

Strandings of Longman's Beaked Whale (*Indopacetus pacificus*) in the Philippines

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ABSTRACT

Longman's beaked whale, *Indopacetus pacificus*, is one of the least known of all cetacean species, with just six specimens recorded prior to 2004. Although at least twenty more specimens have been recovered from strandings since then, knowledge on the species is still very limited. In the Philippines, a stranding in Davao in 2004 was considered the first confirmed sighting of the species in the country until 2021, when a photograph of a stranded animal in Calauag, Quezon from 1965 was found in an archive and confirmed to be of *I. pacificus*. Sightings of *Indopacetus pacificus* alive at sea from the early 1990s to 2000s in the Philippines were previously unconfirmed. Subsequent review of photographs from past surveys and at-sea sightings revealed live sightings in the eastern Sulu Sea near Negros in 1994, off the Maconacon coast in northern Sierra Madre in 2004, and near Arena Island in the Sulu Sea in 2006. Herein this study accounts for all the known strandings of the species in the Philippines and describe the specimens collected, the status of specimens to-date based on examined stranding reports, and examination of the specimens conducted by one or more authors. To date, there are five confirmed strandings of the species, which occurred at five different sites: (1) Calauag, Quezon in 1965 (unverified length and unknown sex); (2) 5.73m male at Matina-Aplaya, Davao in 2004; (3) 5.02m male at General Nakar, Quezon in 2016; (4) 5.4m male at Gonzaga; and (5) 5.6m male at Santa Ana, both in Cagayan Province in 2018. Two individuals stranded alive but died shortly after. From three of these, the stomach contents and tissue samples were examined and collected, while the skeletons of two specimens were collected and examined. Squid beaks of *Taonius* sp. and *Histioteuthis* sp. and unidentified fish eye lenses were found in the stomach. DNA analysis using mitochondrial CytB and COI sequences showed that the specimens were indeed *I. pacificus*. The skeleton collected from Santa Ana, Cagayan is by far the most complete in the country. For a cetacean species that is poorly known, examination of stranded specimens offers a rare opportunity to collect information. Hence, the importance of standardising necropsy and stranding data collection protocols, training stranding first-responders and establishing a database are emphasised.

KEYWORDS: LONGMAN'S BEAKED WHALE, STRANDINGS, DNA BARCODING, PHILIPPINES

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INTRODUCTION

Longman's beaked whale, *Indopacetus pacificus*, is one of the least known of all cetacean species with just six specimens confirmed prior to 2004. Although at least twenty more specimens were recovered from strandings since then, knowledge on the species is still very limited. The external appearance of the species was only first described in the 21st century, having been known from only two skulls prior to 2000 (Dalebout *et al.*, 2003; Pitman *et al.*, 1999). An earlier stranding in 2002 was later documented in China (Peng *et al.*, 2009). Subsequent strandings in Kagoshima, Japan in 2002 (Yamada *et al.*, 2004), in the Philippines in 2004 (Acebes *et al.*, 2005), in northeastern Taiwan in 2005 (Watson *et al.*, 2008; Yao *et al.*, 2012;) and in Hokkaido, Japan in 2010 (Stranding Network Hokkaido 2021) added to published information on the species. At the time of writing, there are about 30 specimens of the species in the world, all collected from stranding events (Garrigue *et al.*, 2016; Kaladharan *et al.*, 2014; Kobayashi *et al.*, 2021a; Kobayashi *et al.*, 2021b; West *et al.*, 2013; Yamada *et al.*, 2012) (See Supplementary table).

Based on specimens examined by other authors certain external features are considered characteristic of the species. The Longman's beaked whale has a moderately long and slender beak with a distinct crease between the melon and the base of the beak (Dalebout *et al.*, 2003; Jefferson *et al.*, 2015). The lower jaw extends slightly beyond the tip of the upper jaw. The forehead or melon is bulging and moderately steep (Dalebout *et al.*, 2003; Jefferson *et al.*, 2015). The relatively large dorsal fin is located well behind the midpoint of the back. The dorsal fin is falcate. It has two grooves on the throat area that converge anteriorly but do not meet, forming somewhat of a V-shape. The small, blunt pectoral fins tuck into depressions called 'flipper pockets' (Dalebout *et al.*, 2003; Mead *et al.*, 1982). The fluke has no notch. The blowhole ends point anteriorly.

The colouration ranges from brown to dark grey on the entire dorsal side, posterior to the blowhole (Dalebout *et al.*, 2003; Jefferson *et al.*, 2015). Around the head, anterior to the blowhole, and the sides of the animal are lighter in colouration. A diffuse dark band from behind the blowhole separates these light areas and extends down to the sides to surround each eye. The dark band posterior to the eyes extend to the pectoral fins but with a small white patch embedded in the ear area (Pitmann *et al.*, 1999), making the dorsal side of the pectoral fins dark while the ventral side is light (Dalebout *et al.*, 2003; Jefferson *et al.*, 2015). The dark grey colouration from the dorsal extends to the sides then merges with the white ventral area (Dalebout *et al.*, 2003). Similarly, the dorsal side of the fluke is dark while the ventral side has light streaks. Adults are more heavily scarred with cookie-cutter shark bites compared to younger animals and in male adults, linear tooth rake scars have been observed, believed to be due to interactions with conspecifics (Pitmann *et al.*, 1999; Dalebout *et al.*, 2003; Garrigue *et al.*, 2016). Hence, adult males can be identified from adult females and younger animals by their extensive tooth rake scarring (Pitmann *et al.*, 1999).

Large size and a pair of apical teeth are also features noted of the species. Data is still limited to estimate body size range for the species (Yamada *et al.*, 2012). The total length from measured adult specimens ($n = 8$) ranged from 5.6m to 6.5m (Dalebout *et al.*, 2003; Garrigue *et al.*, 2016; Jefferson *et al.*, 2015, Yamada *et al.*, 2012) (See Supplemental table). It is believed that adult females are larger than the adult males as in many ziphiids (Jefferson *et al.*, 2015). To date, the largest recorded female specimen is 6.5m from Kagoshima, Japan (Yamada *et al.*, 2004; Yamada *et al.*, 2012) while the largest male specimen is 6.08 from Zhejiang Province, China (Peng *et al.*, 2009; Yamada *et al.*, 2012) (See Supplemental table). Neonates or calves ranged from 2.9m to 3m in length (Dalebout *et al.*, 2003; Garrigue *et al.*, 2016; Jefferson *et al.*, 2015; Yamada *et al.*, 2012). A recently stranded neonate from Okinawa, Japan was 2.35m long and is believed to be the first confirmed newborn specimen of the species (Kobayashi *et al.*, 2021a). The single pair of cone-like teeth set close to the tip of the lower jaw is assumed to erupt only in mature males similar to other beaked whales, except in *Berardius* spp. (Moore, 1968; Pitmann *et al.*, 1999; Dalebout *et al.*, 2003).

The species' distribution is not yet fully known and current data shows they are found in scattered locations in the tropical and subtropical waters (Jefferson *et al.*, 2015). Distribution is likely limited to the Indo-Pacific region and it is believed by some to be more common in the western Indian Ocean and western Pacific (Pitman *et al.*, 1999; Anderson *et al.*, 2006; Jefferson *et al.*, 2015). Previous sightings of large, unidentified 'tropical bottlenose whales' in the tropical Indo-Pacific are now all thought to pertain to Longman's beaked whales (Pitman

et al., 1999; Escorza-Treviño, 2002; Dalebout *et al.*, 2003). Although confirmed sightings of the species have increased in recent years (Afsal *et al.*, 2009; Anderson *et al.*, 2006; Ilangakoon and Alling, 2016; Martin and Nimak-Wood, 2016; Rankin *et al.*, 2011), knowledge of its behaviour, movements, distribution, abundance and ecology remains limited (Yamada *et al.*, 2012).

Knowledge of its feeding ecology is limited to stomach contents from specimen from Kagoshima, Japan suggesting that the species mainly feeds on cephalopods (Jefferson *et al.*, 2015). The five species of squid found in this specimen were *Taonius pavo*, *Onykia loennbergi*, *Onychoteuthis borealijaponica*, *Chiroteuthis picteti*, and *Histioteuthis inermis* (Yatabe *et al.*, 2010). Based on the distribution data for these squid species, it was suggested the Longman's beaked whale fed in epipelagic to mesopelagic zones. Furthermore, *T. pavo*, which made up the majority of squid species found in the Kagoshima specimen, in Hawaiian waters, is not known to undergo diurnal vertical migration, and adult specimens typically inhabit depths around 725–970m (Young, 1978).

