

## BOLD COLOURATION PATTERN IN SOUTHERN BOTTLENOSE WHALES, A PRELIMINARY ASSESSMENT OF EXTERNAL VARIATION

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### ABSTRACT

Insights in the variation in pigmentation patterns and other external features in *Hyperoodon planifrons* are few, in particular, variability contributed by each of individual, ontogenetic, sexual, and geographic factors. A preliminary assessment is based on two close-up sightings of juveniles during IWC-SOWER Cruises and stranded specimens from South Africa, Australia and New Zealand. Bold, cream-white facial fields separated by a distinct dark blowhole stripe are diagnostic of all juveniles/neonates examined and may persist in subadults. Dark eyepatches may be pronounced or almost absent, a light nuchal band behind the blowhole may be prominent or muted, and the dorsal aspect of flippers may be light or dark. A light flank patch on the tailstock is consistent in juveniles. With maturation the head pattern gradually blurs, apparently because facial fields and the nuchal band gain pigmentation. The slate-grey or dark brownish-grey spinal field in juveniles is appreciably darker than in most adults, in which it varies widely, ranging from brownish-grey (most common), bluish-black to yellowish. Diatoms have been blamed as cause for the brown hue, however the evidence is unclear. Large, almost-white animals have been reported but no such specimens were available for study. Much of the external variation seen may be individual and ontogenetic, however sexual dimorphism and geographic variation remain unassessed due to small samples. A comprehensive morphological study is indicated. The bold features in juvenile *H. planifrons* are diagnostically distinct from juvenile *Tasmacetus shepherdi* and *Indopacetus pacificus*. Non-priority status and long dive durations have allowed scant time for data collection on *H. planifrons* during Antarctic surveys. This study shows that maximizing opportunistic encounters through allowance for some flexibility in schedules, valuable data can be obtained. A rule-of-thumb is recommended for avoiding ziphiid species identification at distances exceeding 0.8 nmiles.

KEY WORDS: ANTARCTIC; COLOURATION; ONTOGENETIC VARIATION; MORPHOLOGY; SOUTHERN HEMISPHERE; SOUTHERN BOTTLENOSE WHALE

### INTRODUCTION

The dearth of adequately documented information on variation in the external morphology and pigmentation patterns in many beaked whale species may hamper straightforward, positive identification at sea and during stranding events. In particular, little is understood of variability contributed by each of individual, ontogenetic, sexual, and geographic variation, exemplified in debate on a recent sighting of a small ziphiid in Antarctic waters during the 2004/2005 IWC-SOWER Circumpolar Cruise (Ensor *et al.*, 2005). Although some observers identified it as southern bottlenose whale, it was assigned a cautionary 'ziphiid' identification because: (i) its estimated size (2-2.5m) was smaller than the smallest known calf of *Hyperoodon planifrons* (ca.3m, see below); (ii) its bold colouration pattern had not been previously adequately described; (iii) juveniles of three other ziphiids (*Mesoplodon traversii*, *Tasmacetus shepherdi*, *Berardius arnuxii*) could not confidently be excluded for lack of comparative data; (iv) heightened prudence in positive identification of beaked whales is advised since the number of species authenticated to penetrate polar waters is increasing (e.g. Carlström *et al.*, 1997; MacLeod, 2000; Lien and Barry, 1990; Van Waerebeek *et al.*, 2004). An exhaustive literature search and consultation with colleagues revealed, scattered, mostly unpublished, information on a few other juvenile individuals with similar external features, which we document here. A preliminary evaluation of variation in colouration in southern bottlenose whales is meant as a preparatory phase towards a comprehensive study of morphological variation in *H. planifrons*.

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## MATERIAL AND METHODS

External features of juvenile southern bottlenose whales are described from field notes and photographic material, and compared with published data, for two new sightings in Antarctic waters and three stranded specimens from South Africa, Australia and New Zealand. Sightings were made during the 1997/1998 and 2004/2005 IWC-SOWER Circumpolar Cruises. General survey methodology is detailed in Ensor *et al.* (1998, 2005). The South African specimen was collected by one of us (PB) and is curated at the South African Museum, Cape Town (Cat. No. ZM 41123). The other specimens are pictured in Dixon *et al.* (1994, fig.2) and Dalebout *et al.* (2003, fig. 4).

