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Distribution of Risso's dolphin (*Grampus griseus*, Cuvier 1812) in Chilean waters

Distribución del calderón gris (*Grampus griseus*, Cuvier 1812) en aguas chilenas

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Resumen.- En este trabajo se revisa la información del calderón gris *Grampus griseus* en aguas chilenas. En base al análisis de 44 registros, la distribución a lo largo de la costa chilena parece ser continua entre los 20°13' S y 40° S, sugiriendo que los registros más australes en Chile (~52°S) podrían corresponder a calderones grises provenientes del Océano Atlántico. Los registros en Chile muestran un aumento durante el verano austral e indican una preferencia por aguas sobre los 1000 m de profundidad. Varamientos masivos, interacciones con pesquerías y asociaciones con otras especies de cetáceos son también revisadas.

Palabras clave: Calderón gris, *Grampus griseus*, distribución, Chile, Pacífico Sur Este.

Abstract.- Here we review the knowledge of Risso's dolphin *Grampus griseus* in Chilean waters. Based on analysis of 44 records, this species appears to have a continuous distribution along the Chilean coast between 20°13'S and 40°S and we suggest that the reported southernmost record from Chile (~52°S) could be Atlantic Risso's dolphins. The Chilean records show a peak during the austral summer and indicate a preference for waters over 1000 m in depth. Mass stranding, interaction with fisheries, and associations with other cetaceans species are also reviewed.

Keywords: Risso's dolphin, *Grampus griseus*, distribution, Chile, Eastern South Pacific.

The occurrence of Risso's dolphin *Grampus griseus* in Chilean waters was insufficiently documented, with only one published reports of sightings (Aguayo-Lobo 1975) and a small number of notes regarding collections of osteological material (Venegas and Sielfeld 1978, Sielfeld 1980, Guerra *et al.* 1987, Fernández 1987). Recently, knowledge of *G. griseus* in Chile has increased considerably, due to new sightings in the northern waters (Findlay *et al.* 1998¹).

Here we attempt to integrate all available information about *G. griseus* in Chile in order to resolve

questions regarding its range and distribution. We include information from unpublished reports not considered previously, seek to clarify erroneously interpreted records and present further details for previously published records to assess the possible interaction with some fisheries.

Forty-four records of *G. griseus* were available (Table 1, Figure 1). The two records of unidentified whales observed off Valparaíso in November 1964 (Clarke *et al.* 1978) are also likely to represent *G. griseus* based on the external description of the animals and a published photograph (see Figure 1, Plate III in Clarke *et al.* 1978).

The distribution of Risso's dolphin in Chilean waters appears to be continuous, from 20°13'S in the north to the south, with the southernmost record at 40°S in the Eastern South Pacific. The previously reported southernmost record in Chilean waters (~52°S; Venegas and Sielfeld 1978, Sielfeld 1980) corresponds to bone material collected near the eastern opening of Straits of Magellan. Aguayo *et al.* (1998b) erroneously located these records at the Patagonian channels region and

¹ Findlay K, R Pitman, T Surui, K Sakai, P Ensor, H Iguakami, D Ljungblad, H Shimada, D Thiele, K Van Waerebeek, R Huckle-Gaete and GP Sanino. 1998. 1997-1998 IWC/Southern Ocean Whale and Ecosystem Research (IWC/SOWER) Blue Whale Cruise-Chile. 39 pp. Available from IWC, The Red House, Station Road, Impington, Cambridge, CB4 4NP, United Kingdom.

such, included them among the records for this species from the Pacific coast. Given the proximity of the collection site to the Atlantic Ocean we suggest instead that these specimens were most likely derived from the Atlantic population of Risso's dolphin and not from the Pacific. Similar reason has been applied to the assignment of false killer whale records in this area (Koen Alonso *et al.* 1999). There are no records of *G. griseus* from Chile's oceanic islands in the South Pacific Ocean (Juan Fernández Archipelago, Easter Island, San Felix, San Ambrosio and Sala y Gómez Islands), suggesting a possible preference for temperate waters of the Humboldt current rather than for warmer waters like those founded to the west into the Pacific Ocean (Bernal *et al.* 1982).

