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Colour pattern and external morphology of the Fraser's dolphin (*Lagenodelphis hosei*) in the Southwestern Atlantic

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Abstract

Little is known about the biology of the Fraser's dolphin (*Lagenodelphis hosei*), which is found in tropical and subtropical oceanic waters around the world. There is, depending on age and sex, great variation in intensity and development of the components of the colour pattern and external morphological characteristics of the species. The main characteristic of the colour pattern is the eye-to-anus stripe, which has highly variable development. This is the first description of Fraser's dolphin external appearance in the Southwestern Atlantic, based on 13 specimens stranded dead on the coast of Rio de Janeiro State (Brazil) around 22°30′S. Individuals analysed presented sexual dimorphism in shape of the dorsal fin, presence of a post-anal hump and deepening of the caudal peduncle, features most prominent in mature males of the species. Specimens analyzed revealed that the Fraser's dolphin possesses the same colour pattern and external morphological features reported in other areas.

Key words: Fraser's dolphin, *Lagenodelphis hosei*, colour pattern, external morphological features, sexual dimorphism, Southwestern Atlantic, Brazil.

Introduction

The external appearance of some species of small cetaceans varies with age, sex, and geographical area. When these variations are consistent and well documented, it is possible to document those aspects during sightings and to determine age/sex class of specimens (Jefferson *et al*., 1997).

The Fraser's dolphin (*Lagenodelphis hosei*) is distributed in tropical and subtropical pelagic waters around the world. The species was described in 1956, based on a skeleton collected in 1895 in Sarawak, South China Sea (Perrin *et al*., 1994). Its distribution and external appearance remained unknown until 1971, when several specimens were captured or stranded in the Eastern Pacific, South Africa and Australia (Perrin *et al*., 1973).

This dolphin is usually more robust than other delphinids, has a short well-marked beak and small appendages (Jefferson & Leatherwood, 1994). Maximum known total length is 264 cm for both sexes (Perrin *et al*., 1994).

The Fraser's dolphin shows a dark to brownish grey dorsal cape, light grey flanks and white to pinkish belly. The lower portion of the flanks also can be cream-coloured (Praderi *et al*., 1992; Jefferson & Leatherwood, 1994). The main characteristic of the colour pattern is an eye-to-anus stripe that has highly variable development (Perrin *et al*., 1973; Miyazaki & Wada, 1978; Jefferson & Leatherwood, 1994; Perrin *et al*., 1994; Amano 1996; Jefferson *et al*., 1997). The eye-to-anus stripe is bordered by lighter coloration (Jefferson & Leatherwood, 1994).

It was also suggested that sexual dimorphism should exist in this species, in colour pattern, shape, and height of dorsal fin (Perrin *et al*., 1994), presence of post-anal hump (Perrin *et al*., 1973), deepening of caudal peduncle (Amano *et al*., 1996), and colour pattern of urogenital area (Miyazaki & Wada, 1978).

This is the first description of Fraser's dolphin external appearance in the Southwestern Atlantic, based on 13 specimens stranded dead in the coast of Rio de Janeiro State around 22°30′S.

Table 1. *Lagenodelphis hosei* specimens collected on the coast of Rio de Janeiro State and their respective total length, age-sex class and dorsal fin, rostrum, and left flipper measurements.

Specimen	Total length (cm)	Class[1]	Dorsal fin (cm/%TL)	Rostrum (cm/%TL)	Left flipper (cm/%TL)	Colour pattern[2]	Level of decomposition[3]
UERJ-MQ 83	245	MF	13.7 (5.6)	3.5 (1.4)	25.5 (10.4)	Y	Code2
UERJ-MQ 84	63	Foetus	—	—	—	Y	Code2
UERJ-MQ 86	244	MM	22.5 (9.2)	4.0 (1.6)	26.0 (10.6)	Y	Code2
UERJ-MQ 87	*ca.* 220	MF	15.0 (6.8)	4.5 (2.0)	25.0 (11.4)	N	Code3
UERJ-MQ 88	247	MM	16.5 (6.7)	4.0 (1.6)	25.5 (10.3)	Y	Code2
UERJ-MQ 89	155	IM	8.8 (5.7)	1.7 (1.1)	18.2 (11.7)	Y	Code2
UERJ-MQ 90	230	MF	14.0 (6.1)	3.0 (1.3)	24.0 (10.4)	Y	Code2
UERJ-MQ 91	147	C	6.3 (4.3)	1.8 (1.2)	15.0 (10.2)	Y	Code2
UERJ-MQ 92	182	IF	9.0 (4.9)	4.0 (2.2)	19.0 (10.4)	Y	Code2
UERJ-MQ 94	203	IF	12.5 (6.1)	4.0 (2.0)	21.0 (10.4)	Y	Code3
UERJ-MQ 95	238	MF	17.0 (7.1)	4.0 (1.7)	26.0 (10.9)	N	Code3
UERJ-MQ 96	210	IF	14.5 (6.9)	6.0 (2.9)	24.0 (11.4)	N	Code3
—	*ca.* 170	IM	—	—	—	Y	Code2