No dedicated terminology of ziphiid pigmentation patterns has been developed, so we recur to terminology defined for delphinoid cetaceans, briefly: the eye patch (Perrin, 1969; Mitchell, 1970); spinal field, abdominal field, flank blaze, lip patch (Mitchell, 1970) and blowhole stripe (Perrin, 1997). We newly define 'facial field' as a lateral, light-coloured field on the head, projecting from the abdominal field; 'nuchal band' as a light-coloured transversal band that runs over the head, behind the blowhole, connecting left and right facial fields. The nuchal band appears homologous with a light ring around the neck reported from some female *Hyperoodon ampullatus* specimens, called *ringfiskar* by Norwegian whalers (Ohlin, 1893; *in Ellis*, 1982).

## OBSERVATIONS AT JUVENILE BOTTLENOSE WHALES

### Sighting # 005

#### *Circumstances*

On 23 January 2005, at 10:09:45h, a small bottlenose whale was observed, alone, at close distance (sighting # 005), in the Southern Ocean at 67°12.51'S, 011°25.48'E, south of the Antarctic Polar Front, in pelagic habitat. Sighting conditions, including visibility and sea state 1, were excellent. Digital photographs were obtained by a crewmember and one of us (GF).

#### *External morphology*

One of two most striking features of #005 was its small body size, independently estimated as 2-2.5m by researchers, and 2m by the ship's bosun, Mr. Norihiko Kasai. The melon was pronounced but sloped downward to the rostrum moderately steeply to merge smoothly with the rostrum. The visible, anterior, part of the mouthline was straight. The mandibles projected slightly beyond the rostrum and no teeth were visible. A neck crease was apparent close behind a typical ziphiid crescent-shaped blowhole. The shape of the dorsal fin, set at the latter third of the body, was intermediate between falcate and triangular: its trailing edge was only slightly concave but the fin tip was rounded. Behind the fin, the upper tailstock formed a sharp ridge, such that the anterior 1/3 of the fluke midline was keeled. The posterior contour of the prominent flukes was markedly concave, with tapered fluke tips and no notch.

The small body size, few scars and lack of erupted teeth implied that #005 was very juvenile. According to some, faint slanted lines apparent on some photographs suggest possible foetal folds, however pressure creases due to the thick blubber are another possibility, since the animal was rotund when viewed from behind. This, the presence of some healed tooth rakes below the dorsal fin, the erect dorsal fin and firm fluke tips, do not support neonate status.

