azores (2010), and gathered in the Canary Islands from 2012 to 2015 by observers from the Cetacean and Seabird Sighting Network of the Canary Islands "CetAVist" (www.aviste.me) on board passenger ferries. These sightings were identified as sure or probable True´s beaked whales through examination of photographs, considering the colouration as well as the head and beak morphology of the animals. No teeth could be

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observed in any photograph. This and the poor quality of most photos challenge the certainty of the identification to species level. Photos of live sightings were sharpened and their contrast augmented with software packages Photoshop and GIMP.

Ethics

This work did not require ethical authorization because sightings were gathered opportunistically from ferries or permitted whale watching/educational boats performing their usual activities. Samples of the two whales found dead in the Canary Islands and the Azores were gathered for genetic analysis with authorization of the Cabildo Insular of El Hierro and the Spanish Ministry of Agriculture and Environment (MAGRAMA) and from the Government of the Azores.

RESULTS

Strandings and genetic analysis.

Genetic sex identification confirmed that the specimens stranded in El Hierro (Canary Islands) and found drifting near Faial (Azores) were males. Robust support placed both the El Hierro query sequence (mtDNA control region: 98%; cytochrome *b* gene: 94%) and the Azores' query sequence (mtDNA control region: 97%; cytochrome *b* gene: 94%) in a species-specific clade with True's beaked whale sequences using DNA surveillance.

Furthermore, both the mtDNA and cytochrome *b* sequences from both the El Hierro and Azores' males most closely matched GenBank sequences identified as True's beaked whales, when accessed in May and November 2015, respectively. True's beaked whale sequences from whales that had stranded on the Atlantic coast of the U.S.A. (Accession numbers U70465.2 and AY579525.1) were the closest matches to both the El Hierro sample (U70465.2: 99% sequence identity, E-value 9e-153 and AY579525.1: 98%

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sequence identity, E-value 4e-151) and the Azores' sample mtDNA sequences (U70465.2: 98% sequence identity, e-value 7e-152 and AY579525.1: 100% sequence identity, e-value 7e-147). The two top matches against the cytochrome *b* sequence for both samples were accession numbers AY579551.1 (El Hierro sample: 95% sequence identity, e-value 3e-70; Azores' sample: 99% sequence identity, E-value 3e-112), a beaked whale that stranded on the Atlantic coast of the U.S.A., and accession number KF435028.1, a sequence from a whale that stranded in New Zealand (El Hierro sample: 94% sequence identity, e-value 3e-61, Azores' sample: 95% sequence identity, E-value 4e-81).

Live sightings

Photographs and video from a live sighting of True´s beaked whales in the Azores (Sighting 1 in Table 1) revealed that individuals in the group showed a blaze of pale colouration on their heads, extending horizontally from behind the blowhole to the top of the melon and reaching ventrally to the eye and the start of the mouthline (see Figure 3 and SI video 1). No obvious size differences were observed among the individuals in the group and the three animals observed did not have erupted teeth. This blaze was not evident in animals identified as possible True´s beaked whales in Azores (Sighting 2 in Table 1, Fig. 4), but it was clearly visible in animals identified as True´s beaked whales (Sighting 3 in Table 1, Fig. 5, and stranded whale in Fig. 2) in this archipelago.

Table 1: Live sightings of sure and possible sightings of True´s beaked whales in the Azores and Canary Islands. Sightings classified as "possible" may be of True´s or Gervais' beaked whales.

Sighting	Location	date	Latitude (N)	longitude (W)	nº	calves	behaviour	certainty	Figures Video
1	Azores	5 May 2013	38.4889	28.46388	3	no	milling	sure	Fig. 3 SI video 1
2	Azores	7 Sept 1994	38.36	28.37667	3	no	travelling	possible	Fig. 4
3	Azores	31 Jul 2010	38.3396	28.35725	-	-	breaching	sure	Fig 5
4	Canary Is	27 Aug 2013	28.3100	14.9900	2	no	breaching	possible	Fig. 6
5	Canary Is	11 Jul 2015	28.45026	14.70484	2	no	breaching	possible	Fig. 7