As the largest tropical beaked whale, with a conspicuous, often visible blow, distinct rounded melon and known to occur in large groups, it is one of the easiest beaked whales to identify at-sea (Jefferson *et al.*, 2015). However, identifying the species of a carcass on the beach, especially if in moderate state of decomposition can be challenging. In the Philippines and most other developing countries where there is a lack of awareness in proper documentation and response to marine mammal strandings, coupled with insufficient knowledge in identifying cetacean species in most areas, additional techniques are needed to verify species identification. This is particularly needed for documenting rare or uncommon species such as the Longman's beaked whale. Accurate species identification is an essential first step towards effective conservation of biodiversity (Milne *et al.*, 2009). The use of DNA barcoding is useful in these cases. DNA barcoding is a molecular taxonomic method which uses short genetic markers in an organism's DNA for species identification (Costa and Carvalho, 2007; Hebert *et al.*, 2003). In the Philippines, the mitochondrial DNA cytochrome c oxidase subunit I (COI) and cytochrome b (CytB) have been used to identify large, threatened aquatic species including reef manta ray, *Manta alfredi* (Acebes *et al.*, 2016), Pacific bluefin tuna, *Thunnus orientalis* (Sarmiento *et al.*, 2016), giant clams, *Tridacna* spp. (Lizano and Santos, 2014) and a rare stranded beaked whale, *Mesoplodon hotaula* (Lacsamana *et al.*, 2015).

Previous sightings of *I. pacificus* alive at sea in the Philippines were unconfirmed. At that time these sightings, including reported catches from the Bohol Sea, were thought to be *Hyperoodon* sp. (Dolar, *et al.*, 1994). It wasn't until Pitman (1999) suggested that this was *Indopacetus pacificus*. A subsequent review of photographs from past surveys and at-sea sightings confirmed live sightings of *Indopacetus pacificus* in the eastern Sulu Sea near Negros in 1994 (Dolar *et al.*, 2006), off the Maconacon coast in northern Sierra Madre in 2004 (Alava *et al.*, 2012), and near Arena Island in the Sulu Sea in 2006 (Tagarino and Daclan, 2007). This study presents the data on four of the *Indopacetus pacificus* specimens in the Philippines, including morphological and genetic data available. Skeletal features and stomach contents are also described.

METHODS

Stranding report collection and review

Stranding reports were gathered from newspaper articles and online, as well as on social media. Reports were verified by contacting reporters, local contacts, regional Bureau of Fisheries and Aquatic Resources (BFAR) offices and reviewing photographs of animals. The authors of the stranding report or necropsy report (when applicable) were also contacted and asked for more information, copy of report and photographs. When it was possible one or two of the authors travelled to the stranding site or where the carcass was buried or stored. Local responders and other people present during the stranding and carcass disposal were interviewed.

External appearance, morphometrics and maturity estimation

Fresh carcasses, when available were examined, measured and photographed. For specimens not examined by one or more authors, the information and photographs gathered from reports were used. Only measurements taken or verified by one or more of the authors were included. However, due to the use of different stranding manuals or guides, slight differences in points of measurements were expected for the total body length and a few sections in the skull. The total body length for the Davao specimen was taken as straight measurement from

the tip of the upper jaw to the fluke notch which was based on the WWF-Philippines marine mammal stranding manual while the Quezon specimen was measured using the Philippine Marine Mammal Stranding Network manual, measuring the total length from the tip of the lower jaw to the fluke notch. The Santa Ana specimen on the other hand, although using the same method as the WWF-Philippines manual, could not be measured straight because of the slightly bent positioning of the carcass at the burial site. The Gonzaga specimen was measured with the tip of the lower jaw unaligned because it was broken. External appearances and measurements were compared with published descriptions of Longman's beaked whale specimens from South Africa, Maldives, Taiwan, Hawaii, Japan, and New Caledonia (Dalebout *et al.*, 2003; Garrigue *et al.*, 2016; Peng *et al.*, 2009; West *et al.*, 2013; Yamada *et al.*, 2004; Yao *et al.*, 2012; Jefferson *et al.*, 2015). The maturity of the specimens was estimated based on the total body length, the severity of linear tooth rake and cookie-cutter shark bite scarring and the shape and length of the teeth. With the limited examined and published data on male adult specimens for comparison, the published description of the adult male specimen from New Caledonia was used as basis for comparison since they conducted age estimation by examining the dentinal and cementum Growth Layer Groups (GLGs) of the teeth (Garrigue *et al.*, 2016). It was also compared with the description of the adult male specimen from Zhejiang Province, China, with the shape and length of the teeth in particular (Peng *et al.*, 2009).

Skeletal specimen preparation and osteological analysis

Method of preparation varied depending on the accessibility and condition of the carcass, availability of a facility, manpower and supplies. Specimens with carcasses accessible were processed on-site and bones were cleaned in stages, some on-site and others transported to a facility or museum. Final cleaning was conducted at the place of intended storage or display. Other specimens remain buried within the locality where it stranded. Parts of the cranial skeleton were measured, including the mandible and teeth. Skull measurements of the Davao specimen were taken using an illustrated morphometrics guide of a Ziphiid skull from an unreferenced page used by one of the authors while the Santa Ana skull measurements were taken using Kobayashi *et al.* (2021b) as a guide. These values were compared with values from specimens in the literature (Azzaroli, 1968; Dalebout *et al.*, 2003). Bones were identified, counted and labelled.

Davao specimen

The bones were cleaned by removing most of the flesh then submerging in an artificial fish pond with fresh water for 23 days. The bones were then rinsed with a mixture of water and chlorine bleach and air-dried. Costal cartilages were stored in 70% buffered formalin while the teeth were stored in 70% ethanol. The skull was measured and photographed. The bones were identified, counted and labelled for temporary storage at the BFAR Region XI museum.

Santa Ana specimen

The carcass was carefully flensed at the burial site, half submerged in mud. Bones were removed per section exposed with care taken so as small bones were not lost. The vestigial hip bones were successfully recovered. Bones were submerged in hot water to soften and remove excess tissues. Once all the bones were removed from the burial site, the excavation was covered up together with the excess tissues removed.

Bones were cleaned by removing excess tissues and were labelled. The bones were then transported to the BFAR-Region II facility and left to air-dry overnight. After another round of scrubbing with liquid detergent solution, the bones were air-dried and packed for transport. At the National Museum of Natural History (NMNH) in Manila, the bones underwent another round of soaking, scrubbing and air-drying for several days before they were relabelled and photographed. The skull, mandible and teeth were measured and photographed.

Necropsy and collection of gastro-intestinal contents

A necropsy was conducted on only the Quezon specimen. Internal organs were examined and samples were taken (see Results). For the Santa Ana specimen, the stomach and intestines were opened and examined. The contents were grossly examined and stored in 95% ethanol. Photographs of the gastro-intestinal contents were taken and sent to authors for identification. The lower beaks of cephalopods found in the stomachs were sorted,

counted, and identified to the lowest possible taxonomic level by referring to published guides (Clarke, 1986; Kubodera, 2005).

The Davao specimen was disembowelled before blast-freezing and a short segment of the intestines with its contents was recovered later and stored. The squid beaks were compared with other squid beak specimen collections.

Tissue sample collection

Tissue samples were obtained from two of the specimens: the Davao and Santa Ana specimens. For the Davao specimen coded as MDS 1, two skin with blubber tissue samples were taken from two sites on the dorsal side of the animal and were preserved in Dimethyl Sulfoxide (DMSO) with saturated salt solution and kept in a refrigerator (-4°C). For the Santa Ana specimen, one skin with blubber tissue sample was taken after exhuming the carcass five days after it was buried. This was further subdivided into three pieces and preserved in 95% ethanol. Two samples were kept by the National Museum of the Philippines (NMP), while the third sample was kept by BFAR-Region II. Samples in the NMP were then stored in a refrigerator (-4°C), until they were sent to the BFAR-National Fisheries Research and Development Institute (NFRDI) laboratory for analysis, coded as MDS 2 and MDS 3.