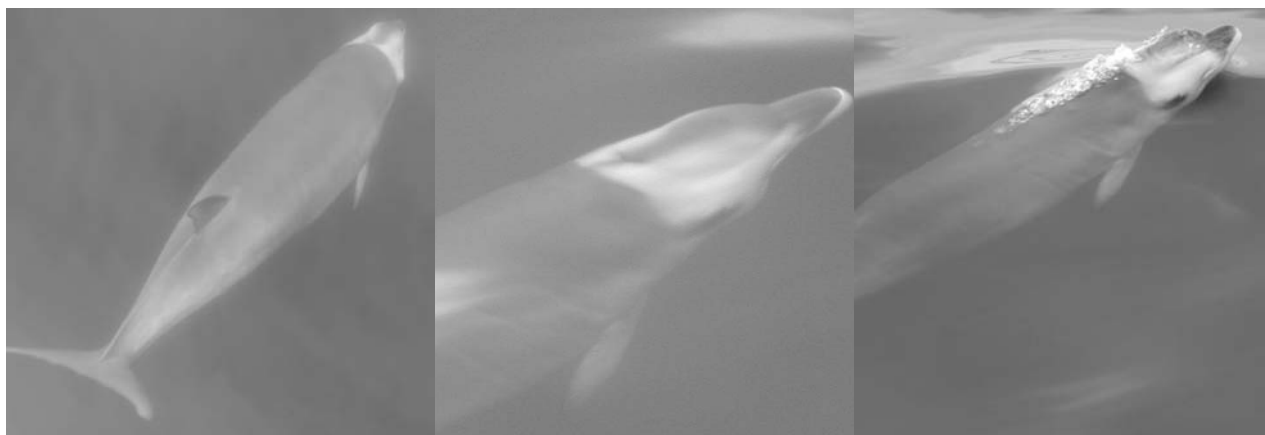


Fig. 1. Sighting #005 of juvenile southern bottlenose whale at 67°12.51'S, 011°25.48'E. Photos courtesy Junya Utashiro.

*Pigmentation pattern*

Bilateral, cream-white facial fields were sharply demarcated from the dark, slate-grey spinal field. The slate-grey of the rostrum extended posteriorly over the melon into a broad, well-defined blowhole stripe, separating left and right facial fields. A cream-white nuchal band behind the blowhole united the facial fields, except for a thin median line (Figure 1). Prominent, dark eye patches, contrasted with the surrounding facial and abdominal fields. Eye patches were off-centre, extending further below the eye than above. A narrow streak anchored the eye patch with the spinal field. Mandibles and lower lips were white. The two-toned trunk consisted of an uniformly slate-grey spinal field extending posteriorly to the tailstock, presumably [not well observed] descending into a light or white ventral field. A light-coloured flank blaze extended from the ventral field and covered the lower half of the tailstock. The upper side of the flukes was slate-grey as the spinal field. The dorsal fin was slightly darker, while the upper side of the flippers appeared light grey. The body appeared unscarred *in vivo*, however enlarged digital images revealed at least two sets of tandem tooth rakes (with narrow separation) below the dorsal fin, some epidermal erosion at the right side of the dorsal fin and a small nick at its trailing edge.

*Behaviour*

Individual #005 moved slowly in no particular direction. With the vessel closing, evasive behaviour occurred at ca.15m distance: the animal headed away, subsurface, perpendicular to the vessel, blew a few times and disappeared from view despite the nearly flat calm sea. It was questioned whether #005 could have been a resighting of a calf in a ziphiid group of three, encountered 56min earlier at 09h:15m:20s (sighting #002) at 67°13.70'S, 011°21.31'E, however no white was noted on the heads. Point-to-point distance between both sightings was 3.7km (NE bearing of 54°). Sighting #002 consisted of three individuals logged as *Mesoplodon* sp. based on modal mesoplodont size (adults estimated as 4-5m), light grey colour (not brownish), a well-formed but not hyperodont-type melon, a moderately short but no tubular rostrum. Although it raises an interesting behavioural question, of whether two larger bottlenose whales would dive simultaneously and abandon a calf alone at the surface, instead of diving alternately, such behaviour was not noted during observation of sighting #002.

**Sighting #30940**

On 25 January 1998, at 08:16h, a southern bottlenose whale approached the drifting R/V *Shonan Maru* at 60°27.66'S, 50°00.13'W during the 1997-1998 IWC/SOWER cruise (Ensor *et al.*, 1998). An off-effort sighting, the whale was briefly seen milling by researchers Sharon Hedley and Paul Ensor and left at 08:18h. Estimated body size was 4.5m, presumably a larger juvenile. Several photographs are available (Figure 2).

The overall body colouration of individual #30940 (IndexKey DESS database) was described as brownish-grey by the above observers, and slate-grey with a slight reddish tone (as in #005) by KVV from three photos. Its head pattern was virtually identical to #005, including bold, light-coloured facial fields separated anterodorsally by a broad, slate-grey blowhole stripe. A prominent nuchal band joined left and right facial fields dorsally, sharply demarcated from the dark spinal field. The lower lips were whitish, exposed by a lower jaw projecting slightly forward relative to the dark rostrum. The melon was rounded but not quite bulbous. The beak looked tube-like and was longer than in both #005 and ZM41123. No teeth were visible.

