Annex L

Report of the Sub-Committee on Small Cetaceans

Members: Rogan (Convenor), Abramson, Acevedo, Aguayo, Aguilar, Alfaro Shigueto, Avila, Bachmann, Baker, Bedrinana-Romano, Bjørge, Bolanos, Brownell, Buchan, Campbell, Cañadas, Childerhouse, Chilvers, Cipriano, Cozzi, da Silva, Dahood, Dawson, de Stephanis, Dulau-Drouot, Fernandez, Flores, M., Flores, J.P., Fortuna, Freitas, Fuentes, Gales, Gallego, Garcia, Garrigue, Gibbons, Heinrich, Hoelzel, Hucke-Gaete, Hughes, Iñiguez, Jaramillo-Legorreta, Kasuya, Kock, Lens, Lescrauwaet, López-Mirones, Mangel, Martin, Moraga, Moreno, Natoli, Ólafsdóttir, Olavarría, Goodall, Palacios, Palma, Parsons, Perez, Reeves, Ridoux, Rosenbaum, Rossi-Santos, Rowles, Sanino, Santillán, Scheidat, Senn, Sequeira, Siciliano, Simmonds, Slooten, Stachowitsch, Štrbenac, Van Bressem, Vasquez, Vely, Verborgh, Wade, Weinrich, Williams, Winship, Yáñez, Ylitalo.

1. OPENING REMARKS

Rogan welcomed the participants to the meeting, noting that the priority topic for the sub-committee this year was a review of the conservation issues regarding small cetaceans in the southeast Pacific.

2. ELECTION OF CHAIR

Rogan was elected Chair.

3. ADOPTION OF AGENDA

The adopted Agenda is given in Appendix 1.

4. APPOINTMENT OF RAPPORTEURS

Martin, Reeves and Winship acted as rapporteurs.

5. REVIEW OF AVAILABLE DOCUMENTS

Documents relevant to the work of the sub-committee were SC/60/SM1-24, SC/60/O2, O16, and papers Carretta and Enriquez (2007), García-Godos (2007), Pérez-Álvarez *et al*. (2007), Mendez *et al*. (2008), Van Bressem *et al*. (2007), Williams *et al*. (2008) and Williams *et al*. (In review).

6. REVIEW OF CONSERVATION ISSUES REGARDING SMALL CETACEANS IN THE SOUTHEAST PACIFIC

The Southeast Pacific region extends along the coast of western South America from about 8°N to 60°S and includes the following countries: Colombia, Ecuador, Perú and Chile. The westward extent of the region was set at 120°W for purposes of this review. The coastline runs on a mostly north-south orientation and the adjacent continental shelf is extremely narrow due to tectonic subduction of the oceanic plates underneath the continental plate.

Several oceanographic regimes characterise this region (Fig. 1). The northernmost portion is known as the Panama Bight, and its circulation is seasonally determined by the meridional migration of the Intertropical Convergence Zone (ITCZ). The ITZC is at its southernmost position (~2°N) between October and March, and circulation is cyclonic with a coastal current to the north (the Colombia Current, fed by the North Equatorial Countercurrent), whereas during the April-September period the ITZC moves northward to about 8-10°N and circulation is anticyclonic, with a coastal current to the south (Badan-Dangon, 1998; Chaigneau *et al*., 2006; Rodriguez-Rubio *et al*., 2003).

Running zonally between the South American coast (near Santa Elena Peninsula at 2°S) and the international dateline, the Equatorial Front is a regional feature that separates the warm waters of the Panama Bight to the north from cool waters to the south. A complex system of transpacific zonal flows in this region includes the westward South Equatorial Current, with its northern and southern branches straddling the equator, and the eastward Equatorial Undercurrent (Fiedler and Talley, 2006; Kessler, 2005). The Galápagos Islands (at 90°30'W, 0°30'S) are embedded in this system and the interaction between the islands and the flows generates a localised productive habitat (Palacios, 2004; Pennington *et al*., 2006). The Humboldt (or Peru-Chile) Current flows northward along the coast of South America from central Chile (~40°S) to northern Peru (~5°S) before turning westward to become the South Equatorial Current (Strub *et al*., 1998; Tomczak and Godfrey, 2003). This eastern boundary current system is characterised by persistent coastal upwelling and has one of the highest productivities and fisheries yields of the world ocean (Carr and Kearns, 2003; Pennington *et al*., 2006).

