Grampus griseus (G. Cuvier, 1812)

English: Risso's dolphin
German: Rundkopfdelphin
Spanish: Delfín de Risso
French: Dauphin de Risso

Family Delphinidae

1. Description

Risso's dolphin is the fifth largest of the delphinids. Adults of both sexes reach 4 m in length. Its anterior body is extremely robust, tapering to a relatively narrow tail stock and its dorsal fin is one of the tallest in proportion to body length of any cetacean, exceeded only by that of the adult male killer whale (*Orcinus orca*). The bulbous head has a distinct vertical crease or cleft along the anterior surface of the melon. Colour patterns change dramatically with age. Infants are dorsally grey to brown, then darken to nearly black and lighten while maturing (the dorsal fin remaining dark). In ageing animals, the majority of the dorsal and lateral surfaces become covered with distinctive linear scars. Older animals can appear completely white on the dorsal surface (Baird, 2002). Risso's dolphins are often confused with killer whales, due to the size of their dorsal fin (Baird, 2009). Adult size ranges up to 3,8 m long and body mass may reach 500 kg (Jefferson et al. 2008).

2. Distribution

http://www.iucnredlist.org/apps/redlist/details/9461/0/rangemap

World-wide distribution of Grampus griseus *(Taylor et al. 2008; © IUCN): tropical and warm temperate waters in both hemispheres.*

This is a widely distributed species, inhabiting deep oceanic and continental slope waters 400-1,000 m deep (Baird, 2002) from the tropics through the temperate regions in both hemispheres (Jefferson et al. 1993). Sighting records indicate this species occurs roughly between 60°N and 60°S latitudes, where surface water temperature are above 10 °C (Kruse et al. 1999). It ranges north to Newfoundland, the Shetland Islands, the North Sea (Weir et al. 2001), the Mediterranean Sea, Ostrov Iturup in the Ostrova Kuril'skiye, Koman-dorskiye Ostrova, 56°, 146° in the northern Gulf of Alaska, and Stuart Island (50°N) in British Columbia; and south down eastern South America as far as Cabo de Hornos in Chile, to Cape Province in South Africa, Geographe Bay (33°S) in Western Australia, Sydney in New South Wales, North Island in New Zealand, and Valparaiso in Chile (Rice, 1998).

3. Population size

There are examples of long term changes in abundance and distribution, e.g. in the Southern California Bight (Kruse et al. 1999 and refs. therein). In the late 1950s, Risso's dolphins were rarely encountered in this area, and between 1975 and 1978 they were still considered to be a minor constituent of the cetacean fauna of the Bight, representing only 3% of the cetaceans observed. Since the El Niño of 1982/83, however, numbers of Risso's dolphins have

increased, especially around Santa Catalina Island where they are now considered to be common. Forney and Barlow (1998) observed that the abundance of Risso's dolphins off California was almost an order of magnitude higher in winter (n = 32,376) than in summer (n = 3,980). The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the two most recent ship surveys, however, is 11,621 (CV = 0.17) Risso's dolphins (Barlow and Forney 2007, Forney, 2007). Currently, there is no evidence of a trend in abundance for this stock. In the EEZ waters around Hawaii, Barlow (2006) estimated abundance at 2,375 (CV=0,65). An earlier estimate for the entire eastern Tropical Pacific was 175,000 (Wade and Gerrodette, 1993).

In the eastern Sulu Sea, Dolar (1999) estimated the population size at 950 individuals. Population estimates off Sri Lanka ranged from 5,500 to 13,000 animals (Kruse et al. 1999 and refs. therein). In three areas of concentrated occurrence off Japan, abundance is estimated at 83,300 (Taylor et al. 2008).

In the western North Atlantic, Waring et al. (2007) estimated the stock from 2004 data at 20,500 (CV = 0,59). In the northern Gulf of Mexico the estimate of abundance for Risso's dolphins in oceanic waters, pooled from 1996 to 2001, is 2,169 (CV=0.32) (Mullin and Fulling 2004).