Whale #30940 showed several oval marks on the anterior back, thought to be caused by cookie-cutter sharks *Isistius brasiliensis* (Jones, 1971; Balcomb, 1989) or *I. plutodus* (L. Compagno, pers. comm.). Because these sharks are believed to occur in warmer waters, the scars suggest that the animal may have migrated from lower latitudes. Two narrowly spaced sets of tooth rakes mark the anterior dorsum of this individual.



Fig.2. Sighting #30940 of an (estimated) 4.5m individual at 60°27.66'S, 50°00.13'W. Photo courtesy S. Hedley.

**Specimen ZM 41123**

On 15 December 1992, a 327cm male southern bottlenose whale stranded dead but very fresh at Scarborough, Cape Peninsula, South Africa (34°13'S, 18°22'E). It was examined by one of us (PBB). The skull and samples of frozen skin and blubber are in the South African Museum collection (cat no ZM41123), Cape Town. Miscellaneous data include morphometrics, total weight (505.5 kg in pieces) and organ weights and parasites.

Its pigmentation pattern largely resembles that of the Antarctic animals described above, except that it looks more melanized. The blowhole stripe of ZM41123 is considerably wider, darker and merges posteriorly with the dark slate-grey spinal field, so there is no nuchal band and the facial fields reach less high on the head. The large, dark eye patch connects caudally with the spinal field via a narrow streak (as with #005). Chin and lower jaw was mostly white. A prominent, light, flank patch is present on the tailstock. The beak appears shorter than in individual #30940 but very similar to that of #005, and the mandibles project slightly forward of the rostrum. Both sides of the flippers were white, except for a dark apical rim and a pigmented spot at the anterior insertion. The dorsal fin of #30940 appears much more falcate than in #005.



Fig. 3. Freshly dead specimen ZM41123 stranded at Scarborough, South Africa. Details see text. Part of the skin lacerations were post-mortem. Photo by The Argus.

## DISCUSSION

### Variation in external morphology

#### *Ontogenetic variation*

Neonatal lengths of *H. planifrons* cited in the literature appear to be informed guesses and range widely from 'about 3.50m' (Mead, 1989), '2.5-2.9m' (Bannister *et al.*, 1996), '2.7-3.6m' (Shirihai, 2002), and 'around 2m' (Jefferson *et al.*, 1993). Ross (1984) estimated 2 calves seen in January 1975 at 3.0-3.5m length. Length at birth is essentially unknown but would be comparable with the 3m in *H. ampullatus* (Benjaminsen, 1972). ZM41123, a calf which measured 327cm, was larger than a neonate considering its umbilicus had healed. The melon becomes more bulbous with age (Mead, 1989, Ross, 1984). The mandibles in juveniles project slightly beyond the rostrum, but in a 636cm adult male this was not the case (Tietz, 1966), a characteristic which likely is linked to age.

#### *Sexual dimorphism*

The largest known specimens of known gender are a lactating female of 745cm collected by Robert Clarke (pers.comm.) off Wilkes Land, Antarctic, in 1948 (Fraser, 1964) and a 700cm adult male from southern Australia (Dixon *et al.*, 1994). However the largest known specimen (unsexed), from Brazil, measured 750cm (Gianuca and Castello, 1976). The largest examined specimens from South Africa are a lactating female 655cm long stranded in St Helena Bay, in 1990, and a male 643 cm long that was harpooned at sea off East London, in 1975.

Relatively small sample size for *H. planifrons* may explain a female is the largest known specimen, considering that in *H. ampullatus* males are the larger gender and reach 9.8m, compared to 8.7m in females (Mead, 1989). There is not enough evidence to decide whether males have a more bulbous forehead than females, as is seen in *H. ampullatus* (Gray, 1883), or show other secondary sexual dimorphism.

### Variation in colouration

#### *Individual variation*

Two main types of dorsal body pigmentation in adults are mentioned throughout the literature, the most common is brownish to yellowish and the other is slate grey, bluish-grey, or bluish-black (see Table 1). Both types were seen by the authors, sometimes together in loose groups, in Antarctic waters during the 2004/2005 SOWER cruise. Gowans (2002) stated that the brown colouration 'is believed to be caused by a thin diatom layer', however we have not been able to uncover the precise evidence.