DNA Analysis

DNA was extracted using 10% Chelex based on the protocol of Walsh *et al.* (1991). Two (2) mitochondrial DNA markers – cytochrome c oxidase subunit I (COI) (Ward *et al.*, 2005; Ivanova *et al.*, 2007) and cytochrome b (CytB) (Palumbi, 1996) – were used, both of which are able to discriminate whales and dolphins (Falcao *et al.*, 2017). Bi-directional sequence electropherograms results were visualised, aligned, and manually edited using Geneious Pro 6.1 software (Biomatters Ltd., Auckland, New Zealand). Voucher CytB and COI sequences were obtained using BLAST⁹ and BOLD (www.boldsystems.org). Alignment explorer package in MEGA 7.0 (Tamura *et al.*, 2013) was used for aligning DNA sequences together with the reference sequences. Species identification was inferred using the Neighbor-Joining (NJ) method (Saitou and Nei, 1987) based on the Kimura 2-parameter (K2P) model with 500 bootstrap replications (Tamura *et al.*, 2013).

RESULTS

Stranding events

During the preparation of this manuscript, a photograph of a beaked whale was discovered in a family-owned web archive (Fig. 1). The photograph dated 28 January 1965 was labeled as: ‘Big fish *Lumba* caught in Simulong

⁹ blast.ncbi.nlm.nih.gov.

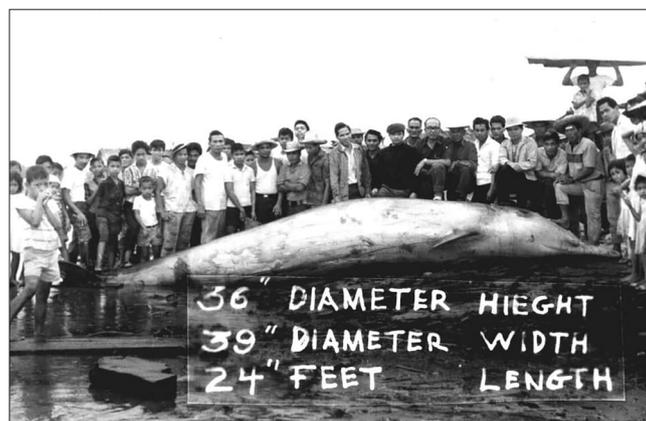


Fig. 1. A recently discovered photograph of a Longman’s beaked whale that stranded in Calauag, Quezon Province in 1965: this is the first known record of this species in the Philippines.

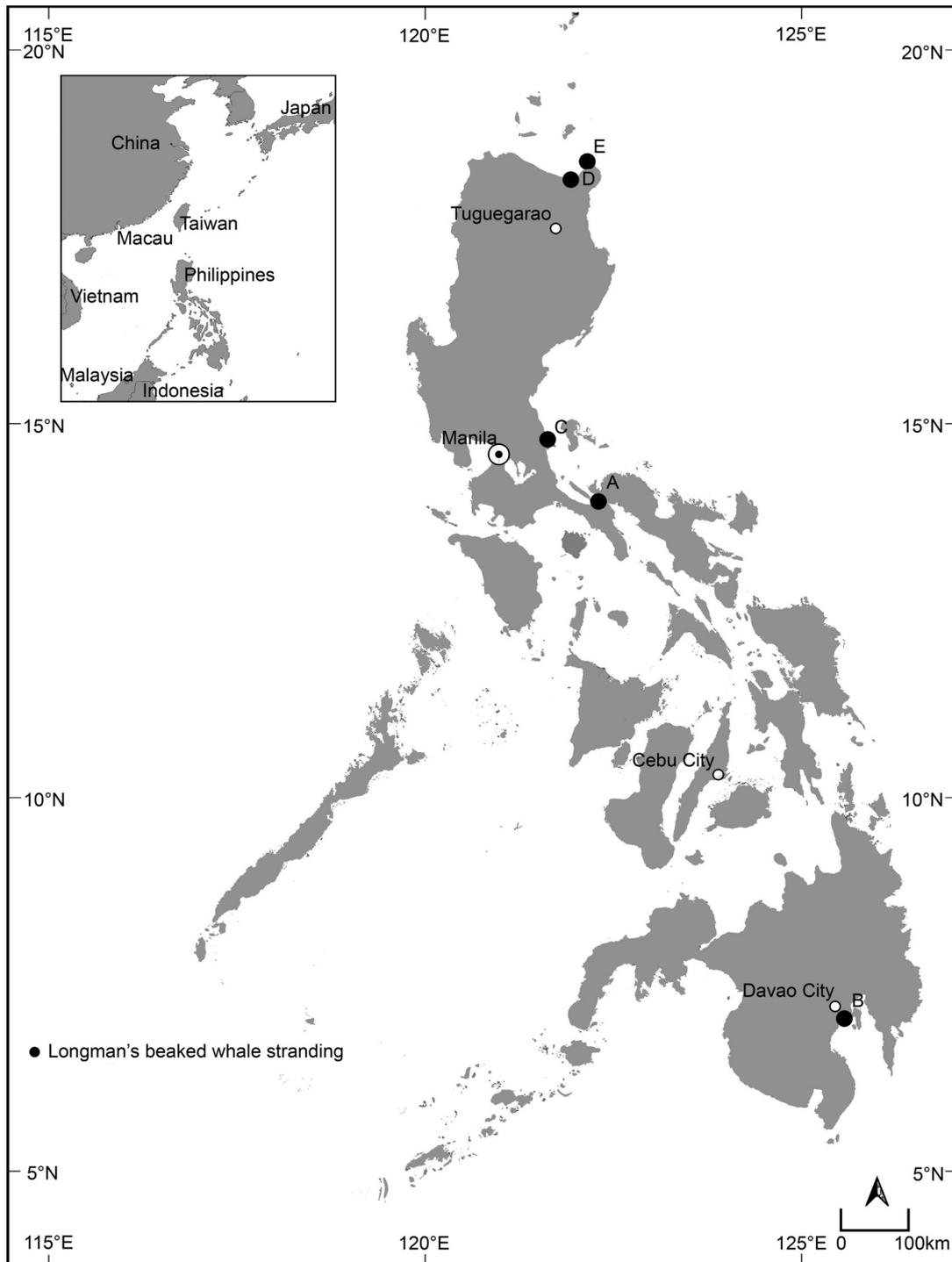


Fig. 2. Location of strandings of Longman's beaked whale in the Philippines. (a) Calauag, Quezon; (b) Matina-Aplaya, Davao; (c) General Nakar, Quezon; (d) Gonzaga, Cagayan; (e) Sta. Ana, Cagayan.

river near Pinagbayanan' and indicates the length of the animal at 24ft, which is clearly an overestimation¹⁰. The correct location of this stranding is Sumulong river, which is also the name of the village or barangay in the municipality of Calauag in Quezon Province in the Philippines (Fig. 2). Based on general appearance and the length, the animal in the photograph appears to be *Indopacetus pacificus* and could be the earliest recorded stranding of the species in the country. No other information was obtained regarding this stranding.

¹⁰ https://artmorato.tripod.com/id4.html?fbclid=IwAR0v7Z2Kmw_wtpfUwO7zAC2nXv7Dw3bB_r9EdlMchuugz1Z5gmmczUFerY.

There are another four confirmed strandings of the species, all sub-adult individuals, which occurred at four different sites: (1) 5.73m male at Matina-Aplaya, Davao in 2004; (2) 5.02m male at General Nakar, Quezon in 2016; (3) 5.4m male at Gonzaga and (4) 5.6m male at Santa Ana, both in Cagayan Province in 2018. Three of the strandings occurred in northern Luzon, while one in southern Mindanao (Fig. 2). Two out of four stranded alive but died shortly after. From three of these the stomach contents and tissue samples were examined and collected. The specimen from Gonzaga (2018) was not examined by any of the authors and the carcass was buried near the stranding site. The carcass of the Quezon (2016) specimen was buried near the stranding site after the conduct of the necropsy. The skeletons of the Quezon and Gonzaga specimens have not been examined. See Table 1 for general information on the four stranding events.

Table 1
Stranding data on four Longman's beaked whale specimens in the Philippines.

Specimen	Davao	Gen. Nakar	Gonzaga	Sta. Ana
Date	13 Jan 2004	7 Feb 2016	15 Sep 2018	16 Sep 2018
Location	Purok del Carmen, Matina-Aplaya, Davao, N 7.04271; E 125.56732	Brgy. Catablingan, General Nakar, Quezon	Brgy. Casitan, Gonzaga, Cagayan	Sitio Pasiquit, Brgy. San Vicente, Sta. Ana, Cagayan
Stranding code	1	2	3	1
Total length (m)	5.73	5.02	5.4	5.6
Sex	Male	Male	Male	Male
Disposal	Necropsied	Necropsied and buried	Buried	Buried
Specimens collected	Skin with blubber, portion of GIT contents, penis, liver, right testis, skeleton	Blood, faeces, hair-like substances from stomach, liver and kidneys, penis and testes	None	Skin with blubber, skeleton, portion of GIT contents



Fig. 3. Longman's beaked whale stranded in Davao. (a) Found by a local fisherman in the shallows; (b) Photo published in a national newspaper; (c) Carcass brought to a local ice plant for freezing and temporary storage.

