

## **Lagenorhynchus obliquidens Gill, 1865**

English: Pacific white-sided dolphin

German: Weißstreifendelphin

Spanish: Delfín de costados blancos del Pacífico

French: Dauphin à flancs blancs du Pacifique

Family Delphinidae

### **1. Description**

The boldly coloured Pacific white-sided dolphin is black or dark grey on the back and posterior sides, as well as on the short snout, the leading edge of the tall dorsal fin, and the pointed flippers. The light grey thoracic patch is sharply delineated from the white belly by a thin dark line, in contrast with the dusky dolphin (*L. obscurus*) which lacks this line and the sharp demarcation. Grey, linear dorsal flank blazes, often called "suspender stripes", project forward from the grayish flank patches along the back and disappear above the eyes. Average adult size is 2.1-2.2 m and body mass reaches 75-90 kg (van Waerebeek, 2002).

Specimens from Korea Strait are on average larger than those from far offshore in the western North Pacific (35°-46°N, 158°-180°E). A tiny proportion of individuals exhibit an alternate colour phase (Rice, 1998, and refs. therein), e.g. in Volcano Bay, Hokkaido, Japan, individuals with anomalous white colour patterns exhibiting various degrees of lack of pigmentation were identified (Tsutsui et al. 2001). Furthermore, investigation of genetic diversity and differentiation (Hayano et al. 2004) suggests that Pacific white-sided dolphins in Japanese coastal waters and offshore North Pacific belong to different populations between which gene flow has been severely restricted.

Animals off Baja California have consistently larger crania than the ones from northern California northward, with inter-grading populations occupying the intervening area off southern and central California (Rice, 1998, and refs. therein). However, Lux et al. (1997) found that population-by-population mtDNA comparisons of four geographic populations in the eastern Pacific indicated that all could be considered isolated, but likely incompletely, from one another. Black (2009) concluded that 6 populations can be differentiated: coastal Japan, offshore Japan, North Pacific, British Columbia, Oregon to California, Baja California.

Close scrutiny of morphological and life history parameters as well as recent cytochrome *c* sequence analysis supports the premise that *L. obscurus* and *L. obliquidens* are sister species which diverged 1.9-3 million years ago (van Waerebeek, 2002).

### **2. Distribution**

<http://www.iucnredlist.org/apps/redlist/details/11145/0/rangemap>

*Distribution of Lagenorhynchus obliquidens: deep temperate waters of the northern north Pacific, predominantly off-shore (Hammond et al. 2008; © IUCN).*

*L. obliquidens* is found in the cool temperate waters of the North Pacific. It ranges in the west from the South China Sea northward, throughout Japanese waters, and around the Kuril Islands, extending north to the Commander Islands, and also occurs in the Sea of Japan and in

the southwestern Okhotsk Sea. In the eastern Pacific, the species occurs primarily in shelf and slope waters from the southern Gulf of California, Mexico along the western coast of North America north to the Gulf of Alaska and as far west as Amchitka in the Aleutian Islands. Across the North Pacific, the species is generally found to have a relatively narrow distribution between 38°N and 47°N (Brownell et al. 1999, Black, 2009).

Vagrant to Bahia de La Paz in the south-western Golfo de California (Rice, 1998) and infrequently, in the southern Bering Sea (Brownell et al. 1999).

### 3. Population size

Buckland et al. (1993) estimated the abundance of Pacific white-sided dolphins in the North Pacific at 931,000 animals. This is in close agreement with the estimate of 989,000 by Miyashita (1993). However, precision is low for both estimates, and vessel attraction probably resulted in overestimation of population size (Buckland et al. 1993).

For the eastern North Pacific, there are separate abundance estimates for different regions and seasons. Off Oregon and Washington, a peak abundance of 23,400 animals was estimated in May 1992 (Forney et al. 1995). The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the two most recent ship surveys was 20,719 (CV =0.22) Pacific white-sided dolphins (Barlow and Forney 2007; Forney 2007). No long-term trends in abundance were suggested based on historical and recent surveys (Caretta et al. 2008).

In February–April 1991 and 1992, aerial surveys conducted along the continental shelf and slope of California resulted in a population estimate of 122,000 (Forney et al. 1995). This contrasts with a ship-based estimate of only 5,900 in August–November 1991 for the same study area (Forney and Barlow, 1998), a discrepancy which may be explained by seasonal migrations (Brownell et al. 1999).

In the coastal waters of British Columbia, Canada, the Pacific white-sided dolphin is probably the most abundant cetacean (Heise, 1997a): In the inshore coastal waters of the Inside Passage, between the British Columbia (BC)-Washington and the BC-Alaska borders, Williams and Thomas (2007) estimated the population size in 2004-2005 at 25,900 (95% CI = 12,900-52,100).