Sightings of Risso's dolphins are generally in waters over 1000 m in depth. A comparative distribution has been observed for this species in the northern Gulf of Mexico, where they prefer a narrow core habitat between the 350 m and 975 m isobaths. This depth range is known to have a high productivity and concentration of prey species (Baumgartner 1997). A similar physiogeographic relationship situation may explain the high number of sightings in the north/central part of Chile, where upwelling and coastal fronts results in highly productive waters, which sustain several large-scale fisheries (Bernal *et al.* 1982).

The majority of records for *G. griseus* concentrate within austral summer months in northern waters. This could be related to seasonal movements into the northern and central waters of Chile. This is supported by the lack of sightings of this species over five cruises (1993, 1994 and 1995) between Valparaíso and Eastern Island, off central Chile, during the winter months (Aguayo-Lobo *et al.* 1998a).

Inter-specific association have been reported for *G. griseus* with several cetacean species (see Kruse *et al.* 1999), including bottlenose dolphins *Tursiops truncatus*, as was observed on two occasions by Findlay *et al.* (1998)¹. Mixed-species aggregations with *Lagenorhynchus australis* (Aguayo-Lobo 1975) and with *Lissodelphis peronii* (Hucke-Gaete 2000²) have also been reported, but were not included in the world-wide review of *G. griseus* of Kruse *et al.* (1999).

Mass strandings of this species are uncommon. On the eastern coast of North America, 30 strandings

incidents involved mostly single animals, with a maximum of five dolphins (Reiger 1980, Leatherwood *et al.* 1980). In South America, Goodall and Schiavini (1992)³ reported eight strandings from Tierra del Fuego, Atlantic Ocean. The majority of these consisted of three or four dolphins, except for two instances where groups of 14 and 15 individuals stranded together. The first mass stranding of *G. griseus* from the Pacific coast of South America was recorded in Santa Maria island (37°S, 73°30'W) in 1992, when 14 animals stranded alive. They were returned to the water by local fishermen and three dolphins subsequently washed up dead (Brito 1996⁴).

Two records of *G. griseus* are of special interest with respect to possible interaction with commercial fisheries. In March 1989, five *G. griseus* were entangled and drowned in nets of a boat fishing for Pacific jack mackerel (*Trachurus symmetricus murphyi*), probably in the gulf of Arauco (37°S; 73°W)^{5,6}. No further data were available, except for photographs of one specimen. Several incidental catches have also been recorded from Peru (Vidal 1992⁷). The Gulf of Arauco record is the first documented evidence of fishery interaction with Risso's dolphin at Chilean waters. In spite of the principal prey species for *G. griseus* being cephalopods, fish may be taken occasionally (Leatherwood and Reeves 1983, Martin, 1990). Therefore, *G. griseus* may feed on *T. murphyi* in Chilean waters, at least in some areas, and so be at risk from entanglement.

² Hucke-Gaete R. 2000. Crucero de la Comisión Ballenera Internacional en la zona económica exclusiva de Chile (1999/2000): Informe del observador científico. Subsecretaría de Pesca, Ministerio de Economía, Fomento y Reconstrucción, República de Chile. 40 pp.

³ Goodall RNP and A Schiavini. 1992. Varamientos de delfín gris *Grampus griseus*, en las costas del extremo sur sudamericano. V Reunión de especialistas en mamíferos acuáticos de América del Sur. 28 septiembre-2 octubre, Buenos Aires, Argentina.

⁴ Brito JL. 1996. Nuevos registros de cetáceos para las aguas de Chile central. VII Reunión de especialistas en mamíferos acuáticos de América del Sur y I Congreso de la Sociedad Latinoamericana de Especialistas en Mamíferos Acuáticos. 22-25 octubre, Viña del Mar, Chile.

⁵ E Tarifeño personal communication to A Aguayo-Lobo, November 12th 1992. Facultad de Ciencias Biológicas y Recursos Naturales, Universidad de Concepción, Casilla 2407, Concepción, Chile.

⁶ Olavarría C, R Bernal, E Tarifeño and A Aguayo-Lobo. 1999. Impacto de las pesquerías de *Dissostichus eleginoides* y *Trachurus murphyi* sobre *Grampus griseus* en aguas de Chile central. XIX Congreso de Ciencias del Mar, 3 a 7 mayo 1999, Antofagasta, Chile.