External appearance and morphometrics

Davao specimen

The whale was first seen stranded alive on the beach of Purok del Carmen, Matina-Aplaya, Davao (N 7.04271 E 125.56732) by two local fishermen on 13 January 2004 (Fig. 3a and 3b) (Acebes *et al.*, 2005). It was found in two-feet deep water thrashing its tail. The animal died several hours later. After removal of the internal organs, the carcass was blast frozen whole (Fig. 3c). A portion of the digestive tract, penis and liver were later recovered from a local veterinarian and the laboratory of the BFAR in Davao City. A photograph of the stranded animal, misidentified as a 'giant bottlenose dolphin', was published on the Philippine Daily Inquirer on 14 January and attracted the attention of researchers from WWF-Philippines.

The animal measured 5.73m in length (See Table 2). The colour pattern was similar to that described by Dalebout *et al.* (2003) except that the darkest hue was grey and not black (Fig. 4). The beak was relatively long



Fig. 4. Longman's beaked whale carcass examination after thawing. (a) Upper body of the animal; (b) Head showing colouration and features; (c) Mid-section of the body of the animal; (d) Lower body of the animal.

Table 2
External measurements of Longman's beaked whale specimens from
Davao and Sta. Ana.

Sex/age class	Measurement	Davao	Sta. Ana
		Male/juvenile	Male/adult
		cm	cm
1	Total length (tip of upper jaw to fluke notch)	573.0	560.0
2	Snout to anus	405.0	–
3	Snout to mammary slit	395.6	–
4	Snout to throat grooves	75.0	–
5	Snout to dorsal fin tip	388.0	–
6	Snout to ant. of dorsal fin	345.0	–
7	Snout to flipper	187.3	–
8	Snout to ear	97.9	–
9	Snout to eye	84.2	95.5
10	Snout to gape	53.2	–
11	Snout to blowhole	85.2	–
12	Snout to melon apex	25.2	–
13	Eye to ear	14.0	–
14	Eye to gape	31.0	–
15	Eye to blowhole edge, L	–	–
16	Eye to blowhole edge, R	29.3	–
17	Blowhole length	–	–
18	Blowhole width	16.5	–
19	Diameter ear opening	–	–
20	Girth	–	305.0
21	Length of R flipper anterior	55.6	52.0
22	Length of R flipper posterior	47.2	–
23	Dorsal fin height	28.5	43.0
24	Dorsal fin width at base	35.9	–
25	Fluke width	135.0	154.0
26	Blubber thickness	5.0	–



Fig. 5. Longman's beaked whale carcass showing (a) Tip of the lower jaw with pair of teeth; (b) Distinct crease between melon and snout; (c) Ventral side of the snout showing V-shaped groove.

with a distinct crease. The lower jaw was longer than the upper jaw. There was one pair of erupted teeth at the anterior tip of the lower jaw (Fig. 5a and 5b) which could be seen with the mouth closed. The dorsal side of the head region was grey including the upper jaw. There was an area of dark colouration around the eye which continued posteriorly (Fig. 4). The throat area was lighter in colouration with a pair of grooves (Fig. 5). The lateral

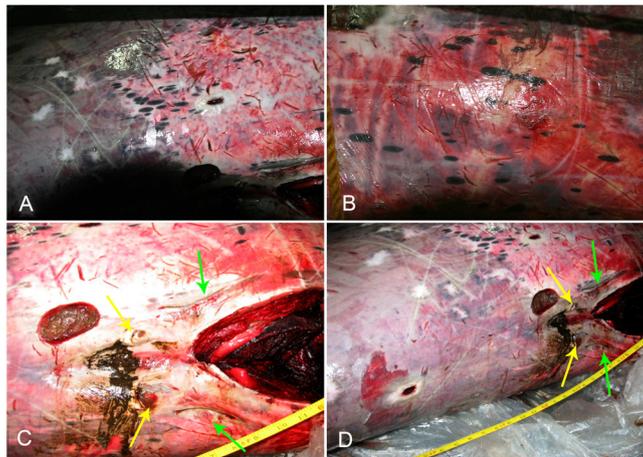


Fig. 6. Longman's beaked whale carcass showing ventral and genital area with (a) and (b) black oval specks, white blotches and whitish area; (c) and (d) protuberances (yellow arrows) and mammary slits (green arrows).

area of the head, anterior to the eye and including the lower jaw, was lighter in colour. The dorsal side of the body was grey. The colouration became lighter laterally and ventrally. The ventral mid-section up to the anal region was whitish with black oval spots or flecks, which were more pronounced in the genito-anal region (Fig. 6a and 6b). A similar type of pigmentation was apparently observed in the Maldivian female specimen (Dalebout *et al.*, 2003). Two mammary slits were evident anterior to the anal slit (Fig. 6c and 6d). The genital slit was no longer recognisable because of the long ventral incision that was made from the throat up to the area just above the anus. Two protuberances or round bulges were observed slightly anterior and to the sides of the anal slit and posterior to the area of the genital slit (Fig. 6c and 6d). These bulges have not been previously described and their function is unknown. Other marks such as linear tooth rake scars and white oval scars likely from cookie-cutter shark (*Isistius* sp.) bites were evident in the genito-anal region (Fig. 6a–d). Three fresh oval scars were present on the antero-lateral side. Fresh wounds were found above the right pectoral fin.

The pectoral fins or flippers had blunt tips and flipper pockets were apparent (Fig. 7b). The dorsal fin was falcate with a wide base (Fig. 7a). The flukes had no median notch; the ventral side had a lighter colouration than the dorsal side.

Quezon specimen

On 7 February 2016, a cetacean was found dead on the beach of Brgy. Catablingan, General Nakar in Quezon by a local fisher. The local government officials of Gen. Nakar sent photos of the fresh carcass to BALYENA.ORG and it was identified as a Longman's beaked whale. It had a relatively long beak with a crease between the melon and beak (Fig. 8a). The colouration was similar to the Davao specimen but there was a light to dark brown hue on the melon and lower jaw (Fig. 8b). The lower jaw was slightly longer than the upper jaw. No teeth were visible in the photos but a pair of erupted teeth on the lower jaw was observed by one of the authors who examined the carcass. There was a pair of throat grooves similar to the Davao specimen (Fig. 9a). There were white circular scars on the head, sides, ventral and peduncle areas, most likely from cookie-cutter shark bites (Figs. 6a and 6b; Figs. 9a–d). A few circular wounds were fresh and still reddish from the exposed tissues (Fig. 9a and 9d). The genito-anal region was lighter than the rest of the ventral area of the body and white scars or blotches were more prominent (Fig. 9a and 9d). A few linear scars were on the ventro-lateral areas (Fig. 9c and 9d). Dark grey to black oval speckles were scattered in the umbilical and genito-anal region (Fig. 9a and 9d). Two mammary slits were also evident anterior to the anal slit (Fig. 9a and 9d).

On 9 February, a team from BFAR-Region IV-A including one author went to the stranding site to examine the carcass which by this time was in moderate state of decomposition. There was slight bloating with the tongue and penis protruding. Post-mortem abrasions on the upper beak and haemorrhages on the left side of the body

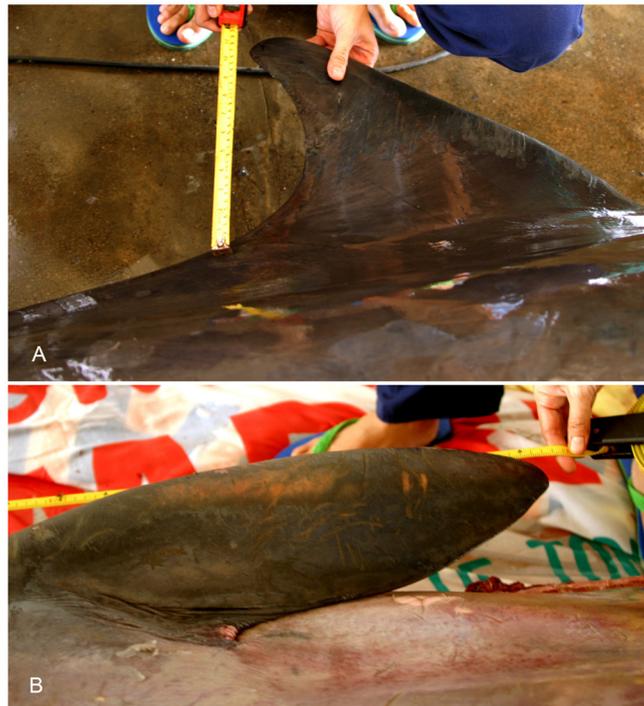


Fig. 7. Longman's beaked whale carcass showing (a) dorsal fin and (b) right pectoral fin.



