

## **Orcaella brevirostris (Gray, 1866)**

English: Irrawaddy dolphin

German: Irrawadi Delphin

Spanish: Delfín del Irrawaddy

French: Orcelle

Family Delphinidae

### **1. Description**

The Irrawaddy dolphin resembles the beluga whale *Delphinapterus leucas* in general appearance and certain anatomical features. However, recent morphological and genetic studies consistently place it in the family Delphinidae, and its closest relative might be the killer whale *Orcinus orca* (Arnold, 2002). Rice (1998), pointed out that *O. brevirostris* shares more morphological similarities with the other Delphinidae than with the Monodontidae, based on morphological features, isozyme and immunological distance studies, by studies of satellite DNA, and by sequencing the cytochrome b gene. Recently, a previously considered sub-population of the Irrawaddy dolphin found in Australia and Southern Papua New Guinea was re-classified as a different species of the same genus, *O. heinsohni*, based on differences in coloration, morphology and genetics (Beasley et al. 2005).

The mobile head of the Irrawaddy dolphin is broadly rounded, and there is no sign of a beak. A shallow dorsal groove extends to the dorsal fin, which is small; the flippers are broad, paddle-like, with a convex leading edge and highly mobile. The colour pattern varies regionally between dark grey to light grey. Maximum recorded length is 275 cm, but average length is only 210 cm. Adult body mass is 115-130 kg (Arnold, 2002).

### **2. Distribution**

<http://www.iucnredlist.org/apps/redlist/details/15419/0/rangemap>

*Distribution of Orcaella brevirostris: warm coastal waters and rivers from the Bay of Bengal to western Sulawesi, Indonesia (Reeves et al. 2008; © IUCN).*

Irrawaddy dolphins are discontinuously distributed mostly in the coastal, shallow, brackish, or fresh turbid waters at the mouths of rivers in southeastern Asia. On the Asian mainland they range from Vishakhapatnam, Andhra Pradesh, India, around the Bay of Bengal to the Strait of Malacca and the Gulf of Thailand. There are freshwater populations in the tributaries at the mouths of the Ganges, in the Irrawaddy as far as 2,300km upstream to Bhamo, and in the Mekong and Sekong Rivers as well as in the Ayeyarwady River (Marsh et al. 1989; Jefferson et al. 1993; Rice, 1998; Baird and Mounsouphom, 1997, Smith et al. 1997a, 1997b).

The presence of the species has not been fully confirmed in China, but it is likely to occur there (Reyes, 1991 and refs. therein). The species occurs in Malampaya Sound, Palawan, in the Philippines (Reeves et al, 2008). It occurs on the Sunda shelf: it is known from the Sungai Belawan Deli in northeastern Sumatra; Belitung; north coast of Jawa Timur (East Java); south coast of Jawa Tengah (Central Java); Kepulauan Bunguran (Natuna Islands); river mouths along the coast of Sarawak, Brunei, and Sabah; the Seruyan and Mahakam river systems,

including Semayang, Melintang, and Jempang lakes, in Kalimantan Timur (East Kalimantan); Sungai Kumai in Kalimantan Tengah (Central Kalimantan); south-western Sulawesi (mod. From Rice, 1998).

Several authors were unable to find differences between populations in the Irrawaddy, the Mekong, and marine waters (Marsh et al. 1989).

### 3. Population size

Various populations have recently been assessed from India to Indonesia. Most of these are very small (< 100 individuals) with the exception of the population off Bangladesh. These are discussed here moving from west to east.

In Chilika lake, Orissa, India, which forms the largest brackish water lagoon in Asia, there are about 80-90 Irrawaddy dolphins (Sarkar, 2007).

The largest population occurs in the nearshore waters of Bangladesh. A vessel-based line-transect survey conducted in 2004 along 1,018 km of systematic trackline resulted in an abundance estimate of 5,383 (CV=39.5)(Smith et al. 2008). In waterways of the Sundarban mangrove forest of Bangladesh, Smith et al. (2006) estimated an abundance of 452 (CV = 10%) individuals.

Off the Mergui (Myeik) Archipelago of southern Myanmar a vessel-based line-transect survey of nearshore waters (to a depth of 40-60m) conducted in 2005 searching along 955 km of trackline resulted in 30 cetacean sightings, only one of which was an Irrawaddy dolphin (Smith and Tun, 2008).