⁷ Vidal O. 1992. Los mamíferos marinos del Océano Pacífico Sudeste (Panamá, Colombia, Ecuador, Perú y Chile): diagnóstico regional. Informes y Estudios del programa de Mares regionales del PNUMA Nº142. 25 pp.

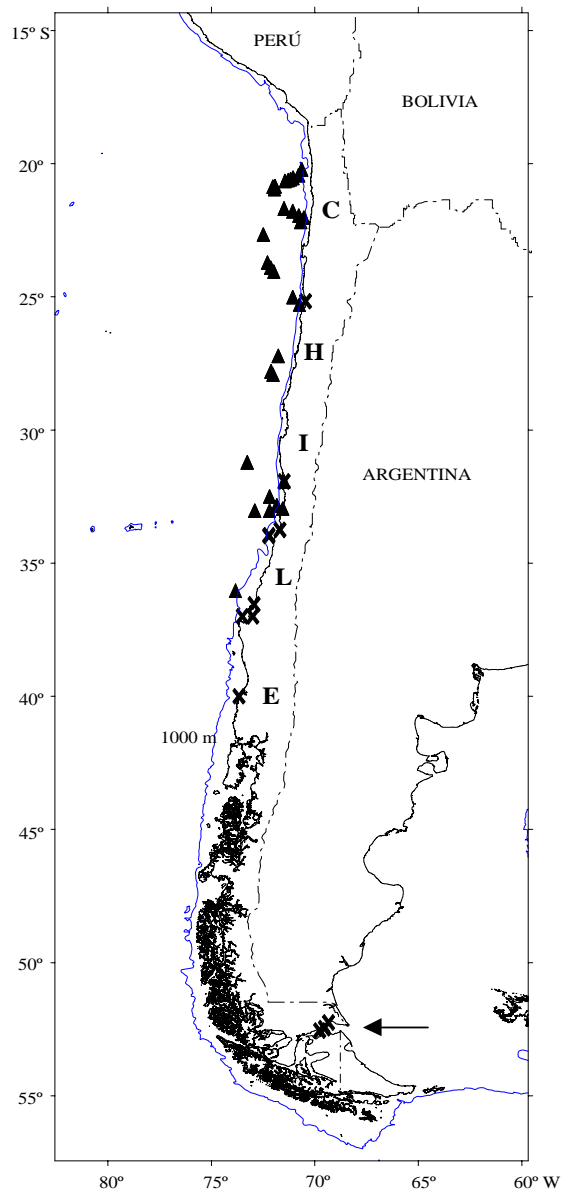


Figure 1

Records of *Grampus griseus* in Chilean waters. Triangles indicate sightings and crosses show the location of stranded animals or skeleton remains. The records reported by Norris (1968)¹¹ off Valparaíso and Sielfeld (1980) at Magallanes are not shown due to lack of geographic information. Arrow indicates records of putative Risso's dolphin from Atlantic population.

Registros de *Grampus griseus* en aguas chilenas. Triángulos indican avistamientos y cruces muestran localización de animales varados o restos óseos. Los registros reportados por Norris (1968)¹¹ frente a Valparaíso y por Sielfeld (1980) en Magallanes no son mostrados debido a la carencia de información geográfica. La flecha indica los registros de supuestos delfines de Risso del Océano Atlántico.

During a boat-based survey realized on 19 December 1991, which aimed to corroborate the reports of Valparaíso fishermen of lost catches from bottom-set longlines for Patagonian tooth fish (*Dissostichus eleginoides*) due to predation by sperm whales (*Physeter macrocephalus*), a group of 15 Risso's dolphins were observed for a period of 10 min, approximately 15 nautical miles off Valparaíso. The closest approach to the survey vessel was 50 m, with the dolphins moving along the starboard and poop of the boat⁸. Sea depth at the sighting location was 1600 m. The fish captured on the longline haul were undamaged.