Fig. 8. Longman's beaked whale stranded in Gen. Nakar, Quezon (a) and (b).

were observed. There was a man-made rectangular excision on the right caudal area, between the anus and the fluke, removing skin, blubber and muscles (Fig. 9d). The total length of the animal was 5.02m.

Santa Ana specimen

A stranding of a cetacean over five meters long at Sitio Pasiquit, Brgy. San Vicente, Santa Ana, Cagayan Province was reported on the website of ABS-CBN on 16 September 2018 (Fig. 10). The dying animal was found by a resident, the chairman of the Municipal Fisheries and Aquatic Resources Council (MFARMC), Mr. Jaime Yosores at around 6:00am and reported it to the Local Government Unit (LGU) and other members of the local marine mammal stranding network of Santa Ana. When it was found it could barely move and after a few minutes died



Fig. 9. Longman's beaked whale carcass in Gen. Nakar, Quezon examined a day after stranding. (A, B, C, D).



Fig. 10. Longman's beaked whale stranded in Sta. Ana, Cagayan.

in the shallows. The 5.6m male animal was promptly buried within the compound of the Naval Base Camilo Osias (NBCO) due to health and sanitation concerns (Fig. 11a).

Examination of the photographs posted online showed that the animal had a relatively long beak with a distinct crease between the melon and the beak (Fig. 11b). The lower jaw was longer than the upper jaw. The colour pattern was similar to that of the Davao specimen (Fig. 11c and 11d). The dorsal side of the head region was grey including the upper jaw. The colouration lightened going down on either side of the melon and head. The grey colouration from the head continued posteriorly from the blowhole and extended around each eye and the flippers. The lateral



Fig. 11. Longman's beaked whale carcass in Sta. Ana transported for burial. (a) Dorsal side; (b) Head showing distinct crease between melon and snout; (c) Head region showing colour pattern; (d) Carcass being placed into burial site.

area of the head, anterior to the eye, including the lower jaw and throat area, were lighter in colour. The colouration became lighter laterally and ventrally. There were a few white circular scars and a pair of parallel linear marks on the left side of the body (Fig. 11c and 11d). Closer inspection of the photographs of the head showed there was one pair of erupted teeth on the tip of the lower jaw. This was verified when the carcass was exhumed.

The dorsal fin was relatively large, falcate, similar to a dolphin's and was located behind the midpoint of the back. The flippers were small and blunt. It had a pair of throat grooves similar to the Davao specimen. The fluke had no notch.

A team from the NMP composed of staff from the Zoology Division and one author were tasked to retrieve the skeleton for the purpose of preservation and future display at the NMNH. The team departed Manila on 19 September and arrived in Santa Ana on 20 September. The following day, excavation of the carcass at the burial site at the NBCO began. A payloader was used for the initial excavation while laborers were hired to manually dig up the carcass to avoid damage to the specimen. As soon as the head of the carcass was exposed, sand and dirt were removed to allow closer examination of the head. The total length of the carcass was measured, as well as the length of the right flipper and the snout. Other measurements could no longer be taken as the carcass was half submerged in mud. The genito-anal region was examined and the animal was confirmed to be male, with the penis protruding.



Fig. 12. Longman's beaked whale stranded in Gonzaga, Cagayan. (a) Dorsal side; (b) Head region showing melon, broken upper and lower jaws and colouration; (c) Upper dorsal area showing colouration.

Gonzaga specimen

A cetacean was found dead on the beach of Brgy. Casitan, in the municipality of Gonzaga, Cagayan on 15 September 2018 (Fig. 12). This was hours after Typhoon *Mangkhut* (locally known as Typhoon *Ompong*) made landfall on the northeastern part of the country. Locals who found the carcass reported it to the LGU of Gonzaga who then reported it to one of the authors. It was approximately 5.4m long. Examination of the photographs showed the animal had a distinct melon and relatively long beak which was broken at the tip but still partly attached (Fig. 12b and 12c). It could not be determined if this occurred post-mortem but it was definitely not a congenital deformity. Its dorsal fin was relatively tall and falcate; the pectoral fins were short and blunt; a pair of throat grooves were present; and the fluke had no median notch. The colouration and pattern were similar to the Davao and Sta. Ana specimens. The dorsal side of the head was grey which lightened on either side of the melon, anterior to the eyes. The grey colouration continued posterior to the blowhole all the way to the fluke, with the grey bands going down and around the eyes and flippers. The ventral side of the body was lighter in colouration, except for a large circular grey patch in the throat region, anterior to the left flipper (Fig. 12b) and small circular grey blotches in the genito-anal region. The large circular grey patch in the throat region is not a typical colour pattern element for this species.

The carcass was left on the stranding site and could not be attended to because the province was in a state of calamity. More photographs were taken three days later and by this time the carcass was already in advanced state of decomposition and the animal was identified as male, with the penis protruding (Fig. 13). No tissue samples were taken. The carcass was buried several meters from the stranding site on 23 September 2018.



Fig. 13. Longman's beaked whale stranded in Gonzaga examined a day after stranding. (a) Carcass bloated; (b) Carcass in moderate state of decomposition with penis protruding.

Skeletal specimen preparation and osteological analysis

Davao specimen

The diagnostic osteological features described by Moore (1968) were observed in this specimen (Fig. 14). In the vertex of the skull, the frontal bones occupy an area that approximates or exceeds that occupied by the nasal bones; there is minimal extension of premaxillary crest between the nasal and maxillary bones, or between the frontal and maxillary bones (Fig. 15). The vertebral formula was $C7 + T10 + L10 + Ca16 = 43$. Post cranial osteology shown in Table 3. The rib count (10) and number of fused vertebrae (C1–5) were consistent with Dalebout *et al.*'s (2003) specimens (Fig. 16). The epiphysial discs of T3–10, L1–10 and Ca1–3 were not fused to the vertebral bodies. The non-fusion of the discs and the animal's length suggest that it was not yet physically mature. Most of the flipper bones were lost during processing. The teeth measured (greatest vertical length): 37.2mm (left) and 34.4mm (right) (Fig. 17A). For cranial measurements see Table 4. The right vestigial pelvic bone was also recovered. The mounted skeleton, without the flippers is displayed at the BFAR office in Davao City.



Fig. 14. Skull of the Davao specimen (a) dorsal view; (b) left lateral view; (c) ventral view; (d) dorsal view of mandible; (e) close-up of cranial vertex; (f) close-up of lateral view of skull. Arrow points to diagnostic cranial features discussed by Moore (1968) and Dalebout *et al.* (2003).

Santa Ana specimen

The osteological features of the skull were as described by Moore (1968) and similar to the Davao specimen (Figs. 18 & 15). The vertebral formula was $C7 + T10 + L8 + Ca19 = 44$; with the first five cervical vertebrae fused (C1–5) (See Table 3) (Fig. 16). The rib count was 10 on the right side, the 10th left rib was lost in the process of retrieving from the carcass. All epiphysial discs were fused to the vertebral bodies. The left and right flipper bones were kept except for the smallest digits which may have been lost during processing. The first carpal bone of the right flipper was fused with the radiale, resulting in only five carpal bones instead of six. The teeth measured 50.99mm (left) and 50.01mm (right) at greatest vertical length (Fig. 17B). Other cranial measurements are in Table 4. The left and right pelvic bones were also recovered but the right pelvic was broken (Fig. 19). The entire skeleton was stored at the Zoology Division of the NMNH in Manila.

Internal examination, gastro-intestinal contents and analysis

Davao specimen

Only the right testis, the penis and a short portion of the digestive tract were recovered from the carcass. The testis measured 170 × 72mm.

Two lower and two upper squid beaks and 4 partial lenses were found in the portion of the digestive tract recovered (Fig. 20). Specimens are kept in the BFAR office in Davao City. The two lower beaks are from large

Table 3
Cranial measurements of Longman's beaked whale specimens from Davao and Sta. Ana.

