

## **Tursiops aduncus (Ehrenberg, 1833)**

English: Indo-Pacific bottlenose dolphin, Indian Ocean Bottlenose Dolphin

German: Grosser Tümmler des Indischen Ozeans

Spanish: Delfín mular del Oceano Indico

French: Grand dauphin de l'océan Indien

Family Delphinidae

### **1. Description**

*T. aduncus* resembles *T. truncatus*, having a relatively robust body, moderately long beak, and a falcate dorsal fin (Jefferson et al. 2008). However, the species tends to be smaller than *T. truncatus*, has a proportionately longer rostrum and, most distinctively, develops ventral spotting at about the time of sexual maturity (Wells and Scott, 2002). Maximum size is geographically variable, with length and weight for males of 238 cm and 160 kg respectively off Zanzibar, East Africa (Amir et al. 2007) and maximum reported values of 2,7 m and 230 kg, respectively (Jefferson et al. 2008).

The taxonomic status of *Tursiops aduncus* was uncertain until 1999, when Wang et al. (1999) confirmed that in Chinese waters two genetically distinct morphotypes of bottlenose dolphins, which he referred to *T. truncatus* and *T. aduncus*, existed in sympatry.

Genetic evidence suggests that *T. aduncus* is more closely related to pelagic *Stenella* and *Delphinus* species, and in particular to *S. frontalis*, than to *T. truncatus* (Wells and Scott, 2002). However, this seems to be inconsistent with osteological characters (Wang and Yang, 2009), and further studies using multiple independent characters will be required to resolve these issues.

### **2. Distribution**

<http://www.iucnredlist.org/apps/redlist/details/41714/0/rangemap>

*Distribution of Tursiops aduncus in coastal tropical to warm temperate waters of the Indian and western Pacific Oceans (Hammond et al. 2008; Wang and Yang, 2009; © IUCN)*

Information on the distribution of *T. aduncus* is patchy, but the species seems to be widespread along the entire eastern coast of Africa, through the Red Sea and Persian Gulf, eastwards as far as Taiwan and south-eastward to the coastal waters of Australia (Curry, 1997; Möller and Beheregaray, 2001; Wells and Scott, 2002). However, the level of continuity in the distributional range is unknown (Wang and Yang, 2009).

### **3. Population size**

In some regions where these dolphins have been studied, the populations have been found to be small compared to nearby open-ocean populations of common bottlenose dolphins (*T. truncatus*) and other species.

Off the south coast of Zanzibar East Africa, Stensland (2004) estimated population size at 161 (95% CI 144-177). High frequency of re-sightings indicated that the species was resident in the area.

For the Arabian Gulf (Preen, 2004) report population sizes to reach 1200. In the region between Kuwait and Oman, the Indian Ocean bottlenose dolphin is the most common cetacean (71% of groups and individuals). However, the estimates of cetacean abundance in the United Arab Emirates differed significantly between 1986 and 1999 and indicated a population decline of 71%. At least two die-offs of marine mammals occurred between these surveys.

Known large concentrations are in regions with large shallow-water areas. There are 2,700 in Shark Bay on the western coast of Australia (Preen et al. 1997) and 700-1000 around North Stradbroke Island on the eastern coast of Australia (Chilvers and Corkeron, 2003). Cribb (2006) counted 191 individuals in the Adelaide Dolphin Sanctuary, Gulf St Vincent, South Australia. Lukoschek and Chilvers (2008) used different methods to estimate abundances of bottlenose dolphins in central eastern Moreton Bay in 2000 and found 407 (+/- 113.5) animals in that area with a line-transect study. As opposed to this, they determined 818 (+/- 152) animals for 1998 with a photo-identification study. The reasons for the difference seem to lie in the different methodologies employed.

In the coastal waters of Amakusa-Shimoshima Island, western Kyushu, Japan, Shirakihara et al. (2002) estimated population size in 1995-1997 at 218 individuals (CV = 5.41%). In Kagoshima Bay there were 50 individuals in 1999, 40 individuals in 2000, and 50 individuals in 2001. The slight change in the number of identified dolphins indicated the possibility of their residency inside the bay (Nanbu et al. 2006).

Given the restricted areas of potentially suitable habitat, populations of *T. aduncus* in the South Pacific islands are likely small, i.e. in the hundreds (Reeves and Brownell, 2009).

#### 4. Biology and Behaviour

**Habitat:** Boat based and photo-identification surveys conducted in the Adelaide Dolphin Sanctuary, Gulf St Vincent, South Australia, yielded a high occurrence of bottlenose dolphins over the bare sand habitat. Mean dolphin group size was largest over the bare sand habitat for all behavioural activities observed (Cribb, 2006). However, in other regions, *T. aduncus* prefers areas with rocky and coral reefs, or sea grass. They can be found over waters 200m deep but are encountered most frequently in waters shallower than 100 m. They seem to prefer water temperatures of 20-30°C, with a minimum of 12°C (Wang and Yang, 2009).

