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First live sighting of Deraniyagala's beaked whale (*Mesoplodon hotaula*) or ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*) in the western Pacific (South China Sea) with preliminary data on coloration, natural markings, and surfacing patterns

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Abstract

Beaked whales represent around 25% of known extant cetacean species, yet they are the least known of all marine mammals. Identification of many *Mesoplodon* species has relied on examination of a few stranded individuals. Particularly, the ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*) and Deraniyagala's beaked whale (*Mesoplodon hotaula*) are among the least-known of beaked whale species, without confirmed sightings of living individuals to date. We present a sighting of 3 free-ranging individuals of *M. ginkgodens/hotaula* whale from a dedicated marine mammal vessel survey carried out in the South China Sea in April and May 2019. Photographic data (301 photographs) from the sighting were compared to photos of fresh stranded ginkgo-toothed beaked whale and Deraniyagala's beaked whale from both historical and unpublished records. We found that free-ranging *M. ginkgodens* and *M. hotaula* individuals can be easily distinguished from other *Mesoplodon* species due to differences in melon and gape shapes and coloration patterns. However, accurate at-sea differentiation of *M. ginkgodens* and *M. hotaula* may not be possible due to high similarity in both coloration and scarring patterns. In addition to our photo-identification data, we collected what we believe to be the first preliminary descriptions of surfacing behavior and diving patterns of one of these species. Finally, the presence of scars possibly caused by fishing gear or marine litter raises concerns about anthropogenic impacts and conservation of these poorly known species.

Key words: Deraniyagala's beaked whale, ginkgo-toothed beaked whale, marine litter, Mesoplodon, South China Sea

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INTRODUCTION

Beaked whales belong to the Ziphiidae family, which is the least known of all cetacean families. At least 23 beaked whale species belonging to 6 genera have been described thus far comprising approximately one fourth of the world's extant cetacean species (Committee on Taxonomy 2020). Beaked whale species mostly live in deep offshore waters (e.g. Correia *et al*. 2015) performing long and deep dives in search of their food (e.g. MacLeod *et al*. 2006). Although knowledge of their ecology increased substantially during the last 2 decades, most beaked whale species remain little studied and knowledge regarding these species is based on examination of few stranded individuals (Hooker *et al*. 2019). Due to the difficulty in both detection and recognition, basic information about diving behavior of some *Mesoplodon* species, such as the ginkgo-toothed (*Mesoplodon ginkgodens*; Nishiwaki & Kamiya 1958) and Deraniyagala's beaked whale (*Mesoplodon hotaula*; Deraniyagala 1963a), have yet to be collected (Hooker *et al*. 2019).

The ginkgo-toothed beaked whale was first described from a specimen stranded in 1957 (Nishiwaki & Kamiya 1958). *M. ginkgodens* is known from less than 40 stranding records restricted to the Pacific and Indian Oceans (Brownell *et al*. 2013), approximately half of which are from Chinese Taiwan and south western Japan (Nishiwaki & Kamiya 1958; Yamada *et al*. 2012). Strandings have also been reported in mainland China (Mead *et al*. 1988), however after (i) a mtDNA analysis and (ii) the re-analysis of skull specimens and comparison with specimens of skull, nasal, mandible, and teeth of ginkgo-toothed beaked whales stranded in Chinese Taiwan, the specimens stranded in mainland China were re-identified as Blainville's beaked whale (*Mesoplodon densirostris*) (Wang *et al*. 2011).