Measurement		Sta. Ana			Davao		
		cm		ave	in	cm	
1	Condylobasal length	120.3	–	–	–	42.0	106.6
2	Length of rostrum; tip of beak to line connecting apices of antorbital notches	78.5	–	–	–	29.0	73.7
3	Tip of rostrum to posterior margin of pterygoid near midline	88.6	88.8	88.4	88.6	35.3	89.5
4	Tip of rostrum to most posterior extension of wing of pterygoid	93.0	93.7	95.4	94.0	39.5	100.3
5	Tip of rostrum to most anterior extension of pterygoid	70.5	67.8	68.9	69.1	27.5	69.9
6	Tip of rostrum to most posterior extension of maxillaries between pterygoids on the palate	84.5	82.0	79.2	81.9	26.0	66.0
7	Tip of rostrum to most posterior extension of maxillary plate	107.3	–	–	–	40.3	102.2
8	Tip of rostrum to anterior margin of superior nares	88.3	–	–	–	33.5	85.1
9	Tip of rostrum to most anterior point on premaxillary crest	90.3	–	–	–	34.3	87.0
10	Tip of rostrum to most posterior extension of temporal fossa	116.5	–	–	–	41.5	105.4
11	Tip of rostrum to most posterior extension of lateral tip of premaxillary crest	93.6	–	–	–	36.5	92.7
12	Tip of rostrum to most anterior extension of pterygoid sinus	72.9	70.3	71.4	71.5	26.0	66.0
13	Length of temporal fossa	17.4	–	–	–	6.8	17.1
14	Length of orbit	14.5	–	–	–	6.0	15.2
15	Length of nasal suture	–	–	–	–	3.0	7.6
16	Breadth of skull across postorbital process of frontals	48.6	–	–	–	13.0	33.0
17	Breadth of skull across zygomatic processes of squamosals	50.5	–	–	–	15.0	38.1
18	Breadth of skull across centers of orbits	45.9	–	–	–	27.5	69.8
19	Least breadth of skull across posterior margins of temporal fossae	32.0	–	–	–	12.5	31.8
20	Greatest span of occipital condyles	15.7	–	–	–	8.0	20.3
21	Greatest width of an occipital condyle	6.6	5.6	–	6.1	–	–
22	Greatest length of an occipital condyle	10.3	10.6	–	10.4	–	–
23	Greatest breadth of foramen magnum	5.8	7.0	–	6.4	2.0	5.1
24	Breadth of skull across exoccipitals	42.6	–	–	–	17.5	44.5
25	Breadth of nasals on vertex	9.9	–	–	–	3.0	7.6
26	Least distance between premaxillary crests	7.8	–	–	–	2.8	7.0
27	Greatest span of premaxillary crests	24.2	–	–	–	–	–
28	Least width (strictly transverse) of premaxillae where they narrow opposite superior nares	17.8	–	–	–	–	–
29	Greatest width of premaxillae anterior to place of previous measurement	17.1	–	–	–	–	–
30	Width of premaxillae at midlength of rostrum	8.8	–	–	–	3.5	8.9
31	Width of rostrum in apices of antorbital notches	34.1	–	–	–	10.3	26.2
32	Greatest width of rostrum at midlength of rostrum	15.3	–	–	–	6.0	15.2
33	Greatest depth of rostrum at midlength of rostrum	7.5	–	–	–	1.0	2.5
34	Greatest transverse width of superior nares	9.0	–	–	–	0.8	1.9
35	Greatest inside width of inferior nares; at apices of pterygoid notches, on the pterygoids	14.2	13.8	13.3	13.8	3.0	7.6
36	Height of skull; distance between vertex of skull and most ventral point of pterygoids	44.6	–	–	–	15.8	40.0
37	Greatest width of temporal fossa approximately at right angles to greatest length	12.2	–	–	–	3.5	8.9
38	Least distance between (main or anterior) maxillary foramina	11.7	–	–	–	4.8	12.1
39	Least distance between premaxillary foramina	2.3	–	–	–	1.5	3.8
40	Greatest length of vomer visible at surface of palate	29.0	29.3	28.4	28.9	7.8	19.7

adult *Taonius* sp. (probably *T. pavo*). A single upper beak with the broken posterior hood margin is from a species of *Histioteuthis*. These species of squid were two of the five species found in the stomach of the Kagoshima specimen (Yatabe *et al.*, 2010). Pieces of plastic bags were reportedly found in the stomach.

Santa Ana specimen

Given the state of the carcass upon exhumation and general conditions on-site, a proper necropsy could no longer be conducted. Only a portion of the stomach and the intestines were cut open to check for contents. Several fish and squid eye lenses were found. Two squid upper beaks were found but species could not be identified (Fig. 21). All specimens are kept in the NMNH Zoology Division in Manila.

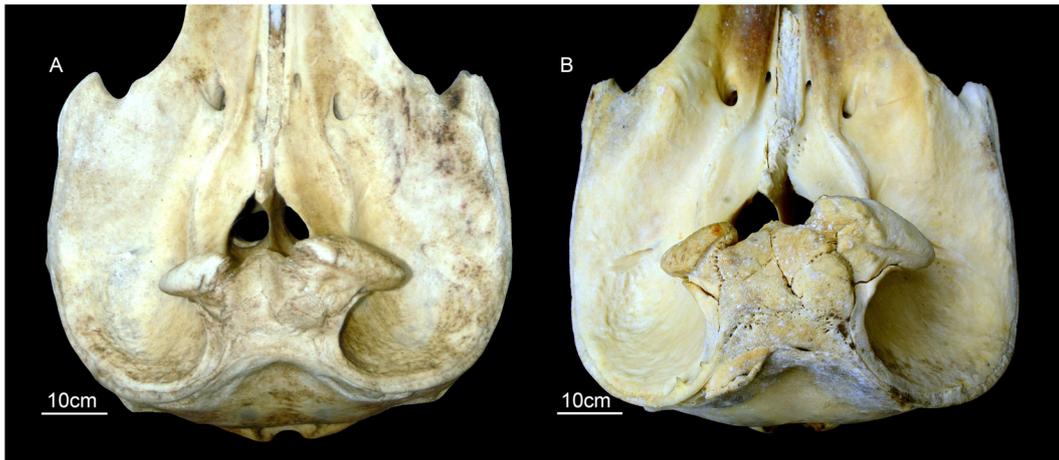


Fig. 15. Vertex of skull of Davao (a) and Sta. Ana (b) specimens. Vertex of the skull, the frontal bones occupy an area that approximates or exceeds that occupied by the nasal bones; there is minimal extension of premaxillary crest between the nasal and maxillary bones, or between the frontal and maxillary bones (Dalebout *et al.*, 2003; Moore 1968).



Fig. 16. Lateral view of the cervical vertebrae of the Davao (a) and Sta. Ana (b) specimens showing the fused first five cervical vertebrae. Note that (a) includes the first four thoracic vertebrae in the photo.

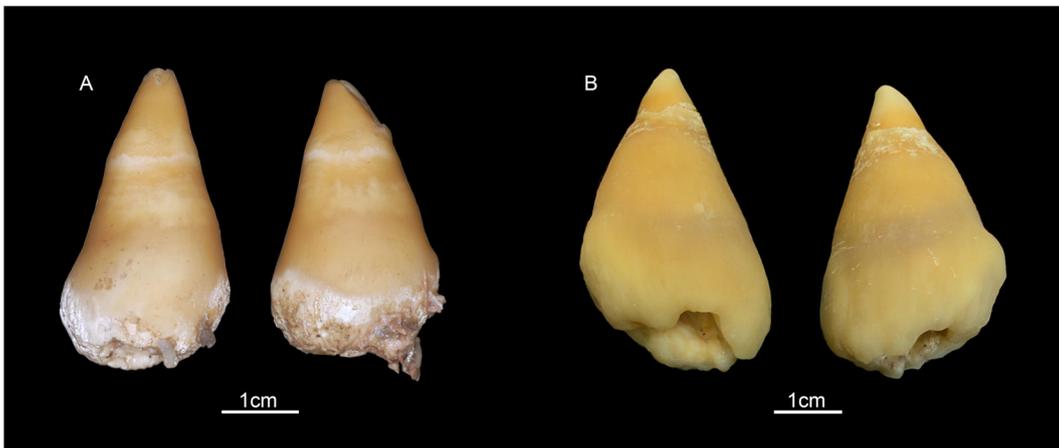


Fig. 17. Teeth of the Davao (a) and Sta. Ana (b) specimens.

Table 4
Postcranial osteology for Longman's beaked whale.