Aguayo-Lobo *et al.* (1992) noted that marine mammals interactions with fisheries do not always result in direct competition for common resources, as was postulated by Northridge (1984). However, such interactions may result in competition between marine mammals and large fish competing by food. Although the Risso's dolphins off Valparaíso in 1991 did not damage the longlines nor fish caught on them, the Risso's dolphin presence may be related to the fishery operations in a common feeding area for *G. griseus* and *D. eleginoides*, plenty in squids (*Dosidicus gigas*). *G. griseus* feed mainly on cephalopods (Clarke and Pascoe 1985, Würzt *et al.* 1992) as well as *D. eleginoides* (Movillo and Bahamonde 1971). Worldwide, there are a few reported interactions between Risso's dolphin and fisheries. Although never taken in large numbers, *G. griseus* have been taken periodically in small whale fisheries and as by-catch in other fisheries at Europe, Black Sea, the lesser Antilles, Japan, North America, Peru and some Indo-Pacific islands such as in the Solomon Islands, Indonesia and Sri Lanka (Leatherwood and Reeves 1983, Northridge 1984, Martin 1990, Vidal 1992⁷, Kruse *et al.* 1999).

The data summarized in this report provides a clearer understanding of the distribution, habitat, inter-species associations, strandings and fishery interactions of *G. griseus* in Chilean waters compared to other previously published reviews for this species (Aguayo *et al.* 1998b, Kruse *et al.* 1999), especially as the latter considered only two sightings of *G. griseus* for this region.

⁸ Olavarria C and R Bernal. 1996. Registro de Cetáceos para la región de Valparaíso, Chile. VII Reunión de especialistas en mamíferos acuáticos de América del Sur y I Congreso de la Sociedad Latinoamericana de Especialistas en Mamíferos Acuáticos. 22-25 octubre, Viña del Mar, Chile.

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Table 1

Grampus griseus records in Chilean waters. IIO: Instituto de Investigaciones Oceanológicas, Universidad de Antofagasta, Antofagasta; IPPA: Instituto de la Patagonia, Punta Arenas; IZUA: Instituto de Zoología, Universidad Austral de Chile, Valdivia; MMSA: Museo Municipal de Ciencias Naturales y Arqueología de San Antonio; MRMB: Museo Regional "Mayorino Borgatello" de la Congregación Salesiana, Punta Arenas; MZUC: Museo de Zoología, Universidad de Concepción, Concepción.

Registros de *Grampus griseus* en aguas chilenas. IIO: Instituto de Investigaciones Oceanológicas, Universidad de Antofagasta, Antofagasta; IPPA: Instituto de la Patagonia, Punta Arenas; IZUA: Instituto de Zoología, Universidad Austral de Chile, Valdivia; MMSA: Museo Municipal de Ciencias Naturales y Arqueología de San Antonio; MRMB: Museo Regional "Mayorino Borgatello" de la Congregación Salesiana, Punta Arenas; MZUC: Museo de Zoología, Universidad de Concepción, Concepción.

Date	Location	N	Observations	Source
16-dec-97	20°13'S; 70°38'W	15	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
17-dec-97	20°26'S; 70°47'W	30	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
17-dec-97	20°32'S; 71°03'W	20	Sighting, associated with <i>Tursiops truncatus</i> , IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
17-dec-97	20°35'S; 71°10'W	10	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
17-dec-97	20°37'S; 71°17'W	3	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
18-dec-97	20°39'S; 71°26'W	6	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
18-dec-97	20°51'S; 71°55'W	70	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
18-dec-97	20°57'S; 71°57'W	30	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
19-dec-97	20°52'S; 72°01'W	10	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
19-dec-97	21°41'S; 71°29'W	5	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
19-dec-97	21°47'S; 71°04'W	1	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
19-dec-97	21°57'S; 70°46'W	6	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
20-dec-97	22°02'S; 70°32'W	22	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
21-dec-97	22°11'S; 70°41'W	5	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
22-dec-97	22°40'S; 72°29'W	5	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
22-dec-97	23°43'S; 72°17'W	20	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
22-dec-97	23°54'S; 72°08'W	5	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
22-dec-97	24°03'S; 71°59'W	6	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
24-dec-97	25°01'S; 71°04'W	6	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
..-jul-86	Playa Cachinales (25°10'S; 70°27'W)	1	Cranium (IIO AMM-27)	Guerra <i>et al.</i> (1987)
26-dec-97	25°18'S; 70°45'W	10	Sighting, associated with <i>Tursiops truncatus</i> , IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
30-dec-97	27°13'S; 71°46'W	6	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
17-dec-97	27°48'S; 72°07'W	55	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
22-dec-97	27°55'S; 72°01'W	6	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
27-nov-64	31°13'S; 73°16'W	14	Sighting, probably <i>Grampus</i> sp	Clarke <i>et al.</i> (1978)
...-89	Coquimbo (31°56'S; 71°29'W)	1	Skull photographed, without date and place of collect	Brito and Reyes 1990 ⁹
3-jan-98	32°30'S; 72°11'W	7	Sighting, IWC/SOWER Blue whale	Findlay <i>et al.</i> (1998) ¹
19-dec-1991	15 nmi off Valparaíso (32°50'S; 71°50'W)	15	Sighting	Olavarría and Bernal (1996) ⁸
4-jan-70	3 nmi off Montemar (32°57'S; 71°33'W)	4	Sighting, associated with <i>Lagenorhynchus australis</i> , largest animal was 3.6 m	Aguayo-Lobo (1975)