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None of the whales in the video (SI video 1), nor the whales identified as possible True´s beaked whales in other live sightings in the Azores and the Canary Islands (listed in Table 1), showed the unusual white head colouration evident in the whale stranded in El Hierro (Figure 1). This white colouration covering all the anterior part of the head, including the melon, beak and lower jaw, has not been previously described for this species. In contrast, the live sightings showed different colouration patterns previously described for the species, such as a dark eye patch and dark dorsal cape (Tove, 1995); a contrasting colour in the head, grey in the dorsum and white in the lower jaw, or a mostly grey head. The two possible sightings in the Canary Islands were of whales breaching repeatedly (Figures 6, 7). This is consistent with the three live sightings of True´s beaked whales previously cited for the eastern North Atlantic (Bay of Biscay) (Weir et al., 2004) (Figure 8), however, we cannot dismiss that some whales classified as probable True´s beaked whales in this paper may be Gervais' beaked whales. All sightings in the Canary Islands occurred in waters depths >2000 m.

DISCUSSION

New records of data-scarce species, such as True´s beaked whales, are highly valuable in increasing our existing knowledge about the morphology, behaviour and distribution of these species. True´s beaked whales in the North Atlantic are described as greyish in colouration, with some individuals displaying a dark eye mark and a dark blaze in the upper part of the body, from behind the blowhole to past the dorsal fin (Tove, 1995). Recent descriptions report that some animals may show a pale ventral colouration, sometimes extending to the lower jaw, while other animals may have a pale blaze on the melon (Weir et al., 2004). Other colour patterns have been found in the southern hemisphere, where a female stranded in South Africa had a whitish dorsal colouration, including the dorsal fin and extending to the tail peduncle (Ross, 1984). The True´s beaked whale stranded in El Hierro had a clearly delimited

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white mask covering the anterior part of the head, from the blowhole and the gular grooves to the rostrum (Figure 1). This pattern of pigmentation seemed too well defined to be the result of a post mortem discolouration. In fact, the general trend is for the colour of beaked whales to darken after stranding due to decomposition. While this does not seem to explain the striking white colouration pattern on the head of the whale stranded in El Hierro (A. van Helden, T. Pusser, pers. comm.), it may increase the contrast between the white head and the grey body after stranding.

However, the animal might have stranded alive and was quite fresh when the photographs were taken, suggesting that the white cephalic patch observed in the specimen stranded in El Hierro was present in the living animal. The white head colouration described here for True´s beaked whales increases the probability of confusing this species with Cuvier´s beaked whales. Cuvier´s beaked whales often have a white colouration on their rostrum and frontal part of the head (see examples at www.cetabase.info), reminiscent of the colour pattern shown by the True´s beaked whale stranded in El Hierro. However, as this colouration has only been observed in one individual of *M. mirus*, it may not be frequent in this species.

While a white rostrum had not been previously described for True´s or Gervais' beaked whales, both species may have a pale ventral colouration covering the lower jaw, sometimes extending dorsally to surround the dark patch of the eyes. Also, a light colour blaze on the melon may be a common feature for True´s beaked whales inhabiting the North Atlantic. True´s beaked whales with a pale blaze on their melon were observed off the Azores (Table 1 Sighting 1 & 3, Figures 3 & 5, SI video 1) and previously in the eastern North Atlantic (Weir et al., 2004). A similar blaze has been observed in True´s beaked whales in the western North Atlantic, in animals of both sexes and with different sizes, albeit the pale colour disappear rapidly in stranded whales (T. Pusser, pers. comm.). These findings suggest that the pale blaze in the melon may pass unnoticed in strandings unless stranded animals are very fresh. A clear

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colouration in the ventral side of the body seems to be common also, and this can reach the lower jaw and extend upwards to surround the dark eye patch (Figure 2).