In the South China Sea, Smith et al. (1997b) reported that they had only four cetacean sightings during 1,121 km of transect. There were no sightings during 224 km of search effort in the Mekong River. However, a subsequent survey in the Mekong River (Baird and Beasley, 2005) reports a 'best' estimate of 40 animals. These authors confirm that the Mekong River dolphin population is apparently declining rapidly.

In eastern Borneo's Semayang Lake, Pela River and adjacent Mahakam River, a survey undertaken in the late 1970s reported between 100 and 150 dolphins. (Reyes, 1991, and refs. there-in). A 1999-2002 survey in the Mahakam River (East Kalimantan) estimated a total population size of 33-55 dolphins (95% confidence limits 31-76); no changes in abundance >8% were detected over 2.5 years (Kreb and Budiono, 2005).

A geographically isolated population of Irrawaddy dolphins recently discovered in Malampaya Sound, Palawan, Philippines was estimated at 77 (CV = 27.4%) individuals. This is the only known population of the species in the Philippines; the nearest known other population is in northern Borneo, some 550 km to the south (Smith et al. 2004).

### 4. Biology and Behaviour

**Habitat:** Irrawaddy dolphins seem to prefer coastal areas, particularly the muddy, brackish waters at river mouths, and do not appear to venture far offshore, since all sightings have been made within only a few kilometres of the coastline. Some populations are apparently

restricted to fresh water, e.g. Chilika Lake, India and Songhkla, Thailand (Reyes, 1991 and refs. therein).

In the Mekong River these dolphins are often observed near sand banks where streams flow into lakes (Reyes, 1991 and refs. therein). During the dry season, they are generally confined to sections of the river with water levels >8-10 m (Baird and Beasley, 2005). In the Mekong River of Laos, sightings were most common in the morning and decreased throughout the day. This could indicate diurnal feeding, given that foraging is suggested by repeated direction changes, lack of through travel, and observed fish consumption. Habitat use was most intense off a tributary mouth and adjacent Sandy Island. Mean water depth at the study site was 18.4 m, current speed of the main channel was 0.15 m/s, and water temperature was 31°C. Mean dive duration of dolphins was 115.3 s and similar for all group sizes (Stacey and Hvenegaard 2002).

In the nearshore waters of Bangladesh they prefer low salinity and shallow depth (Smith et al. 2008). In Malampaya Sound, Palawan, Philippines mean water temperature was 30.2 °C, depth 6.5 m, salinity 28.3 ppt and turbidity 2.2 NTUs (Smith et al. 2004). However, salinity preferences seem to reflect ecological (prey availability) rather than physiological constraints (Smith, 2009).

**Schooling:** Groups of fewer than 6 individuals are most common, but sometimes up to 15 dolphins are seen together (Marsh et al. 1989; Jefferson et al. 1993; Stacey and Hvenegaard 2002). They have been seen in the same area as bottlenose and Indo-Pacific humpback dolphins (Jefferson et al. 1993). Surfacing is quite inconspicuous, with only the uppermost part of the back becoming visible in slow rolling dives. Leaps are infrequent, as are spy-hopping, tail slaps and body rubbing (Smith, 2009).

**Food:** Fish, cephalopods, and crustaceans are taken as food. Irrawaddy dolphins sometimes spit water while feeding, apparently to herd fish (Marsh et al. 1989; Reyes, 1991; Jefferson et al. 1993).

In the upper reaches of the Ayeyawady River (formerly known as Irrawaddy River), Myanmar, fishermen practice castnet fishing with the help of Irrawaddy dolphins. Dolphins and fishermen communicate by audio and visual signals during fishing (Tun, 2008). Catch per cast, defined by the number of fish, their weight and economic value, was higher while the fishermen were cooperating with dolphins, the differences being primarily explained by the much higher frequency of zero catches in non-cooperative casts (Smith et al. 2009a).

**Reproduction:** The calving season is not well known. Some calves appear to have been born from June to August, but 1 captive female gave birth in December (Jefferson et al. 1993). In the Northern Hemisphere, mating is reported from December to June (Arnold, 2002). In Chilika Lake, Irrawaddy dolphins have a very low rate of breeding, producing only one young in three years, with a gestation period of nine months (Sarkar, 2007).