In juveniles, the light nuchal band may either be prominent or appear muted. Eyepatches may be pronounced or almost absent. The dorsal aspect of the flippers may be whitish or dark. Pitman *et al.* (1999) stated that 'some *H. planifrons* also have pale melons (presumably younger animals)...'. Five documented juvenile individuals shows that bold, light-coloured (lateral) facial fields (Table 1) are a modal characteristic. However, Bastida and Lichtschein de Bastida (1984) observed a group of five southern bottlenose whales for 28 minutes, one of which a calf (Table 1). The animals were reported to be rust brown all over, and one should question whether a calf with a light-coloured head could go

unnoticed. Bastida and Rodríguez (2003), presumably based on sightings from Patagonia and the Antarctic Peninsula, state that calves generally are dark brown, with no mention of light-coloured heads.

#### Ontogenetic variation

The dark blowhole stripe and the sharp demarcation between spinal field and facial fields may gradually become indiscernible, if there is a decline in overall body pigmentation with age, or if the facial fields gain in pigmentation with maturation. There is some evidence for that in three sightings of (not juvenile) animals showing somewhat pale, but indistinct, heads (Pitman *et al.*, 1999; fig.3). Pitman *et al.* (1999) indicated that 'adult male *H. planifrons* often appear almost white, mostly from the accumulated scarring on their bodies'. Spinal fields in three stranded adult males ranged from bluish-black (life-colour), cloud grey, to brownish grey, and no such white individuals seem to have been examined till date (see Table 1). In *H. ampullatus* males, the rostrum, lower jaw and forehead is well-documented to become white with age (Van Beneden, 1888; Ohlin, 1893 in Reeves *et al.*, 1993). Bastida and Rodríguez (2003) suggested that also in adult *H. planifrons*, especially the head may become paler again, until turning almost white. However, it is unclear how this was authenticated.

#### Sexual dimorphism

There exists no evidence for or against sexual dimorphism in colouration.

#### Geographic variation

The question is whether southern bottlenose whales with apparent areas of parturition near South Africa (*e.g.* ZM41123), southern Australia (*e.g.* C28757), New Zealand (*e.g.* AUNZ Hpl01) and Antarctic waters (*e.g.* #005) could conceivably constitute breeding stocks distinct from each other.

Both specimens photographed in the Antarctic had a prominent nuchal band, compared to a muted, if not incomplete, band in a juvenile from South Africa (ZM41123) with some signs of melanism. Moreover, the latter shows a broader and darker blowhole stripe and facial fields reaching less high on the melon. Its large, dark eye patches (Fig. 3) contrast with practically no eye patch in C28757 from Australia (see fig. 2. in Dixon *et al.* 1994) and a token patch below the eye in AUNZ Hpl01 from New Zealand (see fig.4 in Dalebout *et al.*, 2003). Larger samples, alongside cranial morphometrics and molecular genetics, should help establish whether this type of variation is merely individual, or perhaps geographic.

Table 1. Sightings (SI), strandings (STR) and live strandings (LST) of southern bottlenose whales, with descriptions of pigmentation patterns. Sightings ordered chronologically, specimens ordered by body length.