[1]MM: mature male; IM: immature male; MF: mature female; IF: immature female; C: calf. [2]Y: colour pattern observed.; N: colour pattern could not be observed due to decaying. [3]Codes listed in Geraci & Lounbury (1993).

Materials and Methods

External appearance of the Fraser's dolphin here reported is based on 13 individuals collected on the coast of Rio de Janeiro State around 22°30′S, in November and December, 1997. All specimens were identified through external morphological features, according to specialized literature (Perrin *et al*., 1973; Jefferson *et al*., 1993; Jefferson & Leatherwood, 1994). Stranded carcasses were measured externally, according to Norris (1961), and photographed. Afterwards, necropsy of each individual was conducted, as described by Geraci & Lounsbury (1993).

Based on examination of ovarian scars and testis weight (Perrin & Reilly, 1984), each specimen was classified into one of six categories of sex and age: mature male ($n=2$), immature male ($n=2$), mature female ($n=4$), immature female ($n=3$), calf ($n=1$) and foetus ($n=1$), according to Jefferson *et al.* (1997).

Colour pattern, shape of dorsal fin, presence of post-anal hump, and deepening of caudal peduncle were examined from photos taken during specimen examinations. The terminology proposed by Jefferson *et al.* (1997) was used to describe colour patterns: eye-to-anus stripe, eye-to-apex stripe, apex-to-blowhole stripe, and flipper stripe.

Results

All individuals showed robust bodies and well-marked short beaks. Maximum total length was 247 and 245 cm for males and females, respectively (Table 1). Some individuals showed circular healed scars, over body parts, probably caused by cookie-cutter shark (*Isistius brasiliensis*) bites. Rostrum length varied, representing between 1.30 and 2.86% of total length. Maximum height of dorsal fin was 22 cm in a mature male (UERJ-MQ86), corresponding to 9% of its total length (Fig. 1). Dorsal fin was more erect in the two mature males than in the other individuals (Fig. 2). Flipper length varied from 10.3 to 11.3% of total length (Table 1).

The presence of a post-anal hump, as well as the deepening of the caudal peduncle in its posterior portion, were only observed in the two mature males (Fig. 2). All individuals possessed a cape, which varied from grey to dark grey. Flanks were grey and ventral surface was white. One of the mature females and the two mature males presented a cream coloration on the lower portion of flanks.

All other individuals presented the eye-to-apex, apex-to-blowhole, and flipper stripes, which were darker in mature specimens (Fig. 3). The eye-to-anus stripe was darker and thicker in the two mature males, and was less developed in the other specimens. When observation was possible, all individuals had this band accompanied by light grey coloration along its upper portion, extending to the base of melon.

The coloration of the urogenital area was variable and was similar in one mature male, two mature females and the calf (Fig. 4).

Discussion

The short beak and small appendages are well-known morphological features of this species.

Figure 1. Mature male *Lagenodelphin hosei* (*UERJ-MQ* 86) stranded dead in Rio de Janeiro coast (22°30′S), in December, 1997.