## 5. Migration

In Semayang Lake, eastern Borneo, Irrawaddy dolphins perform daily migrations from the lake to the Mahakam River (Est Kalimantan, Indonesia), returning to the lake in the evening. They may be found at distances up to 1,300 km upstream in major rivers, an indication of movements of considerable extent (Reyes, 1991). The distribution changes seasonally and is influenced by water levels and presumably variation in prey availability. Dolphins move into

tributaries during high water and back into the main river when water levels recede. Most sightings were made at confluences and river bends (Kreb in IWC, 2000).

## 6. Threats

**Direct catch:** Some small-scale hunting by local people probably occurs in many areas of the range (Jefferson et al. 1993). In some parts of Kampuchea and India, they are taken for food, but in most of the range they are protected by local beliefs (Marsh et al. 1989; Reyes, 1991 and refs. therein). Khmer and Vietnamese fishermen regard *Orcaella* as sacred animals and release them if they become entangled in fishing nets. By contrast, Khmer-Islam fishermen kill them for food. The dolphins are reputed to have learnt to distinguish between the languages of these different communities, and are much more cautious about approaching the Khmer-Islam fishermen (Marsh, 1989 and refs. therein). Kreb and Beasley (in IWC, 2000) informed the IWC sub-committee that live captures have occurred for the oceanarium trade in the Mahakam River and coastal regions of Indo-Malaysia. In both these areas there are also reports of direct killing.

**Incidental catch:** Irrawaddy dolphins are accidentally caught in fishing nets in Bangladesh, India, and the Gulf of Papua New Guinea (IWC, 2000; Smith et al. 2008). In some areas animals are released, but in the case of drowned dolphins, the oil may be used for medicinal purposes. Because of their presence in coastal and riverine areas, incidental catches in fishing nets are likely to occur elsewhere in the range (Reyes, 1991; Jefferson et al. 1993). There have been no systematic observer schemes in freshwater or coastal regions, but evidence of bycatch and the increase in the use of gillnets are causes for concern. In addition, fishing with explosives may adversely affect this species in some areas (IWC, 2000).

Recent data suggests that the threats are ongoing: In Malampaya Inner Sound (Philippines) 29 deaths due to by-catch were recorded between 2001 and 2006. The distribution of fishing gear shows that almost all of the Inner Sound is harvested and that there is almost complete overlap with preferred dolphin habitat. Irrawaddy meat is consumed by the community members after accidental death, but the dolphins are not hunted for food. It is expected that this population will continue to decline and will be lost within 7 years if current fishing practices continue (Gonzales and Matillano, 2008; Smith et al. 2004). Similarly, the concentrations of gill netters/long liners of the Mergui (Myeik) Archipelago of southern Myanmar were particularly high in shallow nearshore waters and at least 150 were operating in the bay where the only sightings of Irrawaddy dolphins were made (Smith and Tun, 2008).

In the Mekong River anthropogenic mortality is also high, and there is considerable risk that the dolphin population will become locally extinct in the near future. The establishment of community-managed deep water Fish Conservation Zones with government support may represent the best opportunity for reducing dry season dolphin mortality from large-meshed gillnet entanglement (Baird and Beasley, 2005).

In the Mahakam River in East Kalimantan, Borneo, dolphins die mainly from entanglement in gillnets (73% of deaths). Their main habitats are also important fishing grounds and subject to intensive motorized boat traffic. Sixty-four percent of deaths (1995-2001) with known location (n = 36) occurred in these areas. Primary conservation strategies would require the introduction of alternative fishing techniques (Kreb and Budiono, 2005).

**Habitat degradation:** Habitat degradation may limit the distribution and abundance of Irrawaddy dolphins, particularly in fresh water. Dams (Baird and Mounsouphom, 1997), gold

mining using mercury abstraction techniques, increased sedimentation as a result of deforestation and other changes in river catchments, overfishing, harmful fishing techniques (poison and electrofishing), vessel traffic and noise pollution are all potential threats to this species. Coastal development with concomitant eutrophication is also cause for concern (IWC, 2000; Smith et al. 2009b). Most reports come from the eastern distributional range of the species and show ongoing habitat reduction caused by anthropogenic activities.

In Indonesia, Irrawaddy dolphins were formerly observed in the Makam River up to Tengagarong and Samararinda. Since the 1980's, probably due to the intense activity related to the timber industry, they are no longer observed near these towns but only above Muarakamen (Reyes, 1991 and refs. therein). In East Kalimantan, Indonesia, Irrawaddy dolphins reacted to boats and surfaced less in the presence of speed boats and tugs (Kreb and Rahadi, 2004).