### 4. Biology and Behaviour

**Habitat:** *L. obliquidens* is mainly found offshore, as far as the edge of the continental shelf, but does come closer to shore where there is deep water, such as over submarine canyons (Carwardine, 1995). It is known to occur close to shore in regions such as the inshore passes of Alaska, British Columbia, and Washington, and seasonally off southern California (Brownell et al. 1999, and refs. therein).

Investigation of habitat segregation between various species of small cetaceans in the central North Pacific Ocean revealed that sea-surface temperature was the most influential habitat parameter examined, with *L. borealis* occupying the warmest waters, *P. dalli* the coolest, and *L. obliquidens* in between but with greater preference overlap with *P. dalli*. (Ferrero, 1998; Ferrero et al. 2002).

Associations between cetacean distributions, oceanographic features, and bioacoustic backscatter were examined in the northern California Current System (CCS) during late spring and summer 2000. Pacific white-sided dolphins were the most numerous small cetacean in early June but were rare during August. Up to 45% of the variation in their occurrence pattern was described by distance to the upwelling front and acoustic backscatter at 38 kHz (Tynan et al. 2005).

**Behaviour:** *L. obliquidens* is very inquisitive and may even approach stationary boats (Carwardine, 1995). It is highly acrobatic and playful, commonly bow-riding, and often leaping, flipping, or somersaulting (Jefferson et al. 1993).

**Reproduction:** Calving occurs from May to September. Females become sexually mature at 8-11 years (175-186 cm length) and males at 9-12 years (170-180 cm length). Gestation lasts 11-12 months. Males may live to 42 years and females to 46 years (Heise 1997b).

**Schooling:** Often seen in large herds of hundreds or even thousands, these highly gregarious dolphins are also commonly seen with other species, especially northern right-whale dolphins and Risso's dolphins (Jefferson et al. 1993) as well as other cetaceans (Brownell et al. 1999). The interspecific relationship with the northern right-whale dolphin appears to be a unique association in which large groups of both species are frequently observed to form heterogeneous herds and subgroups. The reason for this close association may be food related, particularly in the oceanic environment, as there is considerable overlap in preferred mesopelagic prey (Brownell et al. 1999 and refs. therein). Large schools of Pacific white-sided dolphins may split into smaller groups when feeding but re-assemble when resting or travelling (Carwardine, 1995).

**Food:** Pacific white-sided dolphins consume a wide variety of fish and cephalopods. However, considerable differences in feeding preference are evident between animals from coastal and offshore regions. Off British Columbia, Canada, herring (*Clupea harengus*) was the most commonly occurring prey species (59%), followed by salmon (*Oncorhynchus* spp.; 30%), cod (Family Gadidae; 6%), shrimp (Order Decapoda; 3%) and capelin (*Mallotus villosus*; 1%; Heise, 1997a). In the North Pacific they feed primarily on epipelagic fish and cephalopods: northern anchovy (*Engraulis mordax*), Pacific hake (*Merluccius productus*), Pacific saury (*Cololabis saira*), juvenile rock fish (*Sebastes* spp.), and horse mackerel (*Trachurus symmetricus*). The market squid (*Loligo opalescens*) is also frequently ingested. In the central North Pacific *L. obliquidens* feeds heavily on mesopelagic fish and cephalopods and in coastal waters of northern Japan on both mesopelagic and epipelagic fish and cephalopods (Brownell et al. 1999 and refs. therein).

## 5. Migration

Some seasonal shifts occur; while more common in coastal waters during fall and winter, *L. obliquidens* move offshore during spring and summer, in rough synchrony with the movements of anchovies and other prey (van Waerebeek, 2002 and refs. therein). Seasonal abundance estimates off the entire coast of California are an order of magnitude higher in February–April than in August–November, while peak abundances off Oregon and Washington are observed during May. This pattern strongly suggests seasonal north-south movements eastern North Pacific (Forney and Barlow, 1998). Aurioles et al. (1989) also noted that the species is found seasonally, in spring and summer, in the southwestern Gulf of California. Off San Clemente Island, California, Pacific white-sided dolphins were present only during the cold-water months of November–April (Carretta et al. 2000). Brownell et al.

(1999) suggested that the occurrence of the southern form of *L. obliquidens* off Southern California appears to be variable, possibly relating to changes in oceanographic conditions on seasonal or inter-annual time scales (i.e. El Niño events).