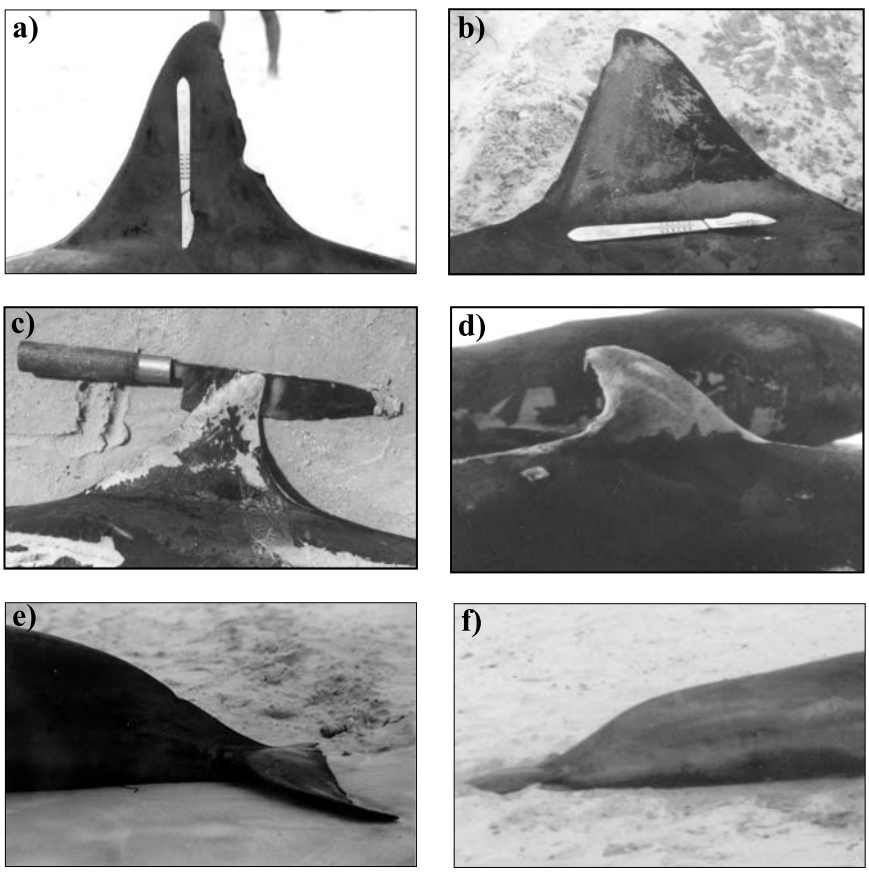

Figure 2. Dorsal fin was more erect in the two mature males, a) *UERJ-MQ* 86, b) *UERJ-MQ* 88 than in the other individuals c) mature female *UERJ0MQ* 95, d) immature female *UERJ-MQ* 96. And *e* and *f* illustrate deepening of the caudal peduncle most prominently observed in the two mature males.

Specimens reported in this paper had rostrum and flipper lengths and dorsal fin height less than 3%, 13% and 9.5% of total length. These ratios are within the variation known for this species (Jefferson & Leatherwood, 1994).

Specimens analysed here showed variable development of the eye-to-apex, apex-to-blowhole, and flipper stripes, with greater development in mature animals. There is, depending on age and sex of individuals, great variation in intensity and

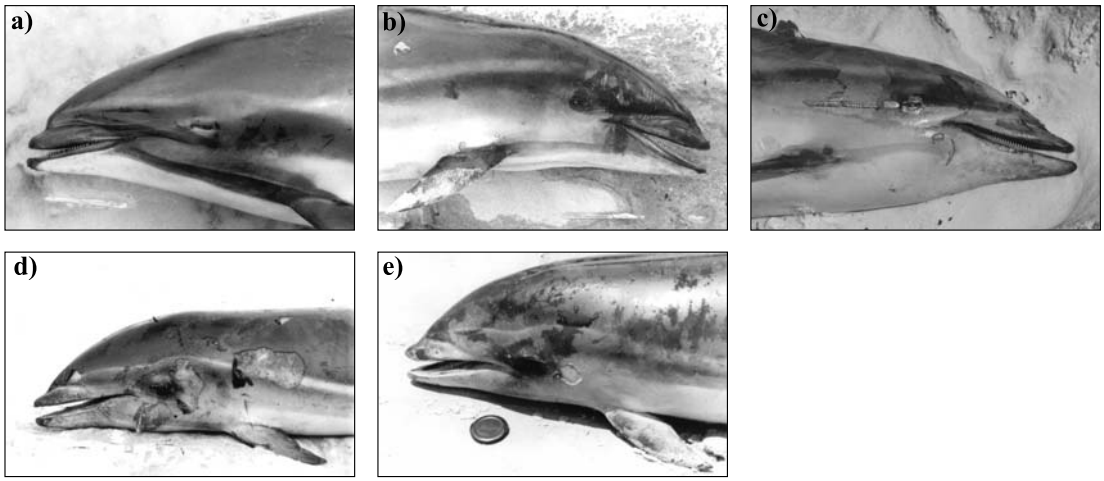

Figure 3. Lateral view of Fraser's dolphins' heads. Note the variable development of stripes that form coloration patterns: (a) mature male (UERJ-MQ 86); mature male (UERJ-MQ 88); (c) mature female (UERJ-MQ 83); (d) immature male (UERJ-MQ 89); (e) immature female (UERJ-MQ 92).