In contrast with the colouration patterns described above, some True´s beaked whales in the North Atlantic tend to be more uniformly grey (Weir et al., 2004) (Figure 8). However, at least in some cases True´s beaked whales may have a small pale mark in the genital-anus area (http://vertebrates.si.edu/mammals/beaked_whales/pages/mmi/mmi_sp_pg7.htm). This was observed in an animal photographed in the Bay of Biscay (Weir et al., 2004) (Figure 8) where the consistent location of white points at the tip of the lower jaw in several successive photographs strongly suggests that these points are the teeth of the whale, confirming its identification as True´s beaked whale. A similar genital white patch was observed in a live sighting of Gervais´ beaked whales in the Canary Islands (Figure 9), and previously in stranded whales of this species in the archipelago (unpublished data from the Canary Islands Stranding Network by V. Martín and M. Carrillo). This similar genital marking in True´s and Gervais´ beaked whales increases the difficulties inherent in the distinction of these two species at sea. Variability in colour patterns is not surprising for ziphiids. These animals often undergo ontogenetic changes in colouration, but colouration can vary even among individuals of apparently the same size and sex classes (Mead, 2002). Similarities in general colouration patterns, size/morphology and behaviour among most *Mesoplodon* species, as well as intraspecific variability in colouration for some species, challenge taxonomic identification at sea. This may cause a bias when assessing the relative abundance of *Mesoplodon* species in the North Atlantic. Animals for which recognition is challenging will be often classified during surveys as unidentified beaked whales, while recognizable animals will be classified to species level. This will result in an apparent lower relative abundance of species difficult to recognize at sea. The relatively short beak, mostly straight mouthline, overall colouration and dark eye patches of North Atlantic True´s beaked whales renders confusion with Gervais' beaked whales. An important cue

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253 to differentiate these species is the pronounced and rounded melon of True´s beaked whales (e.g.
254 Figures 1, 3), contrasting with the relatively more flat-topped melon of Gervais' beaked whales slopping
255 gently towards the beak (Figure 10). However, this may be difficult to judge in photos taken from
256 different perspectives. When present and visible, the intraspecific scarring pattern can also be used to
257 distinguish among species. While True's beaked whales may show parallel and close linear scars,
258 Gervais' whales are expected to display single linear scars due to the position of the erupted teeth in
259 males of both species (Weir et al., 2004). Parallel scars are visible in Sighting 2 (Table 1, Figure 4),
260 supporting that these animals were indeed True´s beaked whales.
261 Behaviour may offer a further, albeit ambiguous, cue for species identification in the field. During 13
262 years of observations of Blainville´s and Cuvier´s beaked whales off El Hierro, we have gathered
263 thousands of sightings for these species (Aguilar de Soto, 2006; Arranz et al., 2014) and Blainville´s
264 beaked whales were observed to breach only on one occasion. In contrast, Cuvier´s beaked whales in the
265 same study were observed to breach more often (N. Aguilar unpublished data). Sowerby´s beaked
266 whales in the Azores and northeastern Atlantic breach with some frequency as well (D. Walker, F.
267 Visser, pers. comm.). The whales classified as possible True´s beaked whale in the Canary Islands were
268 breaching repeatedly in the two sightings reported here. This behaviour is consistent with the
269 observations of repeated breaching from the Bay of Biscay (Weir et al., 2004) (Figure 8), but it is shared
270 by Gervaís´ beaked whales observed in the Canary Islands (see SI video 2). Given the difficulties in
271 recognizing True´s beaked whales at sea, it is possible that the apparent prevalence of breaching
272 behaviour is simply reflecting that repetitive breaching exposes more of the body of the whales and
273 provides more time to get photographic supporting material for identification. However, it is also
274 possible that True´s beaked whales tend to breach more than some of the other *Mesoplodon* species.

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This is true at least when comparing True´s with Blainville´s beaked whales, for which enough sighting data are available to show that they do not tend to breach (N. Aguilar. unpublished data).