Although somewhat ill defined, the Subtropical Front near 40°S separates the upwelling domain to the north from a downwelling-dominated system in the southern part of the region, which is characterised by an intricate network of fjords and heavy rainfall along the coast (Strub *et al*., 1998; Tomczak and Godfrey, 2003).

At least 39 species of small cetaceans have been documented in this geographical area, including 12 Ziphidae and 22 Delphinidae, two Phocoenidae, two Kogidae and one Iniidae (see Table 1). In considering the priority topic, the sub-committee did not adopt a species by species approach,

but rather reviewed all species under each main agenda item, with a view to identifying information gaps and highlighting issues/areas/species of concern.

6.1 Abundance and distribution

Information on small cetacean distribution and abundance was provided in a number of papers, using a number of different methods, including dedicated surveys (SC/60/SM4, 7), platforms of opportunity (SC/60/SM4, 7, 11, 23), strandings (SC/60/SM21) and photo-identification (SC/60/SM23).

SC/60/SM4 presented information on the distribution and relative abundance of oceanic cetaceans in the Pacific exclusive economic zone (EEZ) of Colombia from survey cruises and platforms of opportunity. Cetacean sighting data collected under various programs in Colombian Pacific waters were compiled with the goal of assessing the distribution and abundance patterns of the most common species. Distribution maps were presented for 19 species and one genus based on 548 sightings collected between 1986 and 2008. Concentrations of sightings were observed in two areas: the continental shelf (depths <2,000m) and over the Malpelo Ridge, an oceanic bathymetric feature. Ordered by sighting frequency, these species were: striped dolphin (*Stenella coeruleoalba*), common bottlenose dolphin (*Tursiops truncatus*), pantropical spotted dolphin (*Stenella attenuata*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), Risso's dolphin (*Grampus griseus*), short-beaked common dolphin (*Delphinus delphis*), rough-toothed dolphin (*Steno bredanensis*), beaked whales (*Mesoplodon* spp. and unidentified ziphiid whales), short-finned pilot whale (*Globicephala macrorhynchus*), false killer whale (*Pseudorca crassidens*), melon-headed whale (*Peponocephala electra*), spinner dolphin (*Stenella longirostris*), Cuvier's beaked whale (*Ziphius cavirostris*), killer whale (*Orcinus orca*), dwarf sperm whale (*Kogia sima*), Bryde's whale (*Balaenoptera edeni*), pygmy killer whale (*Feresa attenuata*), Blainville's beaked whale (*Mesoplodon densirostris*) and common minke whale (*Balaenoptera acutorostrata*). In inshore waters, the most frequently seen species were the pantropical spotted dolphin, common bottlenose dolphin and humpback whale. For several of the data sets, encounter rates were provided as indices of relative abundance, but the authors urged caution in their interpretation because of methodological limitations and because several factors that affect sightability were not accounted for in these estimates.

The sub-committee welcomed the results of these analyses and agreed that the results would be useful for ongoing regional research and conservation initiatives aimed at determining population status and connectivity within adjacent EEZs. Future activities should focus on dedicated surveys designed to estimate abundance and monitor trends in areas of special interest (e.g. the continental shelf and the Malpelo Ridge). More research is also needed to identify sources of anthropogenic mortality, quantify that mortality and assess its impact on population sizes. Finally, studies characterising genetic diversity and stock discreteness in coastal species (i.e. pantropical spotted dolphin and common bottlenose dolphin) would help inform local conservation strategies.

SC/60/SM7 presented information on cetacean density and distribution within the productive habitat west of the Galápagos Islands during April 2000. Topographic upwelling on the western side of the Galápagos Islands (0°30'S, 91°30'W) creates localised but quasi-permanently productive habitat. A visual line transect survey was conducted to estimate cetacean abundance. The R/V *Odyssey* (a 28m ketch) was used as the research platform to survey 1,751km of trackline inside an area of 72,400 km^2 during a 15 day cruise (5-19 April 2000). A total of 176 cetacean sightings involving a minimum of 12 species were logged during standardised transects. Four species of small dolphins were recorded in the highest densities: short-beaked common dolphins (2.949 animals km^2), pantropical spotted dolphins (0.247 animals km^2), striped dolphins (0.249 animals km^2) and spinner dolphins (0.068 animals km^2). Three medium-sized cetacean species or species groups had intermediate densities: short-finned pilot whales (0.033 animals km^2), bottlenose dolphins (0.021 animals km^2) and the beaked whales (0.007 animals km^2). Two large cetacean species occurred at low densities: Bryde's whales (0.0017 animals km^2) and sperm whales (0.0008 animals km^2). Dwarf sperm whales had the lowest density (0.0005 animals km^2). These data provide information on cetaceans in key environments, in the context of local and regional marine resource management initiatives like the Galápagos Marine Resources Reserve and the Eastern Tropical Pacific Seascape, respectively. Such information is useful toward building an ecological framework for understanding how island-driven oceanographic processes influence cetacean community structure in various systems around the world.