In 2014, Dalebout and colleagues showed genetic and osteological evidence supporting the recognition of a previously synonymized species of *Mesoplodon* beaked whale in the tropical Indo-Pacific, the Deraniyagala's beaked whale. The Deraniyagala's beaked whale was recognized as a different species closely related to *M. ginkgodens*. The Deraniyagala's beaked whale was initially described in 1963 (Deraniyagala 1963a,b), but was quickly synonymized with *M. ginkgodens* (Moore & Gilmore 1965). With the recent recognition of the Deraniyagala's beaked whale it is currently uncertain how many of the historical records relating to the ginkgo-toothed beaked whale were actually Deraniyagala's beaked whale (Waller 2017). This confusion was partly resolved by Dalebout *et al*. (2014) that genetically validated the identifications of 5 nominal specimens of the ginkgo-toothed beaked whale and 6 nominal specimens of Deraniyagala's beaked whale. Both these species of *Mesoplodon* whales are present in the Pacific and Indian Oceans where they appear to be largely parapatric (Brownell *et al*. 2013; Dalebout *et al*. 2014) but the Deraniyagala's beaked whale appears to have a more restricted distribution range than the ginkgo-toothed beaked whale (Brownell *et al*. 2013). The Deraniyagala's beaked whale is currently identified from only 8 specimens collected from tropical islands in the western and central Indian Ocean and central Pacific (Dalebout *et al*. 2014; Lacsamana *et al*. 2015).

Deraniyagala's beaked whale (hereafter DBW) and ginkgo-toothed beaked whale (hereafter GBW) are among the least-known of beaked whale species. Data from strandings indicate that the 2 species may be a similar size (Brownell *et al*. 2013); however, almost nothing is known about their appearance and biology. Thus, great uncertainty remains concerning the diagnostic features of these species, making them almost impossible to identify with certainty at sea. Some sightings and acoustic recordings of *Mesoplodon* species around Palmyra Atoll (central Pacific) are believed to be of these species (Baumann-Pickering *et al*. 2010, 2013). Particularly, a mother and calf pair of presumable DBW was photographed at Palmyra Atoll in late 2007 (Pitman & Ballance 2008; Brownell *et al*. 2013). So far, there are still no confirmed live sightings of GBW. In order to better understand the distribution and population status of these species, the priority is to learn to identify them in the field.

Here, we present a vessel-based, at-sea sighting of three free-ranging individuals of GBW/DBW with accompanying photographic evidence from dedicated marine mammal surveys in the South China Sea. We believe this is the first description of pigmentation and scarring pattern and surface behavior of living individuals of these species.

MATERIAL AND METHODS

The scientific expedition was conducted onboard the 50-m-long *RV Tian'e* from April 26 to May 10, 2019 (for details, see Lin *et al*. 2020). The study area extended on the northern part of the South China Sea (Fig. 1). In order to collect cetacean sightings, during daylight hours, a group of 4 to 6 observers were continuously scanning the 180° forward sector using 7 × 50 binoculars. Cetacean sighting reports included location, date, time, species identifications, group size, and environmental data (e.g. sea and wind state). Data about surface behavior (travelling, logging, breaching, etc.) and inter and intra-dive duration were recorded. Video and photographs were also taken. The videos collected were used to estimate the average number of respiration per minute per whale (respiratory frequency).