Given the presence of True´s beaked whales in the Azores and Canary Islands, it would be expected that this species also occurs in the area between these archipelagos, including Madeira. However, knowledge about the distribution of beaked whales in the eastern North Atlantic Ocean is limited in part by the relative scarcity of offshore cetacean surveys in Macaronesia. Recently, the Cetacean and Seabird Sighting Network of the Canary Islands (CetAVist, www.aviste.me) has increased survey effort in the deep waters of the inter-island channels. This has resulted in additional sightings of beaked whales, including sightings tentatively identified as True´s beaked whales. However, we cannot dismiss the possibility that some of these sightings may be a misidentification of Gervais´ beaked whales. Sightings of True´s and possible True´s beaked whales in the Azores and Canary Islands occurred from July to November (Table 1) but the sample size is too low to infer any conclusion about seasonality of occurrence. The scarcity of sightings of True´s beaked whales may reflect a low abundance of this species and/or a preference of this species for deep waters far from the slope, where little survey effort has been invested. The latter is supported by the lack of sightings of True´s beaked whales in relatively nearshore deep waters on the slope of the Canary Islands, where other beaked whale species are found routinely. Seasonal surveys in coastal deep waters off the Canary Islands in the last decade have not recorded any sighting of True´s beaked whales, while Cuvier´s, Blainville´s and Gervai´s beaked whales are observed or strand year round (Aguilar de Soto, 2006; Martín, 2011; Arranz et al., 2014); Martín, 2011). The first two species seem to have a preference for the slope (Arranz et al., 2014), while the sightings of probable True´s in the archipelago have been recorded at >2000 m water depth.

The disjointed global distribution of True´s beaked whales has led some authors to suggest that there may be some degree of genetic isolation between the populations of the southern and northern

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hemispheres (MacLeod et al., 2006). These authors go further and propose that more research is required in order to assess if the northern and southern populations might represent different species. This was the case of the only other two ziphiids thought to have an anti-tropical distribution, which were finally separated as different species: Hector´s and Andrews´ beaked whales. *M. hectori* and *M. bowdoini*, were separated from *M. perrini* and *M. carlhubbsi*, respectively. The results of the genetic analysis shown here suggest a phylogeographic pattern for True´s beaked whales, as the sequences from the Canary Islands and Azores' matched most closely to those True's sequences on GenBank from the North Atlantic. However, more data are required to test this hypothesis.

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395 **Supporting information video captions**

396 S1. Underwater video of True´s beaked whales recorded off the Azores by R. Edler within the Master
397 Mint program (Sighting 1, Azores, Table 1).

398

399 S2. Gervais´ beaked whales in a group of four whales breaching repetitively in the Canary Islands,
400 recorded by Roland Gocker (M.E.E.R.).

401

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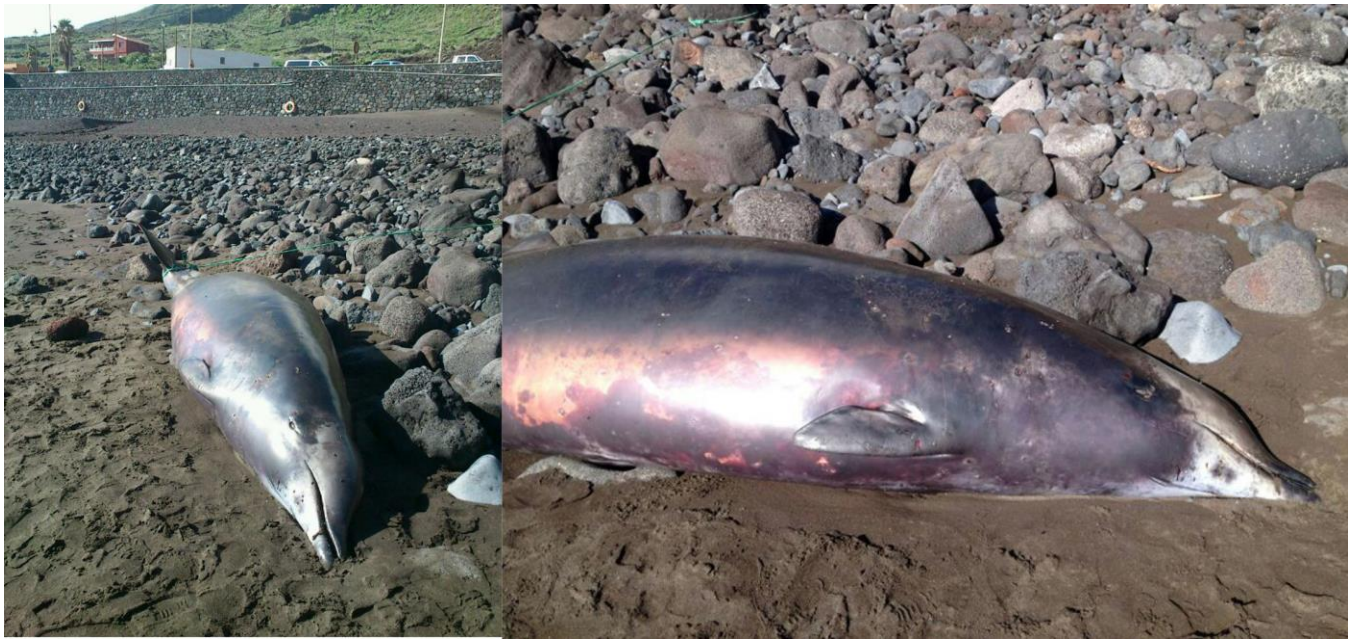

