

Lissodelphis borealis (Peale, 1848)

English: Northern right-whale dolphin

German: Nördlicher Glattdelphin

Spanish: Delfín liso del norte

French: Dauphin à dos lisse boréal

Family Delphinidae

1. Description

Right-whale dolphins are easy to identify at sea because of their distinctive black and white colour and lack of a dorsal fin. The northern right-whale dolphin is mainly black with a white ventral patch that runs from the fluke to the throat region. There is a further small white patch on the tip of the rostrum, and the undersides of the flippers are also white (Lipsky, 2009). Size reaches ca. 3.1 m in males and 2.3 m in females, and body mass reaches up to 115 kg (Jefferson et al. 2008).

A few individuals possess an alternate colour pattern with a more extensive white area below. These animals were first referred to the Southern Hemisphere *L. peronii*. Later it was decided that they represented a new race of the northern species, *L. b. albiventris*. However, such individuals occur sporadically in schools of normally-patterned *L. borealis* throughout the species' range, and they do not constitute a taxonomically recognisable population (Rice 1998, and refs. therein). This is based on Dizon et al. (1994), who found no evidence of geographically concordant population structuring by pairwise examination of geographic and genetic distances among samples.

2. Distribution

<http://www.iucnredlist.org/apps/redlist/details/12125/0/rangemap>

Distribution of Lissodelphis borealis: cool, deep temperate waters of the northern North Pacific (Hammond et al. 2008; © IUCN).

Lissodelphis borealis ranges in temperate and subarctic waters of the North Pacific, from the Kuril Islands (Russia) south to the Sanriku coast of Honshu (Japan), thence eastward across the Pacific between 34° and 47°N, extending north to 55°N, 145°W, in the Gulf of Alaska, to the west coast of North America from British Columbia, Canada, to northern Baja California, Mexico (Rice, 1998; Lipsky, 2009).

Movements beyond the normal range occur occasionally, as evidenced by sightings as far south as 29°S off Baja California, Mexico, and as far north as 59°N in the Gulf of Alaska and just south of the Aleutian Islands in the central Pacific. The northernmost sightings are generally from summer months and the southernmost from winter months (Jefferson et al. 1994 and refs. therein; Carwardine, 1995). *L. borealis* may also occur in the northern Sea of Japan (Carwardine, 1995).

3. Population size

Recent abundance estimates for all California, Oregon, and Washington waters from 1996, 2001, and 2005 surveys were 11,347 (CV = 0.27), 14,937 (0.21), and 11,100 (0.60), respectively (Barlow and Forney 2007, Forney 2007). Currently, there is no evidence of a trend in abundance for this stock (Caretta et al. 2008). However, these values are much lower than peak population size, which was estimated at 17,800 off southern California, and at around 61,500 off central and northern California, making them the second or third most abundant cetacean off California, after *Delphinus delphis* and *Lagenorhynchus obliquidens* (Jefferson et al. 1994). Forney et al. (1995) reported 21,300 animals from Californian waters in winter/spring. Carretta et al. (2000) counted 754 animals off San Clemente Island during winter. Buckland et al. (1993) estimated 68,000 in the North Pacific, and Hiramatsu (1993) estimated the entire population there at 400,000. However, the latter figure may have been positively biased and there are no more recent counts available (Hammond et al. 2008).

4. Biology and Behaviour

Behaviour: The animals are easily startled. When fleeing, a group typically gathers in tight formation, with many animals leaping simultaneously and often working the sea into a froth. They may also swim slowly, causing little disturbance of the water and exposing little of themselves at the surface. Breaching, belly-flopping, side-slapping, and lobtailing are fairly common. They may bow-ride but usually avoid boats (Carwardine, 1995).

Habitat: Northern right-whale dolphins are observed most often in cool, deep, offshore waters over the continental shelf and beyond, in sea-surface temperatures of 8-9°C. They are sometimes seen near shore, especially where deep water approaches the coast (underwater canyons), and apparently prefer "coastal-type" waters in the California Current system (Jefferson et al. 1994 and refs. therein; Carwardine, 1995). Ferrero (1998) concluded that in the central North Pacific sea surface temperature was the most influential habitat parameter examined, *L. borealis* occupying the warmest waters, *P. dalli* the coolest, and *L. obliquidens* in between. Habitat partitioning was best expressed by mature female *L. borealis*, in July, during their calving period. Mature female *L. borealis* associated with a consistent assemblage of other marine organisms during July and August while associations among other species were more varied.

Schooling: Northern right whale dolphins are highly gregarious. They are occasionally seen singly but more often in groups of up to 2,000-3,000. Average herd sizes are about 100 in the eastern Pacific and 200 or more in the western Pacific (Jefferson et al. 1994 and refs. therein). These groups commonly mix with other marine mammals, especially Pacific white-sided dolphins, with which they share a nearly identical range (Jefferson et al. 1993). They also associate with pilot whales and Risso's dolphins. Travelling speed may reach 40 km per hour (Lipsky, 2009).

Reproduction: Males become sexually mature at about 9.9 years and females at 9.7 years (Ferrero and Walker, 1993). There appears to be a calving peak in winter to early spring (Jefferson et al. 1993). Iwasaki and Kasuya (1997), however, observed a calving peak between June and August.