Type	Date	Location	External features	Source
SI	22 Dec 1981	44°37'S, 59°03'W	All individuals were <b>brownish</b> , showed linear scars and oval cookie-cutter shark scars; 4 adults, max. estimated 8m, one young an estimated 2.5m	Bastida and Lichtschein de Bastida, 1984
SI	22 Jan 1984	Drake Passage 59°20'S, 60°42'W	6-8m, <b>back brownish grey</b> ; head with pronounced melon and relatively short beak.	Lichter, 1984
SI	27 Feb 1987	42°29'S, 20°36'W	<b>'Dark fawn on the dorsal surface, with a hint of grey</b> , giving a slightly mottled effect. Dorsal fin was large, set well back.'	Cockcroft <i>et al.</i> , 1990
SI	1998	western half of Area II, Antarctica	4.5m (estimated). <b>Slate-grey with brown tinge; light-coloured head</b> (see text). Rounded but not bulbous melon.	This paper (photos S. Hedley and P.ENSOR)
SI	23 Jan 2005	Antarctica; 67°12.51'S, 011°25.48'E	2-2.5m (estimated). <b>Slate-grey dorsum, with cream-white head (facial and nuchal fields)</b> . Rounded but no bulbous melon.	This paper
STR	7 Dec 1994	Orere Pt., Firth of Thames, New Zealand	ca. 300cm, female. AUNZ Hpl01, B/W photo. extensive facial field, no nuchal band present.	T. Jones (in Dalebout <i>et al.</i> , 2003)
STR	15 Dec 1992	Scarborough, Cape Peninsula, SA	327cm male. ZM 41123. <b>Dark, slate-grey dorsal field</b> , blowhole stripe and extensive eye patch. Muted, discontinuous nuchal band, due to strong melanism.	This paper.
STR	22 Sept 1992	Mentone, Victoria, AUS	367cm, juvenile male. C28757. 'dorsal surface of the beak and head was <b>brownish black</b> , and the lateral aspect of the melon [=facial field] was olive-brown. A brown band continued dorsally [=spinal field] from the posterior limit of the melon towards the tail, and extended midlaterally.' Flippers dark externally. Eyepatch not perceptible.	Dixon <i>et al.</i> 1994
STR	1 April 1996	Ohope, Whakatane, New Zealand	368cm, female. AUNZ Hpl03, B/W photo available; large facial field with apparently narrow blowhole stripe. Nuchal band indeterminate. Minor eyepatch (below eye only).	R. Tully (in Dalebout <i>et al.</i> , 2003)
STR	18 Jan 1964	Port Elizabeth, SA	636cm, adult male. 'In colour it was <b>cloud grey</b> but paler along flanks and belly and on the underside of pectoral flippers'.	Tietz, 1966
STR	Jan 1979	Ohope, New Zealand	6.6m; <b>brownish-grey on the head and back, paler underneath; head somewhat lighter</b> ; distinct shield-shaped light patch beneath the eyes. Scratches, white spots and oval scars.	Baker, 1999
LST	early Dec 1929	Near Port Victoria, Yorke Peninsula, Australia	693.5cm, adult male 'life-colour was described as <b>bluish-black above with the belly creamy or grey</b> '. Forehead massive and overhanging the beak.	Hale, 1931

## CONCLUSION

Contrasting, light-coloured facial fields seem to be a diagnostic feature of most, but possibly not all, neonate and juvenile southern bottlenose whales and may persist in some older juveniles (e.g. #30940) or even subadult animals. Apparently with increasing age, this bold pattern gradually blurs. The facial field in *H. planifrons* differs from the large white chin blaze in *Tasmacetus shepherdi*, which also extends from the ventral field but stops at the level of the mouth gape several cm below the eye (see photographs in van Helden, 1994). A nuchal band may either be prominent or muted in *H. planifrons*, while it does not exist in *T. shepherdi*. The spinal field in juvenile southern bottlenose whales tend to be significantly darker (e.g. dark slate-grey or brown) than in adults. Pigmentation of the spinal field in adults varies, ranging from brownish-grey (most common) to bluish-black.

Much of the variation seen in external features of *H. planifrons* may be individual and ontogenetic. Sexual dimorphism and geographic/phylogenetic sources of variation remain unassessed due to small samples. A cursory overview of published osteological data suggested appreciable variability, warranting a comprehensive study. Mt-DNA control region sequences of two *H. planifrons* specimens from New Zealand differed 4.12%, considerably higher than the normal interspecific variation of 2% found in other beaked whales (Dalebout *et al.*, 1998), and partitions below accepted species level are considered possible (Gowans, 2002; Reeves *et al.*, 2004).