Figure 1: True´s beaked whale stranded in El Hierro (Canary Islands) showing a colouration not described previously for this species. Photos: Baudilio Quintero.

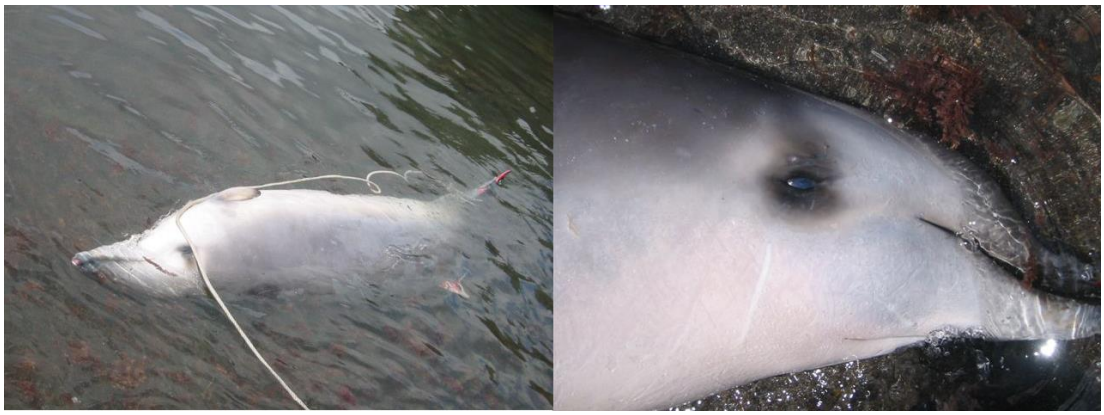

Figure 2:True´s beaked whale found drifting off Pico (the Azores). Photo: Mónica Silva.

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Figure 3:True´s beaked whale observed off Pico showing a pale blaze on the melon (Sighting 1 Azores in Table 1; SI video 1). Photo: Roland Edler.

Figure 4: Possible True´s beaked whale observed off Pico (Sighting 2 Azores in Table 1). Photo: Lisa Steiner.

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Figure 5:True´s beaked whale observed off Pico showing a pale blaze on the melon (Sighting 3 Azores in Table 1). Photo: Petra Szlama.

Figure 6: Possible True´s beaked (Sighting 4, Canary Islands, Table 1). Photos: Cristel Reyes.

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Figure 7: Possible True´s beaked whale breaching (Sighting 5, Canary Islands, Table 1). Photos: Antonio Portales.

Figure 8. True´s beaked whale breaching. Bay of Biscay. Photos. Dylan Walker.

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Figure 9: Gervais´ beaked whales breaching repeatedly in the Canary Islands (SI Video 2). Photos: Michael Scheer.

Figure 10. Gervais´s beaked whale observed off Tenerife (Canary Islands). Note the head morphology of this whale in comparison with True´s beaked whales. Photo: Sergio Hanquet.

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