**Schooling:** Lukoschek and Chilvers (2008) estimated group size of bottlenose dolphins in central eastern Moreton Bay using line-transect surveys in 2000, obtaining a mean of 2.85 animals per group. Mark-recapture surveys in 1998 yielded 5.78 animals per group. Differences in methodologies employed seem to be responsible for the discrepancies observed. Connor et al. (2006) reported that synchronous surfacing in male bottlenose dolphins is associated with alliance membership and that synchrony between members of cooperating alliances is more common during social behaviour with female consorts. Males within the alliance form temporary trios and occasionally pairs in order to consort with individual females (e.g. mounting, displays, chasing) (Connor et al. 2001).

In Kagoshima Bay (Japan), Indo-Pacific bottlenose dolphins were observed near the shore of the innermost area of the bay. The mean school size was 30 individuals (Nanbu et al. 2006). In the coastal waters of Amakusa-Shimoshima Island, western Kyushu, Japan, the group commonly consisted of more than 100 individuals. The large group size was thought to be a response to feeding on schooling fishes (Shirakihara et al. 2002).

Mixed-species groups of Indo-Pacific bottlenose and humpback dolphins frequently occur off the south coast of Zanzibar. Defense against predators coupled with social advantages may offer an explanation for the formation of these groups. However, mixed-species groups may have different functions depending on the individuals that participate (Stensland, 2004). Mixed-species groups include *T. truncatus*, *Pseudorca crassidens*, *Delphinus* sp., *Sousa chinensis*, and *Stenella longirostris* (Wang and Yang, 2009).

**Reproduction:** In the Port River estuary, Adelaide, South Australia, Steiner and Bossley (2008) found the calving season to last from December to March, which coincides with the maximum surface water temperature of the estuary. Inter-birth intervals was 3.8 y when the previous calf was weaned and 1.7 y when the previous calf died. Average crude birth rate was 0.064, which is similar to that found for other bottlenose dolphin populations. Average gestation time is 12 months (Wang and Yang, 2009). Around Zanzibar (Unguja) Island (Amir et al. 2007) calves were born at a length of around 104.5 cm and weight of 15.5 kg. Males became sexually mature at about 13 years, which is late for dolphins, at a length about 202 cm and weight of 112 kg. They may live more than 36 years, based on counts of Growth Layer Groups (GLGs) in teeth.

**Food:** There is great geographical variety in the species' diet. The primary prey species seem to be benthic and reef-dwelling fish and cephalopods, less than 30 cm in length, of continental shelf waters (Wang and Yang, 2009). Off the coast of Zanzibar, Indo-Pacific bottlenose dolphins forage on a relatively large number of prey species. However, only a few small- and medium-sized neritic fish and cephalopods contribute substantially to the diet. While stomach contents comprised 50 species of bony fish and three species of squid, only 5 species of fish, *Uroconger lepturus*, *Synaphobranchus kaupii*, *Apogon apogonides*, *Lethrinus crocineus*, *Lutjanus fulvus*, and 3 species of squid, *Sepioteuthis lessoniana*, *Sepia latimanus* and *Loligo duvauceli*, were the most important prey species. *Uroconger lepturus* proved to be the most important prey species of mature dolphins, whereas *Apogon apogonides* was the preferred prey of immature dolphins. The ecology and behavior of the preferred fish prey species indicate that the dolphins in that area forage over reefs or soft bottom substrata and near the shore (Amir et al. 2005a). Around oceanic islands, epi- and mesopelagic fish and cephalopods as well as benthic crustaceans dominate the diet (Wang and Yang, 2009).

## 5. Migration

Dolphins of different regions appear to exhibit strong year-round residency and natal philopatry in both sexes, with males being more dispersive than females. Although generally considered a coastal species, movements across deep oceanic waters have been reported (Wang and Yang, 2009).

Fury and Harrison (2008) investigated habitat utilisation in two Australian subtropical estuaries and found that 60% and 37% of identified dolphins were residents, 26% and 21% occasional visitors and 14% and 42% transients in the Clarence and Richmond Rivers, respectively.

In the coastal waters of Amakusa-Shimoshima Island, western Kyushu, Japan, individuals identified in one season were frequently resighted, with percentages of mostly over 60% during the subsequent seasons. Most of the dolphins off Amakusa were year-round residents, although the total extent of their habitat was unknown (Shirakihara et al. 2002).

## 6. Threats

Indo-Pacific bottlenose dolphins in coastal areas are exposed to reduced prey availability caused by environmental degradation and overfishing to and habitat degradation due to marine construction and demolition. The cumulative impact of these threats and those listed below is likely to result in longitudinal population declines (Hammond et al. 2008). E.g. in the Port River estuary, Adelaide, South Australia, Steiner and Bossley (2008) reported high calf mortality rates caused by direct impacts by entanglements, boat strikes, deliberate attacks, or exposure to toxic pollution: First-year calf mortality (30%) and mortality rate for calves prior to weaning (46%) were higher than mortality rates described for other locations.