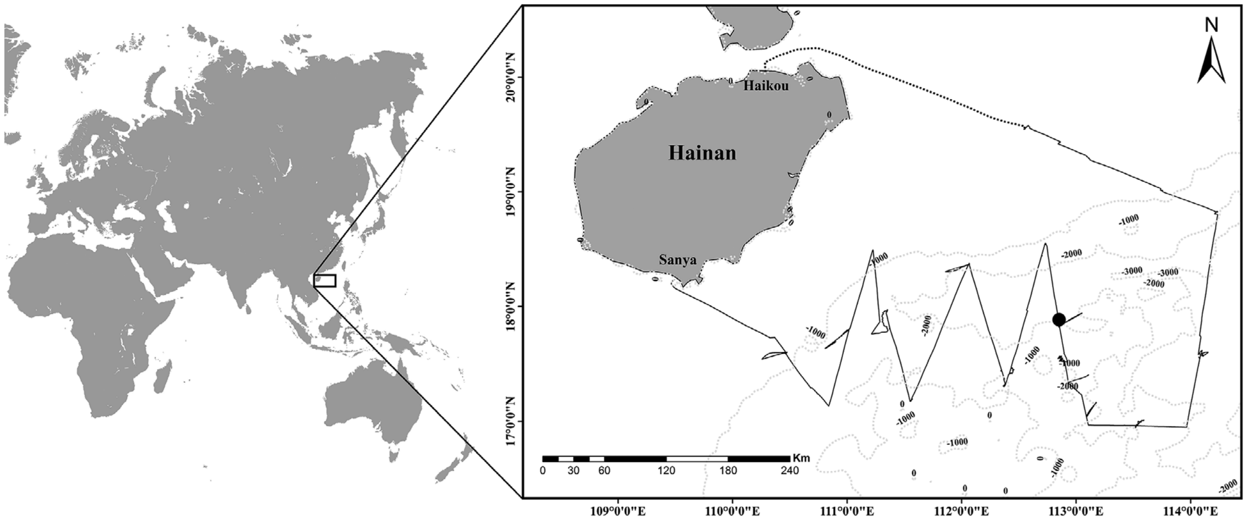

Figure 1 Study area and survey route (solid line when the sampling was in "on effort" mode); the depth contours unit is meter. The black dot indicates the position of the beaked whales sighting.

Following Yahn *et al*. (2019) methods, fin and body measurements were obtained from at-sea photographs of the sighted whales. Seven lateral and three vertical lengths were measured in pixels and compared as relative measurements (Table 1). Moreover, we quantified the number of cookie-cutter shark (*Isistius* spp.) bite scars either re-pigmented or not, visible on the whales flank. The ratio between fresh and re-pigmented cookie-cutter shark scars was assessed.

The photographic data collected during the survey was compared with photos from fresh stranded specimens, which species were confirmed through genetic analysis: (i) GBW—2 adult males from New Zealand (fig. 8 and suppl. fig. 6 in Dalebout *et al*. 2014) and a 466-cm long adult female stranded along Pingtan island in Fujian province (China) on July 9, 2019 (Xianyan Wang–Third Institute of Oceanography, unpublished data; Fig. S1, Supporting Information, of this paper); (ii) DBW–1 adult male from Seychelles (fig. 7 and suppl. fig. 5 in Dalebout *et al*. 2014) and an adult female from Philippines (fig. 1 in Lacsamana *et al*. 2015). Moreover, we also made a comparison with the photos of presumable free-ranging DBW adult female photographed around Palmyra Atoll (Pitman & Ballance 2008; Brownell *et al*. 2013).

RESULTS

On May 2, 2019, at 0732 UTC + 8, position 17°53′177″N, 112°51′121″E (Fig. 1) in conditions of around 50 cm swell height and calm winds (Beaufort scale 2, Douglas scale 1), we observed a group of beaked whales. The group size estimated *in situ* was of 3 individuals, afterward confirmed by 301 photographs and approximately 2 min of video taken during the encounter. The 3 animals were similar in size and visually estimated to be 4.5 to 5 m long. Biopsy sampling was not attempted since the animals were always out of the cross-bow range (distance from the ship >50 m).

Good quality photographs were collected from 2 of 3 individuals sighted, hereafter indicated as ind#1 and ind#2. The general body profile was similar to other ziphiids, with a relatively small, moderately falcate dorsal fin set approximately two third of the body length posterior to the rostrum (Fig. 2). The whale rostrum graded into a gently sloping melon and the upper jaw looked relatively slender. The animal eyes were located about half a beak length behind the angle of the gape. Surfacing generally involved the rostrum skimming through the surface at around 40° angle to the water—keeping the forehead almost at a parallel angle to the water surface—exposing the full length of the rostrum (Fig. 3) similar to the surfacing of various *Mesoplodon* species. Both ind#1 and ind#2 showed a small indentation in the upper lip just behind the arch of the gape. The indentation in the ind#1 was less evident and positioned more caudally than the indentation of ind# 2 (Fig. 3).

The 2 individuals showed similar pigmentation patterns. They were brownish-gray colored dorsally with some brownish patches likely made by diatom films. Diatom films have been recorded in a number of cetacean species (e.g. Bennett 1920) and they are common in beaked whales (e.g. Gowans & Whitehead 2001;

Figure 2 Photographic sequence of respiration surfacing of the ind#2. The general body profile is similar to the typical shape of *Mesoplodon* species.

