

***Sotalia fluviatilis* (Gervais and Deville, 1853)**

English: Tucuxi

German: Amazonas-Sotalia

Spanish: Delfín del Amazonas

French: Dauphin de l'Amazon

Family Delphinidae

1. Description

The appearance of the tucuxi resembles that of a smaller bottlenose dolphin. The tucuxi is light grey to bluish-grey on the back and pinkish to light grey on the belly, with a distinct boundary between the mouth gape and the flipper's leading edge. On the sides, there is a lighter area between the flippers and the dorsal fin. The dorsal fin is triangular and may be slightly hooked at the tip. The beak is moderately slender and long. Body size reaches 152 cm and the tucuxi is thus much smaller than its close relative, the Guiana dolphin and reaches a body mass of 55 kg (Flores and da Silva 2009).

2. Distribution

<http://www.iucnredlist.org/apps/redlist/details/20422/0/rangemap>

Distribution of Sotalia fluviatilis: rivers of north-eastern South America (Reeves et al. 2008; © IUCN).

Dolphins of the genus *Sotalia* are found along the Caribbean and Atlantic coasts of Central and South America and in the Amazon River and most of its tributaries. Until recently, the taxonomy of these dolphins was unresolved. Although five species were described in the late 1800s, only one species was recognized prior to 2007 (*Sotalia fluviatilis*) with two ecotypes or subspecies, the coastal subspecies (*Sotalia fluviatilis guianensis*) and the riverine subspecies (*Sotalia fluviatilis fluviatilis*) (Rice, 1998 and refs. therein; Culik, 2004).

Recent morphometric analyses, as well as mitochondrial DNA analysis, suggested recognition of each subspecies as separate species (e.g. Furtado, 1999). Caballero et al. (2007) and Cunha et al (2005) reviewed the history of the classification of this genus. Caballero et al. (2007) presented new genetic evidence from ten nuclear and three mitochondrial genes as well as evidence from previous studies supporting the elevation of each subspecies to the species level under the Genealogical Lineage Concordance Species Concept and the criterion of irreversible divergence. The authors proposed the common name 'costero' for the coastal species, *Sotalia guianensis* (Van Beneden 1864), and accepted the previously proposed 'tucuxi' dolphin, *Sotalia fluviatilis* (Gervais, 1853), for the riverine species. More recently, the common name "Guiana dolphin" has been used for the marine species (Flores and da Silva, 2009).

S. fluviatilis occurs in the main tributaries of the Amazon/Solimoes River basin with records in all three types of water that occur in this region. The tucuxi does not occur in the Beni/Mamoré river basin in Bolivia nor in the upper Rio Negro. In the Orinoco, the species

presence is controversial, a stretch of rapids and water falls blocking movements (Flores and da Silva 2009).

3. Population size

The species appears to be relatively abundant throughout its range (Flores and da Silva 2009). Numerous estimates exist of relative abundance in small areas, such as minimum number sighted, encounter rate, and estimates of minimum density (IWC, 2000):

In the Amazon drainage area, an average density of approximately 1.1 dolphins per km of river was estimated between Manaus and Tefé in the Solimoes river. In the Iquitos area, Kasuya and Kajihara (1974, in da Silva and Best, 1994) recorded 62 *Sotalia* during 36 hr of observations. Further upstream, *Sotalia* were frequently encountered in the Samiria river and its tributary the Santa Helena river. They are also common in Colombia in the Loretoyacu River, and the Tarapoto River at the El Correo Lake system and in the lower reaches of the Orinoco River (da Silva and Best, 1994 and refs. therein). Mean density along the margins of main rivers in the central Amazon, Brasil (1,320 km of survey strip) was 3,2 individuals per km². More than 54% of the individuals occurred within 50 m of the edge of rivers and channels (Martin et al. 2004).

Vidal et al. (1997) conducted a boat survey in 1993 to estimate the abundance of the tucuxi along ca. 120 km of the Amazon River bordering Colombia, Peru, and Brazil. They estimated that there are 409 *Sotalia* in the study area. *Sotalia* density was highest in lakes (8.6 per km²), followed by areas along main banks (2.8 per km²) and around islands (2.0 per km²). These are among the highest densities measured to date for any cetacean.