In the Pelagos Sancuary in the North-Western Mediterranean Sea, Risso's dolphin was not very abundant, accounting for only 4.3% of all cetacean encounters (Moulins et al. 2008). In the central Spanish Mediterranean, Gomez de Segura et al. (2006) determined a surface-estimated density of 0.015 dolphins / km² (95% CI = 0.005-0.046) and a mean abundance of 493 (95% CI = 162-1,498).

4. Biology and Behaviour

Habitat: Risso's dolphins are pelagic, mostly occurring seaward of the continental slope. They frequent subsurface sea-mounts and escarpments where they are thought to feed on vertically migrant and mesopelagic cephalopods. In Monterey Bay, California, Risso's dolphins are concentrated over areas with steep bottom topography. Currents and upwelling causing local increases in marine productivity may enhance feeding opportunities, resulting in the patchy distribution and local abundance of this species worldwide (Kruse et al. 1999 and refs. therein). Davis et al. (1998), Baumgartner (1997) and Baumgartner et al. (2001) reported that in the Gulf of Mexico, Risso's dolphins were mostly found over the steeper sections of the upper continental slope (200-1000 m) concentrating along the upper continental slope, which may reflect squid distribution.

In the western Ligurian Sea, Mediterranean, Azzelino et al. (2008) found that Risso's dolphins were strongly associated with depth and slope gradient characteristics of the shelf-edge and the upper and lower slope. Their data showed clear and not overlapping habitat preferences for Risso's dolphin and Cuvier's beaked whale. A temporal segregation in the use of the slope area was also observed for sperm whales and Risso's dolphins. In the Spanish Mediterranean, Risso's dolphins preferred waters more than 1500 m deep (Gomez de Segura et al. 2008) and depths of around 1000 m were hot spots in the Pelagos Sanctuary (north-western Mediterranean Sea; Moulins et al. 2008). Blanco et al. (2003) assumed that due to distribution records of prey in the western Mediterranean, Risso's dolphins more frequently inhabit the outer continental slope and shelf break region. The preference for this habitat may be

explained by the high marine productivity with enhanced feeding opportunities and this agrees with results from other countries and sightings in the area.

Behaviour: *G. griseus* are often seen surfacing slowly, although they can be energetic, sometimes breaching or porpoising, and occasionally bowriding (Jefferson et al. 1993).

Reproduction: In the North Atlantic and western Pacific, there appears to be a summer calving peak (Jefferson et al. 1993) and a winter calving peak in the eastern Pacific (Baird 2009).

Schooling: Herds tend to be small to moderate in size (1-100 individuals), averaging 30 animals, but groups of up to 4,000 have been reported, presumably in response to abundant food resources. Limited data on subgroup composition obtained from mass strandings and observations of captive animals suggest that cohesive subgroups may be composed of same-sex and similar-age individuals. Risso's dolphins commonly associate with other species of cetaceans such as gray whales, Pacific white-sided dolphins, northern right whale dolphins, Dall's porpoises, sperm whales, short-finned pilot whales, bottlenose dolphins, common dolphins, striped dolphins, spotted dolphins, false killer whales, and pygmy killer whales (Kruse et al. 1999 and refs. therein).

Hartman et al. (2008) found that individuals at the Azores, central Atlantic, formed stable, long-term bonds organised in pairs or in clusters of 3-12 individuals. Social structure showed strong associations between adult males and between adult females. Males were organised in stable, long-term associations of varying size that occurred throughout the complete range of behavioural states observed. For females, associations could be of similar strength, but the time scale could vary depending on the presence of nursing calves. As subadults, associations also occurred (pair formation), but were less stable than those observed for adults.

Frantzis and Herzing (2002) observed in the Gulf of Corinth, an almost-enclosed sea in Greece in the eastern Mediterranean, that Risso's dolphins associated with striped and common dolphins. However, in all mixed-species sightings, Risso's dolphins and common dolphins were always, and by far the minority species, present. To date, no single-species groups of Risso's or short-beaked common dolphins have been observed in the Gulf of Corinth. Interspecific rake marks on the Risso's dolphinsand behaviours observed through video analysis indicated potentially complex and regular interspecific interactions.