Table 1 List of the (i) 10 measurements taken from lateral photographs of ind#2 and (ii) the 14 ratios examined

Measurements	Ratio	Value
A—Dorsal fin base;	B/A	0.693
B—From the dorsal fin insertion point to the trailing edge apex;	B/C	0.931
C—From the dorsal fin insertion point to the dorsal fin apex posterior point;	B/D	0.994
D—From the dorsal fin insertion point to the dorsal fin topmost point;	C/A	0.744
E—From the dorsal fin base to the topmost point (fin height);	C/D	1.067
F—From the dorsal fin base to the trailing edge apex;	D/A	0.697
G—From the dorsal fin base to the trailing edge apex;	E/A	0.655
H—From the foil edge of the fin to the trailing edge apex;	F/E	0.514
I—From the foil edge of the dorsal fin to the apex posterior point;	F/G	0.583
J—Distance between the dorsal fin insertion point and the blowhole (dorsal ridge).	G/E	0.882
	H/A	0.436
	I/A	0.241
	I/H	0.553
	J/A	5.991

Ratios were found by dividing one measurement of interest by another. Depth measurements are from the anterior insertion while width measurements are from the leading edge (foil) of the fin.

Rosso 2010). The brownish coloration of the dorsum extended anteriorly covering the upper jaw completely, while the lower jaw was clearly paler looking whitish/cream colored (Fig. 3). The paler coloration of the lower jaw extended backward covering also the area between the eye and the angle of mouth forming a pale cheek (Fig. 3).

Fin and body relative measurements were made on ind#2 as it was the only individual of which perfectly perpendicular photos were taken (Table 1).

The cookie-cutter shark bite scars assessment was made on ind#1 and ind#2. Ind#1 showed a minimum of ~66 cookie-cutter shark scars, while ind#2 showed a minimum of ~ 42 scars. The ratios between whitish scars versus re-pigmented scars were 0.031 (2 vs 64) and 0.273 (9 vs 33) respectively for ind#1 and ind#2.

Different coloration patterns of the individuals are listed in Table 2 with comparison between this work and the previous literature.

During the sighting, it was possible to collect some information on the surfacing-diving pattern of the animals. The 3 whales were swimming along in a single line; and they were separated from each other by few body lengths. Particularly, the first 2 animals—ind#1 and ind#2—were separated by less than one body length with ind#2 in an apparent escort position. The third individual was separated by 4 to 5 body lengths from the first couple of whales. The encounter lasted around 56 min. During such time, the whales in the group showed always a