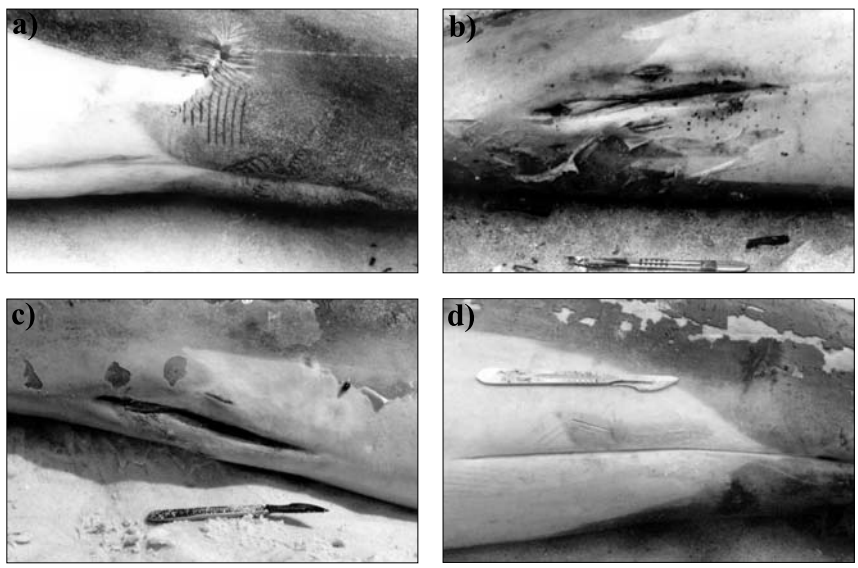

Figure 4. The coloration of the urogenital area of Fraser's dolphins stranded on the Rio de Janeiro coast. Note that it was similar in one mature male (a) UERJ-MQ 88 and two mature females, (b) UERJ-MQ 90, (c) UERJ-MQ 83, but different in another mature male, (d) UERJ-MQ 86.

development of components that form the Fraser's dolphin colour pattern (Amano *et al*., 1996). Perrin *et al*. (1973), the first researchers that described the species' external appearance, noted that the eye-to-anus stripe varied in intensity and thickness, and suggested that it would be related to age. In mature males, the eye-to-anus stripe is more intense and thicker than in immature males, but this difference is absent in females (Jefferson *et al*., 1997). This sex-related pattern was also observed in the specimens analysed here.

Many small cetaceans show sexual dimorphism in colour pattern and external morphological features (see Jefferson *et al*., 1997). Miyazaki & Wada (1978) suggested that the urogenital coloration of *L. hosei* could exhibit sexual differences, based on analysis of two individuals. However, Jefferson *et al*. (1997) suggested that this

feature varies individually, and thus cannot be used for sex determination of this species. Among the specimens that stranded on the coast of Rio de Janeiro, some males and females presented similar patterns of coloration in the urogenital area, indicating a non-sexual variation.

Nevertheless, it is evident that the same kind of sexual dimorphism found in other small cetacean species is present in the Fraser's dolphin (Jefferson *et al*., 1997). This assertive is based in the erect shape of the dorsal fin (Jefferson & Leatherwood, 1994; Perrin *et al*., 1994; Amano *et al*., 1996; Jefferson *et al*., 1997), presence of a post-anal hump (Perrin *et al* 1973, 1994), and deepening of the caudal peduncle (Amano *et al*., 1996), features observed most prominently in mature males of the species. Among all individuals collected in Rio de Janeiro, only the mature males exhibited these characteristics, corroborating the existence of sexual dimorphism in the species. These particular features of *L. hosei* males permit their visual recognition and may constitute a useful tool in studies of social organization and behaviour of this species (Jefferson *et al*., 1997).

The external appearance of some delphinid species varies with geographical area. The spinner dolphin, *Stenella longirostris* (Perrin *et al*., 1991), and the pantropical spotted dolphin, *Stenella attenuata* (Perrin *et al*., 1987), are examples of this variation. However, the external appearance of the Fraser's dolphin has not shown any obvious differences between the tropical Pacific, Japan and South Africa (Jefferson *et al.*, 1997), probably because of the lack of proper studies. Specimens analysed here, which provided the first description of the Fraser's dolphin external appearance in the Southwestern Atlantic, revealed that the species possesses the same basic coloration pattern and external morphological features reported in other areas.

Due to reduced and non-homogeneous sample we conducted a subjective analysis of dolphins features. Homogeneous and larger sample sizes are needed to quantitative analysis, which would reduce bias associated with the visual classification. Some features analysed here, such as shape of dorsal fin and deepening of caudal peduncle showed to be sexually dimorphics, but quantifying external morphological features of Fraser's dolphin would minimize those subjective effects and to search for geographical variations in external morphology of this species.

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