In Lao People's Democratic Republic, large hydro-electric dams planned for the Sekong River sub-basin and the mainstream of the Mekong River are a threat to the dolphins, fish populations, and local people (Baird and Mounsouphom, 1997). Stacey and Leatherwood (1997) concluded that the apparent low abundance and recent declines in numbers of the Irrawaddy dolphin are cause for serious concern. Deep pools existing in some of the major tributaries of the Mekong and in the Mekong itself are refuges during the dry season. In some tributaries, where dams have been constructed, some deep pool habitats have been affected by siltation as a result of changed hydrological conditions. In some areas, the pool habitats and the fishes they sustain have virtually disappeared. (Poulsen et al. 2002).

**Overfishing:** The population inhabiting Chilka Lake in India is said to be declining because of reduction in food supply and silting of the lake due to agricultural development. Reduction of fish populations in Indonesian rivers by illegal fishing methods is a serious threat. (Reyes, 1991 and refs. therein). Cast-net fishermen in the Ayeyarwady River, Myanmar consistently reported dramatically depleted catches in recent years due to illegal electric fishing. Elimination of electric fishing in a recently established protected area will be crucial for conserving the dolphins and the cooperative cast-net fishery (Smith et al. 2009a).

**Tourism:** In Chilka Lake, India the population of *O. brevirostris* (locally known as 'Bhuasuni Magar') is threatened due to the "plying of mechanised boats in the lake" (Sarkar 2007).

**Pollution:** Since Irrawaddy dolphins are found in rivers, they are likely to be affected by pollution and other habitat encroachment associated with the development of their tropical habitat (Reyes, 1991 and refs. therein). In Chilika Lake, India, dichlorodiphenyltrichloroethane and its metabolites (DDTs) were the predominant contaminants, the highest concentration found was 10,000 ng/g lipid weight in blubber. Hexachlorocyclohexanes (HCHs) were the second-most prevalent contaminants in dolphin tissues. Efforts should be made to decrease the sources of these contaminants (Kannan et al. 2005).

## 7. Remarks

Range states (Reeves et al. 2008) :  
Bangladesh; Brunei Darussalam; Cambodia; India; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; Viet Nam.

Listed in Appendix I and II of CMS. Listed in Appendix I of CITES. The World Wide Fund for Nature (WWF) considers *O. brevirostris* as one of the most endangered small cetaceans world wide (WWF, 2009).

The IUCN categorizes *O. brevirostris* as “Vulnerable” (Reeves et al. 2008). The justification is that wherever there is available data, subpopulations are low, ranging in the tens to one-hundreds, except for Bangladesh; There have been significant range declines; threats including by-catch and habitat degradation are well documented, are persisting and cause unsustainable mortality resulting in an estimated 30% reduction in population size over the next 3 generations. Given the vast area and complexity of coastline inhabited by this species, it is unlikely that a more quantitative assessment of the global population will be feasible in the near future (Reeves et al. 2008).

The IUCN marine mammal specialists group considers the populations of the Ayeyarwady (formerly Irrawaddy) of Myanmar (formerly Burma), with 59 individuals (2003 data; Smith, 2004); the Mahakam River, East Kalimantan, Indonesia, with 59-79 individuals (Jefferson et al. 2008); Malampaya Sound, Palawan, Philippines, with 77 individuals (Smith and Beasley, 2004); Mekong River (Viet Nam, Laos, Cambodia), with 69 individuals (Smith and Beasley, 2004); and Songkhla Lake in Thailand, with less than 50 mature individuals (Smith and Beasley, 2004) as Critically Endangered (Reeves et al. 2008). And although a few areas where the species occurs have been designated as protected, little has been done to conserve dolphin habitat (Smith, 2009).

As pointed out by Rosel and Reeves (2000), genetic and demographic consequences associated with very small population size can result in extinction even when effective measures are in place to protect the animals and their habitat. This is explained by low genetic variation, genetic drift and inbreeding and lower fitness.

Possible strategies for conserving the population include that: (1) socioeconomic alternatives be developed to reduce dolphin mortality by fishing gear; (2) fishery free zones be established in core areas of dolphin distribution; (3) Irrawaddy dolphins be promoted as a flagship species of environmental health in their habitat; (4) a long-term programme be established to monitor local dolphin populations; and (5) additional investigations be conducted to determine other areas of occurrence in the respective range stated (mod. From Smith et al. 2004). For additional recommendations, see also Perrin et al. (1996).

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