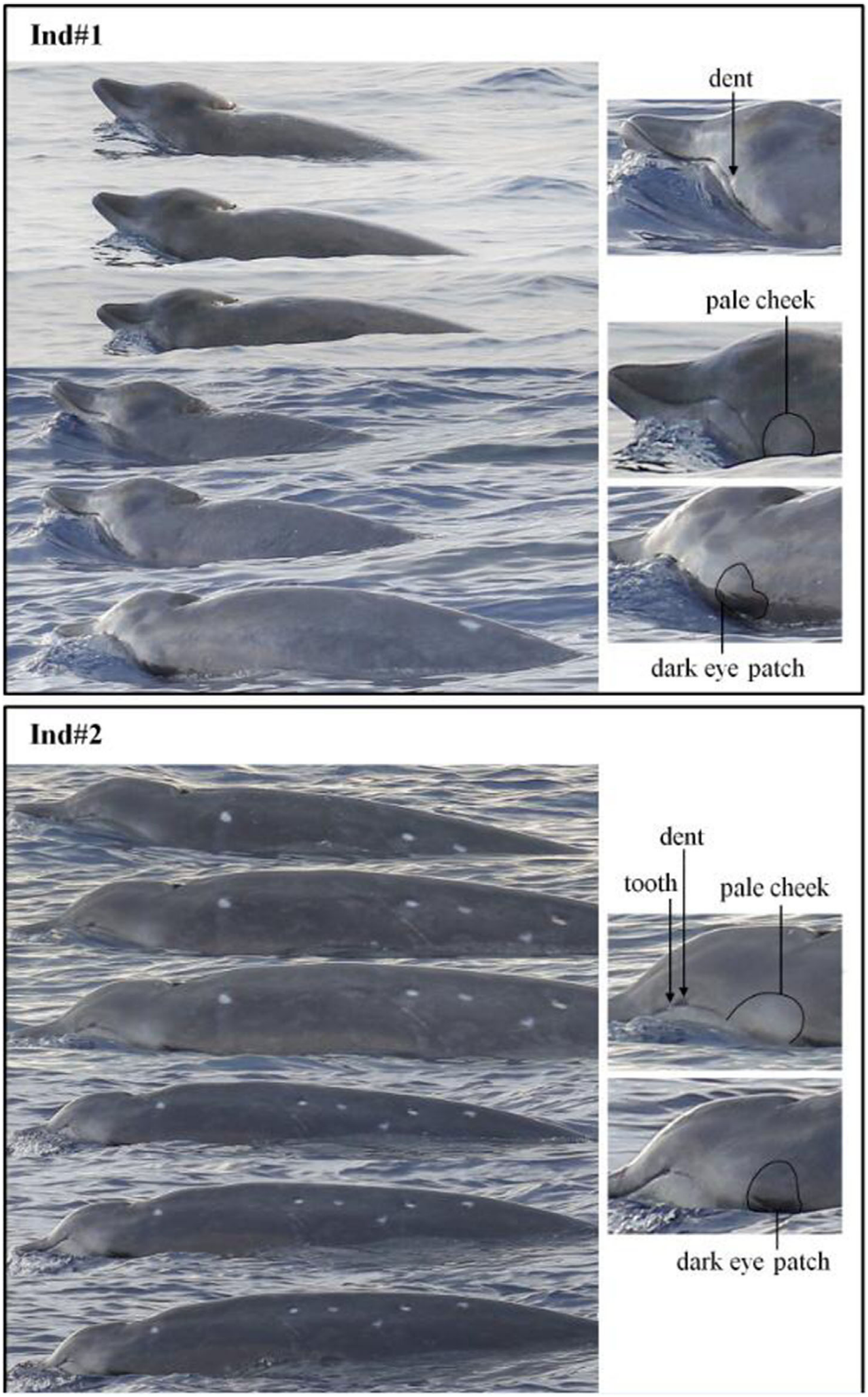

Figure 3 Photographic sequences of ind#1 and ind#2. The two individuals showed similar pigmentation patterns. Notice the: (i) pale lower jaw looking whitish/cream colored; (ii) the uniformly brownish coloration of the upper jaw, without white tip; (iii) the pale cheek with similar coloration of the lower jaw; (iv) the slight dark eye patch; (v) the small dent in the upper lip just behind the arch of the gape; and (vi) the protruding tooth in the ind#2.

Table 2 List of a selection of color patterns from *M. hotaula* and *M. ginkgodens* individuals that have been compared in this work

	Dark coloration of the back	Dark eye patch	Pale cheek	Upper jaw darker than lower jaw (lateral view)	Pale tip upper jaw	Pale tip lower jaw
M. ginkgodens adult male (figure 8 in Dalebout *et al*. 2014)	Brownish	Yes	Yes	No	Yes	Yes
M. ginkgodens adult male (sup. figure 6 in Dalebout *et al*. 2014)	Brownish	Yes	Yes	Yes	Yes	Yes
M. ginkgodens adult female (Fig. S1, Supporting Information)	Brownish	Yes	Yes	Yes	No	No
M. hotaula adult male (Dalebout *et al*. 2014)	Bluish	No	Yes	Yes	No	Yes
M. hotaula adult female (Lacsamana *et al*. 2015)	Brownish	—[†]	Yes	Yes	No	No
Presumable *M. hotaula* adult female (Pitman & Ballance 2008; Brownell *et al*. 2013)	Brownish	Uncertain[†]	Yes	—	—	—
Ind#1	*Brownish*	Yes	Yes	Yes	No	No
Ind#2	*Brownish*	Yes	Yes	Yes	No	Uncertain[§]

[†]Poor photo quality; [‡]It might be a photo artifact; [§]Since only the jaw tip is visible, it is not clear whether the pale coloration is uniform along the jaw or it is a typical pale tip.