In Peru's Pacaya-Samiria National Reserve, encounter rates were within the range of encounter rates for these dolphins elsewhere in South America. Riverine dolphin populations appear to be relatively healthy. Studies indicate that population numbers in the Samiria System have been stable over the last 10 years (McGuire, 2002).

4. Biology and Behaviour

Habitat: Tucuxis inhabit all types of water ("whitewater", "clearwater", and "blackwater" rivers) of the Amazon region, so physical factors such as visibility and pH appear not to affect their distribution directly. They are found in the main channels of rivers as well as in larger lakes where access is not limited by a narrow or shallow channel. They generally do not enter the flooded forest. Rapids and fast-moving turbulent water are also avoided. *Sotalia* show a distinct preference for junctions of rivers and channels (da Silva and Best, 1994 and references therein). Martin et al. (2004) confirmed that in western Brazil highest densities occurred near the margin, and were lowest in the center of rivers. Tucuxi prefer areas with diminished current and where two channels join, the most preferred habitat type being where a sediment-rich white water channel meets one carrying acidic black water; the resultant mixing produces particularly productive, and obviously attractive, conditions for dolphins.

McGuire and Henningsen (2007) used photo-identification to examine range, rate of movement, and site fidelity of *S. fluviatilis* in Peru's Pacaya-Samiria Reserve from 1991 to 2000. Maximum range for *Sotalia* was 130 km, with a greatest rates of movement of 56 km/d. Encounter rates were highest in confluences, intermediate in lakes, and lowest in rivers. In general, encounter rates in rivers and lakes did not differ among seasons. During low water,

tucuxi persisted longer in the confluences throughout the sampling day, and occurred in higher densities than in any other season; the reverse pattern was observed during high water (McGuire, 2002).

Schooling: According to da Silva and Best (1994) the tucuxi and Guiana dolphin have a similar social structure. The riverine form occurs in groups of one to six individuals in 55% of the observations. Groups of more than nine animals are seen on rare occasions. Group composition is unknown. Two groups that were captured consisted of a female with a male calf, and the third of a pregnant female with an immature female (da Silva and Best, 1994). Vidal et al. (1997) reported overall mean group size of 3.9 individuals in the upper Amazon river. In rivers and lakes of Peru's Pacaya-Samiria Reserve, tucuxis were seen most often as singles or pairs. Significant seasonal differences in group size were not detected (McGuire, 2002).

Reproduction: In Brazil, calving in the riverine form apparently occurs primarily during the low water period, September to November (Jefferson et al. 1993). Gestation is estimated at 11 months (Flores and da Silva, 2009).

Food: In the Amazon region, tucuxis prey upon at least 28 species of fish belonging to 11 families. The characoid family Curimatidae was represented in 52%, Sciaenidae in 39% and siluriforms in 54% of the stomachs analysed (n = 29). In the dry season fish become concentrated in the main water bodies and thus are more vulnerable to predation. During the flood period many of these fish enter the floodplain to feed, but *Sotalia* usually do not enter this habitat (da Silva and Best, 1994). Da Silva and Best (1996) found that competition between man and dolphin for commercial fish is still minimal in the Central Amazon. Dietary analysis has shown that only 43% of 53 identified prey-species are of commercial value and that the dolphins generally prey on size-classes of fish below those of commercial interest.

5. Migration

General patterns: The principal limiting factor in the Amazon is the presence of rapids and small channels, where manoeuvrability would be restricted. The large seasonal fluctuation in river levels (10m) influences the distribution of tucuxis: they enter lake systems during periods of high water but will leave these as the waters recede, thus avoiding entrapment in lakes that are too small or shallow. Animals may occur during the whole year in the same area. Two tagged individuals in the Amazon were found within 5 km of the tagging site up to 1 year later (da Silva and Best, 1994 and references therein; Jefferson et al. 1993). It is therefore possible that tucuxis have a limited home range, but the area of such a range is unknown (Reyes, 1991). Two types of travelling were observed: slow directional movement and faster swimming, including porpoising, usually in a single direction (Jefferson et al. 1993). The tucuxi is present in rivers of the Amazon region that cross territories of such countries as Brazil, Colombia, Ecuador and Peru. It definitely crosses international boundaries in areas such as Leticia, as Amazon river dolphins do (Reyes, 1991, and refs. therein).