Food: Kruse et al. (1999) reported that Risso's dolphins prey on a mix of neritic, oceanic, and occasionally bottom dwelling cephalopods. From daily activity patterns observed off Santa Catalina Island, California, Risso's dolphins are presumably mainly nocturnal feeders. Santos et al. (2001) found *Octopus vulgaris* in the stomachs of animals stranded in NW Spain.

Blanco et al. (2003) analysed stomach contents of 13 Risso's dolphins stranded on the western Mediterranean coast between 1987 and 2002 and found only cephalopod remains: 25 species belonging to 13 families were found in the samples, mostly Argonautidae, Ommmastrephidae, Histioteuthidae and Onychoteuthidae. Despite the numerical importance and high frequency of small pelagic octopods, mainly *Argonauta argo*, Blanco et al. (2003) assumed that greater nutritional content came from of ommastrephids, mainly *O. bartrami* and *T .sagittatus* because of the larger size of some specimens. The prey were mainly oceanic and pelagic species with a muscular mantle.

In the eastern Mediterranean Sea off the Turkish coast, Risso's dolphins also only feed on cephalopods; *Histioteuthis reversa* was the most common species (60.9%of all beaks found),

and all the other species comprised less than 10%. Most of the prey species are oceanic cephalopods, with wide vertical distribution and diurnal movement. Many of the cephalopods identified in the diet of these dolphins are bioluminescent, suggesting that these dolphins use bioluminescence as a target when feeding on cephalopods (Oeztuerk et al. 2007).

Philips et al. (2003) monitored a trained Risso's dolphin and established that the species echolocates, and that, aside from slightly lower amplitudes and frequencies, the clicks emitted are similar to those emitted by other echolocating odontocetes.

5. Migration

Although *Grampus* is present year-round in most of its range, there may be seasonal onshore-offshore movements in some areas (Carwardine, 1995). In more constant environments, e.g. the Azores, Hartman et al. (2008) found strong site fidelity for at least part of the population. In seasonally more variable areas, *G.s griseus* seems to show annual changes in abundance, being e.g. more abundant around northern Scotland in the summer and in the Mediterranean in the winter (e.g. Gannier, 1998; Evans, 1998).

Similar seasonal shifts in abundance have been reported from the Northwest Atlantic, British coastal waters, and the south-east coast of South Africa. Summer "reproductive migrations" (characterised by schools of 20-30 animals with empty stomachs and females carrying large foetuses), and winter "feeding migrations" (characterised by schools of nearly 200 animals with full stomachs and females carrying smaller foetuses) have been observed off Japan. Because some authors maintain that the species is equally abundant in some areas throughout the year, systematic studies of the distribution and abundance of Risso's dolphins in localised areas are required to resolve this conflict (Kruse et al. 1999 and refs. therein).

Water temperature appears to be a factor that affects the distribution of Risso's dolphins, the acceptable temperature range for the species being 7.5°C-35°C (Kruse et al. 1999 and refs. therein). In California, increasing numbers of Risso's dolphin and a shoreward shift in their distribution have been observed during periods of warm water, suggesting that seasonal patterns of distribution and abundance are associated with changing sea surface temperatures (Kruse et al. 1999).

However, Forney and Barlow (1998) found no significant seasonal difference in distribution of Risso's dolphins in Californian waters. In both summer and winter, they were seen most frequently in the Southern California Bight and were also observed off central California. Seasonal movement of Risso's dolphins from California into Oregon and Washington waters in spring and summer has been suggested, and there is an indication that Risso's dolphins were also common in offshore waters of northern California. The degree of movement into Mexican waters is unknown (Forney and Barlow, 1998).