synchronized behavior performing 3 (presumable shallow) consecutive dives of around 15.1, 16.7, and 13.7 min, respectively. Then, they started a fourth dive and disappeared. The observation remained on-effort for 1.8 h after the fourth dive started, without re-sighting of the group of whales (environmental conditions did not change since the first sighting). The 3 surfacing periods, recorded before the second, the third, and the fourth dive, respectively, lasted around 1.5, 2.0, and 4.5 min. The length of the last surfacing period coupled with the absence of re-sighting after the fourth dive might indicate that the whales started a deep-dive after the last recorded surfacing period. The distance covered by the group between the first sighting position and the last diving position was about 2080 m. The whales always surfaced at a distance <200 m from the ship, displaying nonevasive behavior. Therefore, we are confident that the surfacing/dive information presented in this study were accurately collected.

During the surfacing, the respiration frequency from the ind#1 and ind#2 were also examined. Overall, the time between two consecutive breaths was around 6 sec ($x = 5.8$ s, SE $= 0.89$ s, $n = 20$), meaning a respiration frequency of around 10 blows per minute. Blows were barely evident, being always very rapid, low and bushy. Surface-active behavior such as breaching, lob-tailing, and spy hopping were not observed.

DISCUSSION

There are at least 5 beaked whale species known to inhabit boreal Indo-Pacific tropical waters: the Longman's beaked whale (*Indopacetus pacificus*), the Cuvier's beaked whale *(Ziphius cavirostris*), the Blainville's beaked whale, the GBW, and the DBW (e.g. Jefferson *et al*. 2015). Detailed examination of the shape of the gape and beak length indicated that the 2 animals sighted during our survey were not *Z. cavirostris* (e.g. Jefferson *et al*. 2015). The shape of both the gape and the rostrum is not differentiated from the forehead, which rules out the Longman's beaked whale (e.g. Jefferson *et al*. 2015). The ind#2 showed what it seems to be an erupted tooth (Fig. 3). The tooth was protruding from the elevated mandibular arch. This character is shared with adult male of Blainville's beaked whale, GBW and the DBW (e.g. Dalebout *et al*. 2014). However, the relatively low arch in the gape rules out the Blainville's beaked whale, since in this latter species teeth do not erupt until the lower jaw is arched above the upper jaw (e.g. Jefferson *et al*. 2015). Therefore, we are confident to state that the beaked whales sighted were either GBW or DBW individuals.

GBW and DBW were both described as darkly pigmented dorsally. Particularly, Japanese GBW individuals were described to be bluish-dark colored (Nishiwaki & Kamiya 1958) such as the DBW male stranded in Seychelles (Dalebout *et al*. 2014). Photographs from both the fresh GBW specimens stranded in New Zealand and the individual stranded in mainland China indicated a dorsally brownish/brownish-gray coloration grading to lighter tones ventrally (fig. 8 in Dalebout *et al*. 2014; Fig. S1, Supporting Information, in this paper). This latter coloration pattern is also shared with the DBW specimens stranded in the Philippines (fig. 1 in Lacsamana *et al*. 2015), the individuals photographed around Palmyra Atoll (Brownell *et al*. 2013) and the ind#1 and ind#2 photographed during our sighting.

In the GBW stranded specimens (the ones described by Dalebout *et al*. 2014 and the specimens stranded in Fujian), there was a darker patch around the eye. Both the individuals photographed during our sighting showed a slightly evident darker patch around the eye (Fig. 3). The darker eye patch is not evident in the DBW specimens photos analyzed in this paper; however, the photo quality of 2 of the DBW considered did not allow a conclusive statement (Table 2).

Dalebout *et al*. (2014) described in DBW a gray mottling of the cheek and eye area forming a distinct wedge of color (i.e. pale cheek). This pale cheek coloration pattern was evident in the other stranded DBW, in ind#1 and ind#2 and also in 2 of the 3 stranded GBW analyzed (Table 2).