⁹ Brito JL and J Reyes. 1990. Registros de cetáceos en aguas de Chile central. IV Reunión de especialistas en mamíferos acuáticos de América del Sur. 12-15 noviembre, Valdivia, Chile.

¹⁰ Huckle-Gaete, R. 1998. Crucero de investigación sobre la Ballena Azul (*Balaenoptera musculus*) en aguas chilenas IWC/SOWER 1997/98: Informe de terreno. 41 pp.

Continuación Tabla 1

Date	Location	N	Observations	Source
-68	Off Valparaíso	?	Sighting and photographed	Norris (1968) ¹¹
24-nov-64	33°02'S; 72°11'W	15-20	Sighting, probably <i>Grampus</i> sp	Clarke <i>et al.</i> (1978)
20-feb-94	33°02'S; 72°54'W	5	Sighting	Pastene and Shimada (1999)
11-may-95	El Yali (33°45'S; 71°41'W)	1	Male beached, length 2.90 m. Complete skeleton collected (MMSA-	Brito (1996) ⁴
..-.-80	20 nmi off Santo Domingo (33°57'S; 72°13'W)	1	Calvarium collected from the sea bed (MMSA-CE-006)	Brito and Reyes (1990) ⁹
7-jul-98	Estero Tricao, Santo Domingo (33°59'S; 72°13'W)	1	Adult male beached with net marks in the body. Complete skeleton	JL Brito personal communication ¹²
7-jan-00	36°02'S; 73°50'W	3	In one group associated to <i>Lissodelphis peronii</i>	Hucke-Gaete 2000 ²
..-dec-82	Dichato (36°33'S; 72°56'W)	1	Calf beached, 1.4 m total length	Fernández (1987); Brito (1996) ⁴
19-may-92	Isla Santa María (37°00'S; 73°30'W)	15	Beached	E Tarifeño personal communication ⁵
..-mar-89	Golfo de Arauco (37°S; 73°W)	5	Entangled	Stiefeld (1980)
No date	Mehuín (40°00'S; 73°40'W)	1	Cranium (IZUA no data)	Stiefeld (1980)
23-apr-80	Punta Tandy (52°15'S; 69°20'W)	1	Cranium (IPPA CE-29)	Stiefeld (1980)
13-jun-1978	Punta Espora (52°28'S; 69°32'W)	1	Cranium without mandible (IPPA CE-19)	Venegas and Stiefeld (1978)
16-may-78	Punta Catalina (52°33'S; 68°46'W)	1	Skeleton almost complete (IPPA CE-8)	Venegas and Stiefeld (1978)
No date	Magallanes	1	Cranium (MRMB (P) R.79-47)	Stiefeld (1980)

¹¹ Norris KS, 1968. Cruise R/V Hero: November 12 - December 11, 1968. Valparaíso-Punta Arenas, Chile. Report, Punta Arenas, Chile, 11 pp. (mimeo).¹² JL Brito, personal communication to C Olavarría, november 17th 1999. Museo Municipal de Ciencias Naturales y Arqueología de San Antonio, Sanfuentes 2365, Casilla 93 Correo Lito Lito, San Antonio, Chile.