In Alaskan waters, published sighting records are sparse, but the occurrence of Pacific white-sided dolphins may be related to periods of warmer waters (Dahlheim and Towell, 1994). Off Japan, Pacific white-sided dolphins occupy the Korean Strait and waters of western Japan in the winter and appear to move to the east from March to July. Nothing is known about the movements of the two forms described from Japanese coastal waters (Brownell et al. 1999 and refs. therein; Tsutsui et al. 2001).

## 6. Threats

**Direct catch:** According to Jefferson et al. (1993), Japanese drive and harpoon fisheries took hundreds or even thousands of Pacific white-sided dolphins in most years, but Brownell et al. (1999) reported that only "small numbers" are taken annually. Black (2009) confirmed that dolphins are still harpooned in Japan today for human consumption, whereas the drive fishery in Taiji does not generally catch Pacific white-sided dolphins. However, the Japanese government is currently considering a renewed direct harvest of this species (Hammond et al. 2008). Few live captures have been reported in the past, the most recent one in 1992 when 3 animals were taken for public display (Forney, 1994).

**Incidental catch:** In the eastern Pacific a total of 363 animals were estimated to have been killed in the shark and swordfish drift net fishery in California during the period from April 1988 to December 1995. Additional mortality has been documented for trammel and set nets in California coastal waters, for drift gill nets in British Columbia and Alaska, and for trawl fisheries in Alaska. Pacific white-sided dolphins were rarely taken in the tuna purse seine fishery in the eastern tropical Pacific because most of the fishing takes place south of the range of these dolphins (Brownell et al. 1999 and refs. therein). The most recent average estimate of fishery-related mortality of Pacific white-sided dolphins in US eastern Pacific waters is very low. Including mortality from drift gillnet, groundfish trawl, and unknown fisheries, 1.4 (CV = 0.86) animals are removed annually. Similar low levels of mortality have also been documented in the California/Oregon/ Washington domestic groundfish trawl fisheries (Caretta et al. 2008). By-catch mortality estimates for 2004-2005 in salmon gillnet fisheries off British-Columbia, Canada, were also below precautionary limits (Williams et al. 2008).

In the western Pacific, Pacific white-sided dolphins were one of the most commonly caught cetaceans in the Japanese and Korean high seas squid drift net fisheries (Hobbs and Jones, 1993). They were also taken in the Japanese large-mesh and Taiwanese squid and large-mesh fisheries. In 1989, the estimated total by-catch for only the Japanese squid drift net fishery was about 6,100; in 1990, the total estimate for all drift net fisheries combined was 5,759 animals (Hobbs and Jones, 1993). Effort for these fisheries was estimated to have increased during the late 1970s and early 1980s and then remained relatively stable at least until 1990 (Hobbs and Jones, 1993). In January 1993 a United Nations moratorium on these high seas drift net fisheries went into effect. Smaller catches (e.g. at least 194 in 1987) are reported from the Japanese land-based salmon drift net fishery. Small numbers are taken yearly in seines, set nets, and trap nets around Japan (Brownell et al. 1999 and refs. therein).

Molecular monitoring of 'whalemeat' markets in the Republic of (South) Korea between 2003 and 2005 revealed that Pacific white-sided dolphins were for sale there. As Korea has no

programme of commercial or scientific whaling and there is a closure on the hunting of dolphins and porpoises, the only legal source of these products was assumed to be incidental fisheries mortality (Baker et al. 2006).

**Killing:** Japanese government-supported "cull" programmes to control several small cetaceans, including Pacific white-sided dolphins, were initiated during the 1970s. Between 1976 and 1980, which were the peak years of this programme, at least 466 *L. obliquidens* are reported to have been killed (Brownell et al. 1999 and ref. therein).

**Pollution:** The maximum concentrations of DDT and PCBs reported in the blubber of Pacific white-sided dolphins in Japanese waters were 99 ppm and 71 ppm wet weight, respectively. Organochlorine levels in the blubber of two stranded animals from Californian waters were 2.08 ppm and 99.5 ppm DDT, and 0.23 ppm and 4.88 ppm PCBs. Overall, pollutant loads for this species appear to be variable (Brownell et al. 1999 and refs. therein).

## 7. Remarks

Range states (Hammond et al. 2008) :

Canada; China; Japan; Korea, Democratic People's Republic of; Korea, Republic of; Mexico; Russian Federation; United States of America

IUCN Status: "Least Concern" (Hammond et al. 2008). CMS status: "not listed". However, the Pacific white-sided dolphin is a migratory species which presumably crosses the boundaries of several countries on the east and west coasts of the Pacific Ocean. The species should therefore be included in Appendix II of the CMS. The species is listed in Appendix II of CITES.

## 8. Sources

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