Sex/age class	Davao specimen		Sta. Ana specimen
	Male/subadult		Male/subadult
Cervical vertebrae	2 + 5		2 + 5
Thoracic vertebrae	10		10
Lumbar vertebrae	10		8
Caudal vertebrae	16 (*missing 3–4)		19
Chevron bones	8 (*1st is missing)		10
Ribs (L)	10 (*R5,6,8 & 9 broken in two; R7 & 10 broken in 3)		9 (*10 th rib lost in burial site)
Ribs (R)	10		10
Scapula (L/R)	1/1		1/1
Radius (L/R)	1/1		1/1
Ulna (L/R)	1/1		1/1
Humerus (L/R)	1/1		1/1
Pelvic bone (L/R)	0/1		1/1
Hyoid bone (L/R)	3		2
Sternum	4 (*broken into 7 pcs.)		4
Carpal bones (L/R)	3 (*others lost)		6/5
Metacarpal (L/R)	3 (*others lost)		5/5
			I – 0/0
			II – 4/4
Phalanges (L/R)	*lost		III – 2/4
			IV – 5/5
			V – 1/2



Fig. 18. Skull of the Sta. Ana specimen (a) dorsal view; (b) left lateral view; (c) ventral view; (d) dorsal view of mandible; (e) close-up of cranial vertex; (f) close-up of lateral view of skull. Arrow points to diagnostic cranial features discussed by Moore (1968) and Dalebout *et al.* (2003).



Fig. 19. Left and right pelvic bones of Sta. Ana specimen.



Fig. 20. Stomach contents of Davao specimen.

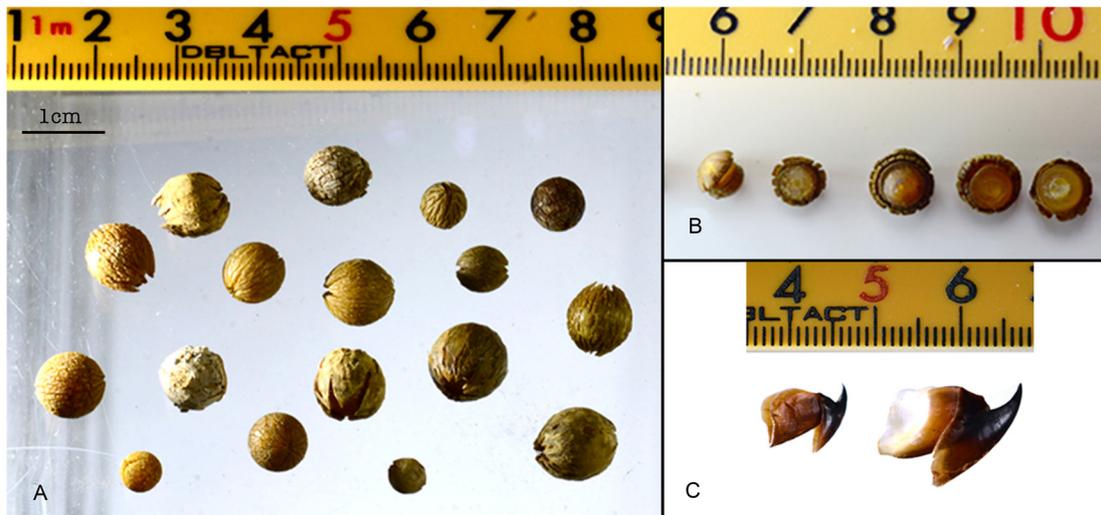


Fig. 21. Stomach contents of Sta. Ana specimen.

Quezon specimen

A necropsy was conducted the following day (10 February) by veterinarians and staff from BFAR-Region IV-A, by this time, the fluke had been cut-off, most likely by curious locals. Gross examination of the thoracic and abdominal cavities was conducted. Reddish foam was found in the trachea while the lungs were edematous. The heart was unremarkable and some blood were taken as samples. The abdominal organs were soft and moderately friable. The stomach was empty except for thick yellowish fluid on the mucosa and whitish, hair-like substances, of which samples were taken. The intestines were empty except for watery faeces in the distal end. Samples of the faeces were also taken. The liver and kidneys appeared reddish brown and samples were collected. The penis and testes were also collected.

Genotypes

For the Davao specimen (MDS 1), BLAST search using fragments of the CytB revealed that the sample sequence have 100% similarity with *I. pacificus* (GenBank: KY364702). Further analysis using NJ method confirmed that the samples belonged to the same monophyletic clade with *I. pacificus*, supported by a bootstrap value of 100% (Fig. 22). For the Santa Ana specimens (MDS 2 and MDS 3), BLAST search and NJ analysis using the CO1 fragments also point to the samples as *I. pacificus* (GenBank: KY364702) based on the distinct monophyletic clade formed, which was also supported by a bootstrap value of 100% (Fig. 23).

DISCUSSION

The five strandings of the Longman's beaked whale expanded the area of the Philippines where this species is known to occur. Although the country is within the known range of distribution for this species, it was not until the stranding in Davao in 2004 that scientists confirmed its occurrence with specimen evidence. Live at sea sightings in the country are few and were not confirmed until careful review of photographs several years later because of the brevity of interactions and/or lack of photo-documentation (Dolar *et al.*, 1994; Leatherwood *et al.*, 1992).

To date, the strandings and sightings in the Philippines are the southernmost records in the western North Pacific. Furthermore, these are the only confirmed records of the species in the Southeast Asian region to date.

The data presented adds important information on the external appearance and osteological characteristics of the species, particularly for subadult males. The distinct crease between the melon and the beak were common features observed in all four specimens. Until 2009, the largest documented male specimen was that from Davao which was believed to be a subadult because of the unfused epiphysial discs. The teeth of the Davao and Santa Ana specimens were all slightly pointed, compared to the rounded and worn teeth of the 5.9m-long adult male

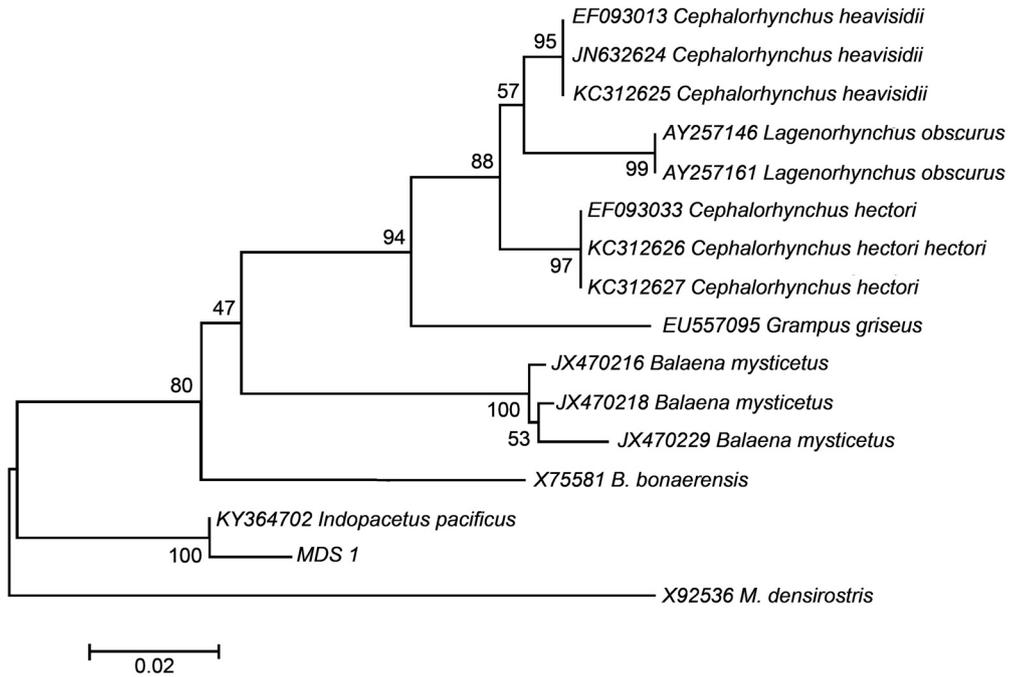


Fig. 22. Neighbour-Joining analysis of Davao sample (MDS 1) CytB sequences with reference sequences using Kimura 2-parameter model. Bootstrap values from 100 bootstrap samples are indicated beside the nodes. The scale bar represents 2% genetic distance and GenBank accession numbers are shown before the species names.