Although good progress has been made, beaked whales encountered during sighting surveys often still remain unidentified. The publication of good series of photographs and detailed descriptions of intraspecific variation should help remedy the predicament. The frequency with which even freshly dead, stranded beaked whales are misidentified despite unlimited hands-on access, should bring a sense of reality to the difficulty of positively identifying mostly submerged beaked whales at great distance. Ensor *et al.* (2005) recommended a rule-of-thumb distance not exceeding 0.8 nmiles for identification of ziphiids to species level. Long dive durations and non-target species status have impeded closing, however it is obvious from this paper that valuable data can be obtained with some flexibility or minor adjustments to cruise schedules when favorable opportunistic encounters with ziphiids are optimally exploited.

In the Southern Ocean, the risk exists that some ziphiid sightings may be assigned too readily to southern bottlenose whale, partly because the species is reported to account for more than 90% of ziphiid sightings in this region (Kasamatsu *et al.*, 1988; Kasamatsu and Joyce, 1995). If this figure would be biased upwards by hasty identifications, the bias could reinforce itself. Mead (1989) already warned that 'there is the possibility that some of the sighting records [in the literature] are misidentifications of *Berardius arnuxii*, a ziphiid difficult to distinguish at sea from *Hyperoodon planifrons*'. When sighted from reasonably close, however, the longer, tubular beak, less bulbous melon and small, rounded dorsal fin of *B. arnuxii* should allow a positive identification. For the recently rediscovered *M. traversii* (Gray, 1874), the least-known cetacean, no external features are documented other than an estimated adult size of ca. 5-5.5m (Reyes *et al.*, 1995; van Helden *et al.*, 2002). While no *M. traversii* records exist from Antarctic waters, it is possible that it may routinely be confused with other species.

*Tasmacetus shepherdi* probably has a circumpolar distribution in cold temperate waters of the Southern Hemisphere, possibly as far south as 53°50'S (Van Waerebeek *et al.*, 2004). A recent sighting shows that Shepherd's beaked whale also occurs in Antarctic waters (Robert L. Pitman, pers.comm.). Adults and juveniles appear to have a similar colouration as shown by a 350cm fresh juvenile specimen from Wanganui, New Zealand (van Helden, 1994), and quite distinct from *H. planifrons*. For instance, in *T. shepherdi* no facial fields, nuchal band, eye patches nor blowhole stripe are present. An almost uniformly grey head, a large white chin blaze that extends from the ventral field only as high as the level of the gape and (anteriorly) to the throat grooves (Figure 4), a white thoracic blaze above and behind the flippers, and a slow-sloping non-bulbous melon distinguishes it from southern bottlenose whale. However, a whitish flank blaze, on the tailstock, is very similar to the one in *H. planifrons*.



Fig. 4. Head of juvenile *Tasmacetus shepherdi* from Wanganui, New Zealand, stranded in July 1994. Note the eye set in the grey spinal field, in contrast with juvenile *H. planifrons* in which the eye, and its dark eyepatch, are set in a light facial field. Photo courtesy Anton van Helden.

Although the distribution of Longman's beaked whale *Indopacetus pacificus*, proposed to be identical with the 'tropical bottlenose whale' (Pitman *et al.*, 1999; Dalebout *et al.*, 2003), is considered restricted to tropical waters of the Indian and Pacific Oceans, distribution into higher latitudes is possible. South African specimens have already extended its range south into temperate waters (Dalebout *et al.*, 2003) and now overlap the range of *H. planifrons*, although the role of the rapid southward flowing Agulhas current in extending the range of strandings into temperate latitudes requires consideration. What we know of its external morphology is so similar to *Hyperoodon* spp. (see Pitman *et al.*, 1999) that it is very hard to positively distinguish the species in the field unless good views are had. The main differences in juvenile *I. pacificus* compared to *H. planifrons* (see fig. 11 in Ross, 1984 and fig. 3 in Dalebout *et al.*, 2003) is the noticeably less steep melon, a wide, dark flipper stripe, anteriorly shifted facial fields so that the eye patch is engulfed by the dark spinal field and only the anterior third of the rostrum remains dark; also the blowhole stripe seems narrower and more muted.

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