The individuals photographed during this at-sea survey showed a pale coloration of the lower jaw. A pale lower jaw was evident in all the stranded individuals analyzed, even though there were individual variations of the pale coloration extent along the jaw. Stranded GBW adult males appeared to have a white tip to both upper and lower jaws and a gray-brown chin and throat region (fig. 8 and suppl. fig. 6 in Dalebout *et al*. 2014), while the DBW adult male (stranded in Seychelles) appeared to have a gray tip only to the lower jaw and a white chin and throat region (fig. 7 in Dalebout *et al*. 2014), and no pale tip on the upper jaw. White tips on the jaws were absent in all the females analyzed of both species.

This work provided for the first time detailed dorsal fin relative measurements for a beaked whale species through the methods from Yahn *et al*. (2019). Therefore, the data provided here can be compared with further data from other *Mesoplodon* species in future research.

Ind#1 and ind#2 were poorly marked and mostly covered with re-pigmented (brown-colored) healed cookie-cutter shark scars. Few of the healed cookie-cutter shark scars looked like the characteristic whitish healed scars, typically found in other *Mesoplodon* species, while most of the scars (likely the oldest) were the same color as the surrounding skin (Fig. 4).

To our knowledge, brown-colored healed cookie-cutter shark scars were previously reported from GBW (Pitman & Lynn 2001), the presumable DBW adult female photographed around Palmyra Atoll (see fig. 3 in Pitman & Ballance 2008), and from a strap-toothed beaked whale (*Mesoplodon layardii*) (Pitman *et al*. 2019). However, as previously reported by Waller (2017), in one of the GBW males stranded in New Zealand (fig. 8, Dalebout *et al*. 2014), numerous white scars apparently caused by the healed bites of the cookie-cutter shark were evident. This evidence may suggest that also in GBW the scar tissue formed after skin injury can remain white as in other *Mesoplodon* species (Waller 2017).

Ind#1 showed 33% more cookie-cutter shark scars compared to ind#2. In *Mesoplodon* species, the number of scars increases with age (e.g. McSweeney *et al*. 2017); therefore, the ind#1 was likely older than ind#2. Since ind#1 did not show any signs of protruding teeth presence, as opposed to the youngest ind#2, this suggests that ind#1 was probably an adult female escorted by an adult male. Ind#2 was showing only two linear marks (tooth rakes) on the visible flank, one on the back posterior to the head, and a shorter one below the dorsal fin (Figs. 2 and 3). This is congruent with GBW/DBW species classification. In fact—uniquely among currently recognized *Mesoplodon* spp.—adult males of these 2 species do not become heavily scarred with white, linear tooth rakes. The lack of scarring marks together with the lack of ossification of the mesorostral canal of adult males suggests a scarce use of the tusks during intra-specific interactions

Figure 4 Photos of the anterior part of ind#1 taken in different light conditions. Generally, few of the healed cookie-cutter shark scars looked like the characteristic whitish healed scars (see the white one in the left photo), while most of the scars were healed to the same color as the surrounding skin (evidenced by the small circular bumps in the right photo). The healed scars are similar to the ones photographed in Pitman and Ballance (2008, Fig. 3).

(MacLeod 1998; Dalebout *et al*. 2014). The natural marking pattern observed in the two individuals photographed fits with the natural marking observed in stranded GBW and DBW; however, it does not permit to distinguish one species from the other.

The origin of the presence of the small indentation along the upper lip of the 2 whales is not clear. The fact that it is visible in both the individuals suggests that it could be a morphological feature; however, the position of the indentation is not exactly the same in the 2 whales. No evident indentations are visible along the gape of the other stranded specimens analyzed in this paper. Even if the photos of the stranded individuals were taken with a different angle than those collected during our survey, the indentations should have been visible. The GBW female stranded in Fujian province showed a depigmentation in a similar position of the dent shown by ind#1; however, the quality of the photo does not allow any accurate analysis (in fact the size and shape of the latter depigmentation is consistent also with marks caused by parasites, e.g. see Rosso *et al*. 2011). The indentations might be scars caused by interactions with fishing gear or marine litter (R. L. Pitman, personal communication). Bradford (2018) reported an interaction of a GBW with Hawaii longline fisheries in 2014. The individual got entangled around caudal peduncle by 1–2 wraps of mainline. Example of mouthline injuries due to fishing gears were described in Baird *et al*. (2017) for false killer whales (*Pseudorca crassidens*). The shape of the injuries is similar to the indentation photographed in our beaked whales while the severity in false killer whales seems greater. The difference in injury severity might be due to various factors such as interaction with marine litter (drifting untied monofilament) rather than fishing gear and also because of the feeding mode: bite feeding (false killer whales) versus suction feeding (beaked whales). Therefore, interaction with fishing gears/marine litter cannot be excluded as source of the indentations.