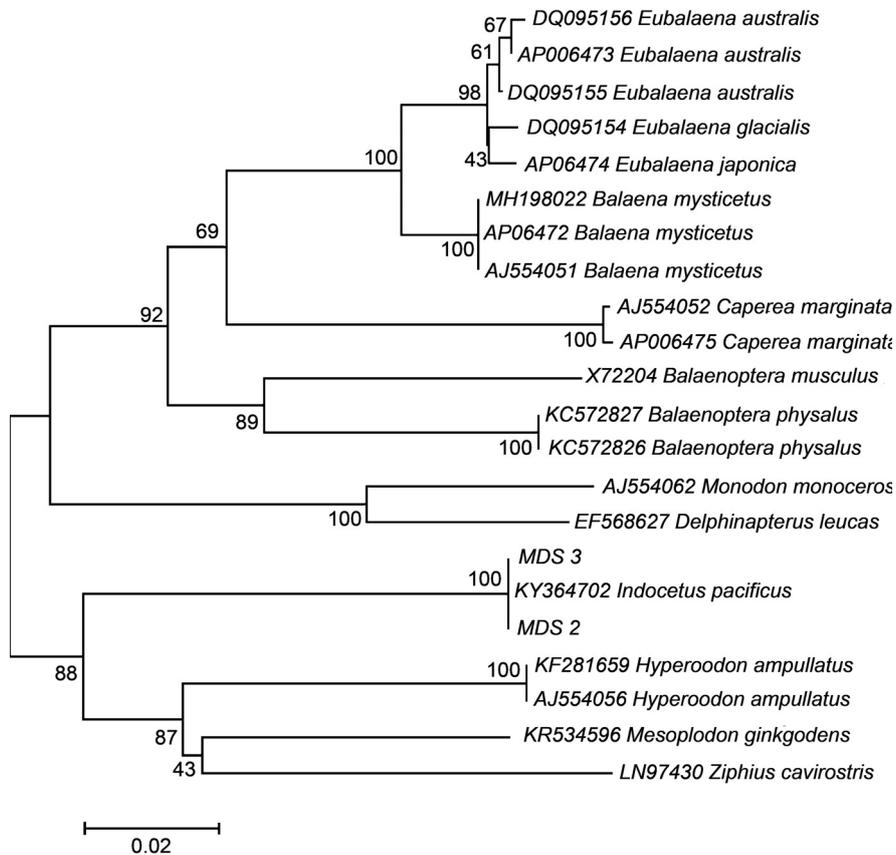


Fig. 23. Neighbour-Joining of Santa Ana samples (MDS 2 and MDS 3) COI sequences using Kimura 2-parameter model. Bootstrap values from 100 bootstrap samples are indicated beside the nodes. The scale bar represents 2% genetic distance and GenBank accession numbers are shown before the species names.

specimen from New Caledonia (Garrigue *et al.*, 2016). Comparing the lengths of the teeth, the Davao teeth (37.2mm and 34.4mm) were shorter than the Santa Ana teeth (50.9mm and 50.01mm) and the New Caledonia (42mm) teeth, while the Santa Ana teeth were longer than the New Caledonia teeth. The China teeth were described as conical and pointed while it could not be verified from Peng *et al.* (2009) if the length/height or base of the teeth were measured. These features and the total lengths of all four specimens led the authors to believe these specimens were subadults. However, comparing the Davao and Santa Ana specimens, although the total length of the Davao specimen was longer than the Santa Ana specimen, the Santa Ana specimen's epiphyseal discs were all fused and its teeth were larger. It is possible that the Santa Ana specimen was not measured accurately and could possibly be longer than the Davao specimen.

The presence of two mammary slits in the Davao and Quezon specimens are notable. The mammary slits were not observed in the Santa Ana and Gonzaga specimens because of the state of decomposition of the former and the absence of clear photographs of the genital area in the latter. In other *Indopacetus pacificus* specimens, mammary slits were observed in the juvenile male animal that stranded in Okinawa in July 2011 and the male animal that stranded in August 2021 (Kobayashi, pers. comm.). However, the two round protuberances were not observed in any other specimen, including the Okinawa male specimens (Kobayashi, pers. comm.). The length of the mammary slits in the male neonate specimen from South Africa (PEM 292) in Dalebout *et al.* (2003) was measured but neither described in the text nor shown in the photographs. Mammary slits may be present in male cetaceans but are not present in all individuals of a species (Dixon *et al.*, 1994; Rommel *et al.*, 2007; Rommel and Lowenstine, 2001; Mazzariol and Centelleghé, N.D.). Among beaked whales, in Boschma 1951, mammary slits were illustrated in a juvenile and an adult male specimens of *H. ampullatus* (Dixon *et al.*, 1994) and has been noted in male specimens of *Hyperoodon planifrons* (Dixon *et al.*, 1994), *Mesoplodon hectori* (Mead and Baker, 1987); and *Mesoplodon mirus* (Reeve-Arnold *et al.*, 2020). Furthermore, Clarke (2005) documented the presence of nipples in grooves posterior to the insertion of the penis in foetal and postnatal male blue and fin whales and stated that male nipples (and grooves) occur in most 'whalebone whales' while absent in sperm whales. The skeleton from Santa Ana is the most complete in the country. The external appearance, colouration pattern and osteological characteristics are consistent with published literature on the species with some minor variations in the colour hues and the vertebral formula. These variations may be due to regional or individual differences or the freshness of the carcass may affect colour variation.

This study also documents that beaks from *Taonius* sp., *Histioteuthis* sp., both found in the Kagoshima specimen (Yatabe *et al.*, 2010) and unidentified fish eyes were found in the stomachs of specimens from Davao and Santa Ana. Although samples collected were limited, this adds knowledge on the feeding preferences of *I. pacificus*.

All tissue samples from the Davao and Santa Ana specimens sequenced and analysed were confirmed to be *I. pacificus*. The reference sequences used in this study came from the complete mitochondrial genome (mitogenome) of a dead stranded *I. pacificus* (voucher no. NMNS011169) collected in Ilan County, Northeastern Taiwan (Yao *et al.*, 2018). Unfortunately, genetic analysis for the Quezon whale was not performed because of the absence of tissue samples.

The lack of information on the circumstances and causes of strandings are important to note since many of the strandings of this species have come from live strandings that eventually died. The causes of stranding and mortality are difficult to determine since there were no obvious signs of trauma and none of the animals were emaciated. Although it was reported that plastic bags were found in the gastro-intestinal tract of the Davao specimen, with no opportunity to examine other organs and no details on the amount (number or weight) of plastics found, it cannot be concluded that it was indeed the cause of stranding and eventual death. The necropsy of the Quezon specimen was inconclusive and the tissue samples collected were not analysed. The strandings of Longman's beaked whales in the municipalities of Santa Ana and Gonzaga only a day apart during or immediately after a typhoon, are important to note. The two stranding locations are only approximately 26km from each other and could have occurred at the same time but were only observed and reported later. This may be considered as an unusual mortality event. The timing and proximity of these stranding may raise suspicion about anthropogenic sound as a possible cause however, no navy sonar exercises or seismic activities were reported during that time. The typhoon may have been a factor in causing those two animals to get lost into the shallower

parts of the coast but what led to its actual stranding cannot be determined. Diseases may be another possible cause for any or all of these strandings. Finding morbillivirus in the Longman's beaked whale stranded in Hawaii generated many questions on the prevalence of this disease and its possible impact on marine mammal populations in Hawaii (West *et al.*, 2013) and its presence should also be considered as a possibility in the Philippines. Other actual and potential threats to Longman's beaked whales are limited to the reported incidental catches in Sri Lanka (Anderson *et al.*, 2006; Dayaratne and Joseph, 1993; Jefferson *et al.*, 2015), possible impact of active SONAR and other seismic activities (Yang *et al.*, 2008; Yamada *et al.*, 2012) and plastic debris ingestion (Kaladharan *et al.*, 2014; Yamada *et al.*, 2012).

The challenges encountered in documenting and collecting information on these stranding events demonstrates the need for a standardised method of stranding data collection. The method of taking external measurements varied and cast doubt on accuracy of the total lengths of some of the specimens because of different marine mammal stranding data sheets or guides used (i.e. Davao versus Quezon specimens). On-site conditions, positioning and condition of the carcass also made it difficult to accurately measure the total body length of the Santa Ana and Gonzaga specimens. Similarly, skull measurements taken from the Davao specimen and the Santa Ana specimen were based on different measurement guides. Incomplete examination of physical features, including colouration and presence of erupted teeth makes comparison among specimens difficult. The importance of conducting necropsy on a fresh carcass, taking tissue samples for genetic analysis and collection of the skeleton for further examination must also be emphasised. It further highlights the need for training local stranding responders using standardised methods and centralising the repository of stranding data, including specimens collected. For a species as elusive and little-known as the Longman's beaked whale, proper documentation, examination and collection of samples from animals, dead or alive, is crucial in understanding its biology and ecology.

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