6. Threats

Direct catch: In Sri Lanka, Risso's dolphins were apparently the second most commonly taken cetacean in fisheries, providing fish and meat for human consumption and fish bait; stocks there may be adversely affected (Jefferson et al. 1993). An estimated 1,300 Risso's dolphins may have been landed annually as a result of this fishery and population estimates in these waters range only from 5,500 to 13,000 animals (Kruse et al. 1999). In Japan, Risso's dolphins are taken periodically for food and fertiliser in set nets and as a limited catch in the

small-type whaling industry (Kruse et al. 1999 and refs. therein). However, Endo et al. (2005) surveyed the total mercury (T-Hg) and methyl mercury (M-Hg) levels in red meat products from small cetacean species, including Risso's dolphins, sold for human consumption in markets throughout Japan. Due to high levels in all species, the consumption of red meat from small cetaceans could pose a health problem for not only pregnant women but also for the general population.

Incidental catch: Although they have never been the basis of a large-scale fishery, Risso's dolphins have been taken periodically as by-catches in other fisheries throughout the world. There are reports from the North Atlantic, the southern Caribbean, the Azores, Peru, and the Solomon Islands. They are also a rare by-catch in the US tuna purse seine industry, and are taken occasionally in coastal gill net and squid seining industries off the US coast, or shot by aggravated fishermen (Kruse et al. 1999 and refs. therein).

Baker et al. (2006) reported on identifying Risso's dolphins via molecular monitoring of 'whalemeat' markets in the Republic of (South) Korea based on nine systematic surveys from February 2003 to February 2005. 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 'bycatch'.

The U.S, East Coast pelagic longline fishery has a history of interactions with Risso's dolphin, one of the primary species that interact with longline gear. Waring et al. (2007) found that the annual average combined mortality and serious injury for 2000-2004 was 46 Risso's dolphins (CV =0.37). They concluded that the total U.S. fishery mortality and serious injury for this stock was not less than 10% of the calculated PBR and, therefore, could not be considered to be insignificant and approaching a zero mortality and serious injury rate. Garrison (2007) found that incidental bycatch of marine mammals is likely associated with depredation of the commercial catch and is increased by the overlap between marine mammal and target species habitats. Altering gear characteristics and fishery practices may mitigate incidental bycatch and reduce economic losses due to depredation

Culling: Off Japan, Risso's dolphins were killed in the drive fishery (*oikomi*) in response to competition with commercial fisheries (Kruse et al. 1999 and refs. therein).

Pollution: Accumulation of butyltin compounds, organochloride and DDT levels have been analysed in tissue samples from various specimens (Kruse et al. 1999 and refs. therein). Mercury levels have been reported by Frodello et al. (2000). Increasing levels of plastics and other refuse at sea may pose a threat to wild populations: Necropsies of specimens from Japan revealed that they had eaten foreign materials such as plastic bags, soda cans, and pieces of rope, which may have been fatal (Kruse et al.1999 and refs. therein).

Chou and Li (2004) analysed blubber samples of cetaceans from Taiwan coastal waters for polychlorinated biphenyls (PCB). Total concentrations of 19 PCB congeners (SIGMAPCBs) were 0.23 µg/g lipid weight of Risso's dolphin with pentachlorobiphenyls, hexachlorobiphenyls and heptachlorobiphenyls the predominant PCB congener species. Stranded cetaceans had significantly higher PCB levels than by-caught cetaceans because of their higher lipid consumption during starvation or illness. However, by comparison cetaceans from Taiwan waters had relatively lower PCB concentrations than those from high-latitude areas.

Chen et al. (2002) analysed total mercury (Hg), organic-Hg and selenium bioaccumulations in small cetaceans distributed in Taiwanese waters of the Taiwan Strait and the southwestern

Pacific. Volcanic activities are possibly the major source of mercury to the environments. Muscle samples of Risso's dolphins had the highest mean concentrations of Se (1.77 mg/kg +- 1.29), while mercury concentrations were low compared to the other cetaceans.

In a specimen stranded on the Mediterranean coast of Israel, high concentrations of trace metals (Hg, Cd, Zn, Fe and Se) were found in the various tissues analysed, while Cu and Mn concentrations were naturally low. Plastic bags found in its stomach contributed to the dolphin's poor physical condition (Shoham-Frider et a. 2002).