Overall, both coloration and scarring patterns did not allow an accurate species classification. All the individuals considered in this study showed the typical brownish primitive coloration of many Ziphiidae species, without a well-defined exclusive coloration pattern. The coloration patterns of all the individuals compared in the present study were very similar. Ind#1 (adult female) showed exactly the same coloration of the GBW female stranded in Fujian, mainland China; however, we cannot classify ind#1 and ind#2 as ginkgo-toothed beaked whales, without genetic evidence. Moreover, it is not possible to tell from such a small number of animals analyzed whether these are color pattern differences/similarities between the species or individual variation. In fact, conspicuous individual variation in coloration patterns have been described in beaked whales, particularly in Cuvier's beaked whale (e.g. Coomber *et al*. 2016).

In conclusion, our findings suggest that: (i) free-ranging GBW and DBW can be easily distinguished from other *Mesoplodon* species. The shape of the gape and the presence of the pale cheek are the most obvious cues for the at sea identifications, since they were shown outside the water during most of the surfacings photographed in this study. Nevertheless, the cheek coloration may be noticed only in good light and in a relatively close proximity to the animals (see differences in Fig. 3). (ii) Even though the quality of the collected photographic data was relatively high in our study, accurate classification between living GBW and DBW is not possible due to the high similarity in both coloration and scarring patterns between the species. This might be particularly true in females since they do not seem to show pale tips on the jaws. (iii) The preliminary data collected on diving and surfacing behavior are similar to those observed in other beaked whale species (e.g. Tyack *et al*. 2006), which indicate that GBW/DBW detectability and approachability may be similar to other *Mesoplodon* species. (iv) Future research should verify whether mouthline indentations are normally present in GBW and/or DBW specimens. In fact, the presence of an indentation possibly caused by fishing gears or marine litter raises concerns on the possible direct/indirect interaction with human activities in an area of high fishing pressure like the Southeast Asia seas (Teh *et al*. 2019; Li 2020; Li *et al*. 2020). A 133 cm black polypropylene rope, probably from a fishing net, was suspected to have co-caused blockage in the gastro-intestinal tract of the specimen of the DBW beached in the Philippines (Lacsamana *et al*. 2015; Abreo *et al*. 2016). To our knowledge, at least 4 out of 5 GBW/DBW individuals reported since 2012 (Lacsamana *et al*. 2015; Bradford 2018; the present study) showed possible interaction with fishing ropes or marine litter. Beaked whale populations in the Southeast Asia seas might possibly be more prone to interaction with marine debris, since these seas are global hotspots for marine plastic ingestion (Schuyler *et al*. 2014) and the Southeast Asia is considered as one of the highest sources of marine plastic pollution (Jambeck *et al*. 2015). Moreover, the South China Sea is a region with an increasing military presence (Rahman & Tsamenyi 2010). Therefore, noise pollution is a further threat for these beaked whale populations. The Scientific Committee of the IWC (Brownell *et al*. 2013) observed that DBW are probably vulnerable to sound from naval sonar and seismic research, similar to other beaked whales. Thus, greater understanding of the distribution and population size and structure of poorly-known beaked whale species throughout the Southeast Asia seas is urgently needed in order to assess the overall impact of all these threats at the population and/or species level.

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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SUPPLEMENTARY MATERIALS

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure S1 The 4.66 m long *Mesoplodon ginkgodens* female stranded along Pingtan island in Fujian province on July 9, 2019 (Xianyan Wang–Third Institute of Oceanography, *unpublished data*).

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