Diurnal rhythms: An apparent diurnal behaviour rhythm has been observed in the Amazon, where more *Sotalia* were seen between 09:00 and 10:00h than at any other time (da Silva, unpublished data). There was a marked movement into lakes from rivers in the early morning before about 09:00h, and again in the late afternoon from about 16:00 to 18:00h.

6. Threats

Major threats for the tucuxi are related to human fishing activity, and include entanglement in fishing gear and possibly poisoning to reduce net damage and predation on fish. Potential threats include boat strikes, oil spills, water and noise pollution, and overfishing of prey (McGuire 2002).

Direct catches: There are no records of past or recent commercial fisheries for *Sotalia* spp. (IWC, 2000). Tucuxis have been protected by the superstitions of fishermen from Colombia to southern Brazil as well as in the Amazon. (Jefferson, 1993; da Silva and Best, 1994 and refs. therein). Interviews with fishermen in the boats, in the fishmarket and in the shops supposedly selling dolphin products were conducted in an attempt to quantify the overall incidental kill attributed to commercial fisheries operations. The results showed that in the Central Amazon dolphin catches are incidental and only a very small number of these carcasses are used for commercial purposes (da Silva and Best, 1996).

Incidental catches: Modern fishing practices and the greatly increased intensity of fishing are the greatest direct threats to the species. The tucuxi is easily captured in monofilament gill nets as well as in shrimp and fish traps and seine nets. Analysis of the type of fishing gear associated with the mortality of 34 animals from the central Amazon revealed that 74% were caught in gill nets and 15% in seine nets. They apparently do not steal fish from nets as do *Inia* in the Amazon, but as they consume 14 of the 30 species of fish most exploited by man in the Amazon, incidental captures during fishing are frequent (da Silva and Best, 1994 and refs. therein; da Silva and Best, 1996). Martin et al. (2004) showed that tucuxis selectively occur in areas known to be favoured for gill net deployment by local fishermen, which may explain why entanglement is apparently a common cause of mortality.

Habitat degradation: Another potential threat to riverine *Sotalia*, is the damming of rivers for hydroelectric projects, with future plans for up to 200 such dams in series along many of the main Amazon tributaries. At the very least, such dams would interrupt gene flow between *Sotalia* populations, creating isolated groups between dams. Furthermore, most of the migratory fish on which *Sotalia* feed would become extinct in the reservoirs, and the potential suitability of nonmigratory fish for the diet of *Sotalia* is unknown (da Silva and Best, 1994, Jefferson et al. 1993).

Pollution: Pollution from industrial and agricultural activities may be considered a threat both directly, through the destruction of habitat, or indirectly, through contamination of the food chain. The continued use of insecticides containing substances banned elsewhere is common in South America. Mercury is used in the refining of fluvial gold and then, like the pesticides, probably enters the aquatic food chain of the rivers (da Silva and Best, 1994 and ref. therein).

7. Remarks

Range states (mod from Reeves et al. 2008):
Brazil; Colombia; Ecuador; Peru; Venezuela

According to Monteiro et al. (2000) the small number of individuals in conjunction with long gestation and nursing periods suggests that an increased mortality due to dolphin-fisheries interactions could severely impact local populations. The IWC sub-committee on small cetaceans (IWC, 2000) recognised that incidental catches of tucuxi are widespread.

Sotalia fluviatilis is listed in Appendix I of CITES and in Appendix II of CMS. The species is listed as "Data Deficient" by the IUCN.

The tucuxi is abundant and widely distributed in the central Amazon, but there are no estimates of total population size. It is vulnerable to the same threats that apply to *Inia*, including fisheries entanglement, habitat deterioration and fragmentation of populations by dam construction. The large numbers of animals taken as incidental catches in the Amazon estuary are a cause for concern, though it is not yet clear which form of *Sotalia* these represent (IWC, 2000, and refs. therein).

The IWC sub-committee on small cetaceans (2000) recommends:

- that research should be directed towards detecting trends in abundance by making repeatable and statistically rigorous estimates of density in a range of regions and habitats,
- that information be collected to allow evaluation of the relative levels of incidental mortality of the tucuxi associated with different fishing methods,
- that research be directed to determine which form of tucuxi occurs in areas such as the Orinoco and Amazon estuaries.

National legislation specifically protects the tucuxi in Brazil, Peru, and Colombia. The species is indirectly protected in Ecuador, Venezuela, Guyana, and French Guiana (Reyes, 1991, and refs. therein).

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