**Direct catch:** In many regions of the world, e.g. Philippines, Taiwan and East Africa, the species is taken directly for human consumption or as bait for fishing operations. Through past drive hunting, hundreds may have been captured per season in the Penghu Islands, although only 20 were captured in 1993, possibly an indication of local depletion (Wang and Yang, 2009).

**Incidental catch:** Shark nets placed along the coast of KwaZulu-Natal, South Africa, to protect bathers from shark attacks result in an incidental by-catch of dolphins at twice the level suggested by the IWC as the maximum sustainable capture rate for a cetacean population (Natoli et al. 2008).

Incidental catches are reported from drift- and bottom set gillnet fisheries off Zanzibar (Unguja Island). Amir et al. (2002) expressed concern over exceedingly high by-catch rates for *T. aduncus* at this location; between 1995 and 1999, 43 Indo-Pacific bottlenose dolphins were reported taken, 50% of these in 1999. However, the numbers were extrapolated to about twice that value. In a later study (Amir et al. 2005b), conducted between 2000 and 2003, 68 Indo-Pacific bottlenose dolphins were recorded. Most of the bycatches (71%) were in nets set off the north coast of Unguja Island. These figures suggest that the incidental capture of dolphins in Zanzibar's artisanal gillnet fisheries is an ongoing problem and is high enough to have a significant negative impact on local populations.

A large number of possibly over 2000 per year was incidentally taken in northern Australian waters by a Taiwanese drift gillnet fishery in the 1980s, which after establishment of strict regulations moved into neighbouring waters off Indonesia (Wang and Yang, 2009).

### **Live capture:**

The government of the Solomon Islands issued a permit for export of up to 100 live dolphins per year in 2008, most likely to be only *T. aduncus*. If an international standard rule allowing 1% or 2% of a population to be removed annually were applied in this instance, the local *T. aduncus* population would have to be at least 5,000 or 10,000 to sustain the permitted level of exports. However, an ongoing photo-identification study around Guadalcanal Island has catalogued only something more than 100 individuals (Reeves and Brownell, 2009).

**Pollution:** Lavery et al. (2008) report on trace metal concentrations in stranded or by-caught *T. truncatus* in South Australia from 1988 to 2004. This species had higher mean tissue

burdens of liver Pb (0.45 g/kg), Cd (6.45 mg/kg), Hg (475.78 mg/kg), Se (178.85 mg/kg) and Zn (93.88 mg/kg) and bone Pb (2.78 mg/kg), as opposed to *D. delphis* and *T. truncatus*, probably reflecting their coastal habitat and benthic prey. Lavery et al. (2009) found that two dolphins had high metal burdens, high metallothionein concentrations, renal damage, and evidence of bone malformations, indicating possible severe and prolonged metal toxicity.

**Tourism:** Stensland and Berggren (2007) found behavioural changes in Indo-Pacific bottlenose dolphins in response to boat-based tourism off the south coast of Zanzibar. While movement patterns of dolphin groups were not affected by the presence of 1 to 2 tourist boats without swimmers, groups displayed a significantly larger proportion of erratic (non-directional) movements as tourist activities increased and when swimmers were present. Females travelled more frequently, with potential negative effects on the time available to nurse their calves. Intense non-regulated dolphin tourism may lead to a shift in habitat use by nursing females, and the apparent changes in dolphin behaviour due to the increased levels of tourism may ultimately reduce fitness at both individual and population levels.

**Natural threats:** Both scar frequencies and attack rate suggest that dolphins in Shark Bay, Western Australia face a greater risk of predation than bottlenose dolphins in other locations. Bite scars from sharks were found on 74.2% (95 of 128) of non-calves; most of these were inflicted by tiger sharks (*Galeocerdo cuvier*). Large sharks (>3 m) are responsible for a disproportionate number of attacks. However, bites from small carcharhinid sharks on 6.2% of dolphins suggest that some of these small sharks may be dolphin ectoparasites (Heithaus, 2001).

## 7. Remarks

Range states (Hammond et al. 2008):

Australia; Bangladesh; Brunei Darussalam; Cambodia; China; Djibouti; Egypt; Eritrea; Guam; Hong Kong; India; Indonesia; Iran, Islamic Republic of; Japan; Kenya; Madagascar; Malaysia; Mozambique; Myanmar; Northern Mariana Islands; Oman; Pakistan; Papua New Guinea; Philippines; Saudi Arabia; Singapore; Solomon Islands; Somalia; South Africa; Sri Lanka; Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; United Arab Emirates; Viet Nam; Yemen

*T. aduncus* is categorized as “Data Deficient” by the IUCN (Hammond et al. 2008). However, the variety and intensity of threats the species is exposed to may well lead to a re-consideration of this status. There are serious concerns about the depletion of local populations, particularly as the species shows strong residency and limited population sizes in many regions (Wang and Yang, 2009).

Populations in the Arafua/Timor Sea are listed in Appendix II of CMS. For general remarks on south-east Asian species, see also Perrin et al. (1996). The species is listed in Appendix II of CITES.

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