Food: Although squid and lanternfish are the major prey items for right-whale dolphins off southern California, a variety of surface and mid-water species are taken (Jefferson et al. 1993). Chou et al. (1995) reported that stomach contents in two *L. borealis* consisted of 89%

myctophid fish. Other prey species include hake, saury and mesopelagic fish (Lipsky, 2009 and refs. therein). Ohizumi and Kato (2004) find that the prey of northern right-whale dolphins and Pacific white-sided dolphins are closely similar; both feeding mainly on myctophids in the central North Pacific. Both species are distributed in the transitional zone, suggesting a potential competition for food.

5. Migration

Movements south and inshore in winter months and north and offshore in summer months have been reported for both sides of the Pacific. Peak periods of abundance off southern California coincide with peak occurrence there of market squid (*Loligo opalescens*) (Jefferson et al. 1994 and refs. therein).

Forney and Barlow (1998) studied seasonal abundance and distribution of cetaceans within 185-280 km of the California coast during 1991 and 1992. Northern right-whale dolphins were significantly more abundant in winter than in summer, and significant inshore/offshore differences were identified. In winter, northern right-whale dolphins were widespread throughout the continental shelf region of the Southern California Bight, but no sightings were made there in summer. This is in agreement with Carretta et al. (2000), who found that off San Clemente Island, *L. borealis* were only present between November and April. During both seasons they were commonly observed off central and northern California, and in summer they were also observed off Southern California near the offshore edge of the study area. This evidence for a winter influx of northern right whale dolphins into shelf waters of the Southern California Bight in 1991-1992 is consistent with similar findings made during the late 1970s (Barlow, 1995).

6. Threats

Direct catch: In the western Pacific, coastal fisheries off Japan have taken them for many years, with 465 reported killed in the harpoon fishery in 1949. Although this fishery mainly targets other small cetaceans, northern right-whale dolphins continue to be taken (Jefferson et al. 1994 and refs. therein; Lipsky, 2009).

Incidental catch: Northern right-whale dolphin mortality in the California drift gillnet fishery for broadbill swordfish, *Xiphias gladius*, and common thresher shark, *Alopias vulpinus*, was estimated at 151 individuals in 1996 to 2002 (Caretta et al. 2004). However, in recent years, the mortality has dropped drastically and the average estimate is now 3.8 (CV=0.83) taken annually in commercial fisheries in eastern US Pacific waters (Caretta et al. 2008).

L. borealis has experienced very high levels of fishery-induced mortality in international high-seas, large-scale driftnet fisheries, from about 38°N to 46°N, and 171°E to 151°W. Assessing the impact of this mortality is difficult, however, because of the possible existence of a coastal population off California and the Pacific Northwest that is separate from offshore populations (Dizon et al. 1994). Northern right-whale dolphins have also been observed entangled in net debris in the western Pacific (Jefferson et al. 1994 and refs. therein).

Total numbers killed by the North Pacific squid driftnet fleets of Japan, Taiwan, and South Korea in the late 1980s were estimated at about 15,000-24,000 per year, and this mortality is considered to have depleted the population to 24-73% of its pre-exploitation size (Mangel, 1993). This order of magnitude was confirmed by Ferrero et al. (2002), who reported on

having analysed biological specimens collected by observers monitoring Japanese squid driftnet fishing operations, consisting of 805 northern right-whale dolphins incidentally taken in 800 observed gillnet sets. The UN moratorium on large-scale high-seas driftnets that came into effect in 1993 is likely to have relieved this pressure to a considerable extent, but the continued use of driftnets to catch billfish, sharks, squid, and tuna inside the exclusive economic zones (EEZ) of North Pacific countries presents an ongoing threat. Furthermore, continued illegal fishing on the high-seas results in the killing of unknown numbers of northern right-whale dolphins each year (Hammond et al. 2008). This is especially concerning, as catches of driftnets are highly aggregated. Reporting a kill rate of a fraction of an animal per unit of effort assumes that driftnets "cull" the population of animals and masks the more important effect of large, simultaneous kills of large fractions of pods, families, or other reproductive units. In addition, aggregated catches may lead to underestimates of the necessary level of observer effort (Mangel, 1993).

Pollution: The effects of habitat degradation and pollution on right-whale dolphins are largely unknown, but their pelagic habitat is probably safer from contaminant effects than coastal areas are. The seasonal shoreward movements of right whale dolphins may put them at increased risk during certain times of the year (Jefferson et al. 1994; Lipsky, 2009). For example, Minh et al. (2000) found concentrations of polychlorinated biphenyls (PCBs) in one individual which exceeded levels leading to immunosuppression in harbour seals.

7. Remarks

Range states (Hammond et al. 2008):

Canada; Japan; Mexico; Russian Federation; United States of America.

L. borealis is categorized by the IUCN as "Least Concern" (Hammond et al. 2008). However, the enormous variability associated with the estimates of population size create difficulties for "statistically sound analysis" of management plans, as called for by the U.N. resolutions. In addition, depletion caused by high-seas driftnet fisheries could even be greater than the worst-case estimate (Mangel, 1993).

The species is not listed by CMS. However, south-north as well as inshore-offshore movements have been reported from both sides of the Pacific, so *Lissodelphis borealis* seems to be a good candidate for inclusion in App. II of CMS. The species is listed in Appendix II of CITES.

8. Sources

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