In discussion, members noted that peaks in the histograms of perpendicular sighting distances were off the trackline. The authors of SC/60/SM7 noted that this might be indicative of responsive movement away from the survey vessel, but that the aspect of animals was not recorded. The sub-committee suggested that other potential reasons for the pattern in perpendicular sighting distances are a blockage of the view of the trackline and observers not focusing enough on the trackline.

The sub-committee agreed that these initial analyses and estimates of cetacean abundance within the productive habitat of the Galápagos will provide baseline data required for the assessment of cetacean populations in the area. Abundance estimates for other times of the year are needed to provide a more complete picture of population variability, given the strong oceanographic seasonality of the region.

SC/60/SM11 described a cetacean survey on a 25m platform of opportunity undertaking a *ca*. 3,000km voyage in the Chilean fjords, from Ushuaia to Puerto Montt during March and April 2006. The principal focus of the survey was Chilean dolphin (*Cephalorhynchus eutropia*). Two observers were on effort in all conditions of Beaufort 3 or less (*ca*. 2,000km of trackline). In general, the vessel avoided travelling down the centre of large channels, instead maintaining a distance of about 400m off the most sheltered side. Peale's dolphins (*Lagenorhynchus australis*) were by far the most common cetaceans encountered (30 sightings, *ca*. 99 individuals), and were seen over the entire latitudinal range of the survey. Chilean dolphins (*ca*. 40 individuals) were seen in only five locations, all north of 49°15'S, including one location in which 23 individuals were found in groups of 3-8 in one inlet (Bahia Elizabeth). Excluding this sighting, maximum group size was six, and groups were typically separated by >50 n.miles. While no abundance estimates are possible from this survey, the main conclusion was that Chilean dolphins were very rare in the main fjords and major channels. The authors of SC/60/SM11 suggested that data from this survey, and from as many other sources as possible, be compiled in order to assist in the design of a comprehensive, dedicated line-transect abundance survey of the channels and the open coast.

Table 1

List of the small cetaceans of the Southeast Pacific. Paper numbers ('SM1', 'SM2', etc.) were entered into appropriate categories and correspond to papers presented at SC/60. Column for previous information includes a selection of representative references and is not exhaustive.