Noise pollution: In early 2004 and in 2005, several unusual stranding events including Risso's dolphins occurred in Taiwan during a period when large-scale naval exercises were conducted in and on nearby waters. The findings of the gross post mortem examination of the only specimens that were available for study suggested that nearby naval exercises may have contributed to or caused the death of at least one cetacean in this region and that species other than beaked whales may also be susceptible to such activities. With an increasing number of military exercises in this region, more attention to the impacts of such activities on cetaceans is needed (Wang and Yang, 2006).

7. Remarks

Range states (Taylor et al., 2008):
Algeria; American Samoa; Anguilla; Antigua and Barbuda; Argentina; Aruba; Australia; Bahamas; Bangladesh; Barbados; Belgium; Belize; Benin; Bermuda; Brazil; British Indian Ocean Territory; Brunei Darussalam; Cambodia; Cameroon; Canada; Cape Verde; Cayman Islands; Chile; China; Cocos (Keeling) Islands; Colombia; Comoros; Congo; Congo, The Democratic Republic of the; Cook Islands; Costa Rica; Côte d'Ivoire; Croatia; Cuba; Denmark; Djibouti; Dominica; Dominican Republic; Ecuador; Egypt; El Salvador; Equatorial Guinea; Estonia; Fiji; France; French Guiana; French Polynesia; Gabon; Gambia; Germany; Ghana; Greece; Greenland; Grenada; Guadeloupe; Guam; Guatemala; Guernsey; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; Hong Kong; India; Indonesia; Iran, Islamic Republic of; Iraq; Ireland; Isle of Man; Israel; Italy; Jamaica; Japan; Jersey; Jordan; Kenya; Kiribati; Kuwait; Lebanon; Liberia; Madagascar; Malaysia; Maldives; Malta; Marshall Islands; Martinique; Mauritania; Mayotte; Mexico; Monaco; Morocco; Mozambique; Myanmar; Namibia; Netherlands; Netherlands Antilles; New Caledonia; New Zealand; Nicaragua; Nigeria; Niue; Northern Mariana Islands; Norway; Oman; Pakistan; Palau; Panama; Papua New Guinea; Peru; Philippines; Pitcairn; Portugal; Puerto Rico; Qatar; Russian Federation; Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Samoa; Sao Tomé and Principe; Saudi Arabia; Senegal; Serbia; Sierra Leone; Singapore; Slovenia; Solomon Islands; Somalia; South Africa; Spain; Sri Lanka; Sudan; Suriname; Sweden; Syrian Arab Republic; Tanzania, United Republic of; Thailand; Timor-Leste; Togo; Tonga; Trinidad and Tobago; Turkey; Turks and Caicos Islands; United Arab Emirates; United Kingdom; United States of America; United States Minor Outlying Islands; Uruguay; Vanuatu; Venezuela; Viet Nam; Virgin Islands, British; Virgin Islands, U.S.; Wallis and Futuna; Western Sahara; Yemen

This is a circumglobal species which migrates between summering and wintering grounds. Off California, where these movements are best known, they may involve US and Mexican waters. In other areas, the species is insufficiently known with respect to basic biological parameters. Abundance, by-catch and behavioural data at sea are needed in order to enable protection of the natural habitat of the species. For South American stocks, see further recommendations in the Hucke-Gaete (2000) report (see Appendix 1).

General recommendations on Southeast Asian stocks can be found in Perrin et al. (1996; see Appendix 2).

The IUCN lists *G. griseus* as "Least Concern" (Taylor et al. 2008). The Mediterranean, North and Baltic Sea populations are included in Appendix II of CMS. However, as described above, populations off the East and West coasts of North America (Range states US, Mexico, Canada) also seem to migrate along the coast, and this is also the case for animals off SE South Africa. It is therefore suggested not to restrict the inclusion into CMS App. II to the populations mentioned, but to include *G. griseus* as a species.

The species is listed in Appendix II of CITES.

8. Sources

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