Common name	Scientific name	Abundance	Distribution	Population structure	Diseases	Ecology	Habitat	Directed takes	Bycatch	Previous information
Family Kogiidae										
Pygmy sperm whale	*Kogia breviceps*									Aguayo-Lobo *et al.* (1998); Sanino and Yañez (1997); Muñoz-Hincapié *et al.* (1998); Van Waerebeek *et al.* (Van Waerebeek *et al.*, 1987); Reyes and Van Waerebeek (1992)
Dwarf sperm whale	*Kogia sima*	SM4, SM7	SM4, SM7							Aguayo-Lobo *et al.* (1998); Vidal (1990); Félix and Samaniego (1994); Félix *et al.* (1995); Flórez and Capella (1995); Muñoz-Hincapié *et al.* (1998); Reyes and Van Waerebeek (1992); Palacios *et al.* (2005)
Family Iniidae										
Boto*	*Inia geoffrensis*							SM17		McGuire and Aliaga-Rossel (2006); Martin and da Silva (2004a; 2004b)
Family Phocoenidae										
Burmeister's porpoise	*Phocoena spinipinnis*		SM21, SM23		For Info 37	SM22	SM23		SM19, SM21, SM23, For Info 2	Aguayo-Lobo *et al.* (1998); Goodall *et al.* (1995a; 1995b); Reyes and Van Waerebeek (1995); Heinrich (2006); Molina-Schiller *et al.* (2005); Reyes and Oporto (1994); Rosa *et al.* (2005); Reyes and Van Waerebeek (1995); Van Waerebeek *et al.* (1994; 2002; 1999; 1997); Van Bressem and Van Waerebeek (1996); Van Bressem *et al.* (2001a; 2007a; 2007b); Van Waerebeek and Reyes (1994); Goodall (1978; 1989); García-Godos *et al.* (2004)
Spectacled porpoise	*Phocoena dioptrica*		SM21			SM22				Aguayo-Lobo *et al.* (1998); Perrin *et al.* (2000); Sekiguchi *et al.* (2006); Goodall (2002); Goodall and Schiavini (1995)
Family Delphinidae										
Rough-toothed dolphin	*Steno bredanensis*	SM4	SM4							Van Waerebeek and Guerra (1988); Vidal(1990); Palacios *et al.* (2005)
Tucuxi*	*Sotalia fluviatilis*									Caballero *et al.* (2008; 2007)
Dusky dolphin	*Lagenorhynchus obscurus*		SM21			For Info 37			SM19	Aguayo-Lobo *et al.* (1998); Cassens *et al.* (2003; 2005); Harlin-Cognato *et al.* (2007); Goodall *et al.* (1997a); Van Waerebeek (1992a; 1992b); Van Waerebeek (1993a; 1993b); Van Waerebeek (1994); Van Waerebeek and Read (1994); Van Waerebeek and Reyes (1994); Van Waerebeek *et al.* (1999; 1997); Van Bressem *et al.*(1998; 2001b; 1996; 2000); Van Waerebeek and Würsig (2002); McKinnon (1994); García-Godos *et al.* (2004)
Hourglass dolphin	*Lagenorhynchus cruciger*		SM21			SM22				Aguayo-Lobo *et al.* (1998); Gazitúa *et al.* (1999); Goodall (1997); Goodall *et al.* (1997c)
Peale's dolphin	*Lagenorhynchus australis*	SM23	SM11, SM21, SM23		DW3	SM22, SM23, For Info 37	SM23	SM5	SM23	Aguayo-Lobo *et al.* (1998); Christie (2005); Fuentes (2005); Goodall *et al.* (1997a; 1997b); Heinrich (2006); Lescrauwaet and Gibbons (1994); Lescrauwaet (1997); Reyes and Oporto (1994); Schevill and Watkins (1971); Schiavini *et al.* (1997); Viddi (2002); Viddi *et al.* (2005); Viddi and Lescrauwaet (2005); Lescrauwaet (1996); Van Bressem *et al.* (2007b)
Risso's dolphin	*Grampus griseus*	SM4, SM7	SM21			SM22, For Info 37			SM19	Aguayo-Lobo *et al.* (1998); Olavarría *et al.* (2001); Vidal (1990); Flórez and Capella (1995); Chiluiza *et al.* (1998); Palacios and Day (1995); Palacios *et al.* (2005); Van Waerebeek *et al.* (1988); Guerra *et al.* (1987)
Common bottlenose dolphin	*Tursiops truncatus*	SM4, SM7	SM4, SM7, SM18, SM21	SM10	DW4			SM6	SM19	Aguayo-Lobo *et al.* (1998); Paolo Sanino *et al.* (2005); Van Waerebeek *et al.* (1990; 1999; 1997); Vidal (1990); Flórez and Capella (1995); Félix (1994; 1997); Van Bressem and Van Waerebeek (1996); Chiluiza *et al.* (1998); Van Bressem *et al.* (2006; 1998; 2007b); Canepa *et al.* (2006); Sanino and Yañez (2000; 2001a); Paolo Sanino *et al.* (2005); Palacios and Salazar (2002); Palacios *et al.* (2005); Van Waerebeek and Reyes (1994); Goodall (1978)

Cont.

Common name	Scientific name	Abundance	Distribution	Population structure	Diseases	Ecology	Habitat	Directed takes	Bycatch	Previous information
Pantropical spotted dolphin	*Stenella attenuata*	SM4, SM7	SM4, SM7					SM6		Vidal (1990); Félix and Samaniego (1994); Flórez and Capella (1995); Chiluiza *et al.* (1998); Palacios and Salazar (2002); Palacios *et al.* (2005); Escorza-Treviño *et al.* (2005)
Spinner dolphin	*Stenella longirostris*	SM4, SM7	SM4, SM7							Vidal (1990); Palacios and Salazar (2002)
Striped dolphin	*Stenella coeruleoalba*	SM4, SM7	SM4, SM7							Aguayo-Lobo *et al.* (1998); Vidal (1990); Chiluiza *et al.* (1998); Van Waerebeek *et al.* (1998); Palacios *et al.* (2005)
Common dolphin	*Delphinus delphis*	SM4, SM7	SM4, SM7, SM21							Aguayo-Lobo *et al.* (1998); Vidal (1990); Félix and Samaniego (1994); Van Waerebeek *et al.* (1994); Flórez and Capella (1995); Chiluiza *et al.* (1998); Palacios and Salazar (2002); Sanino *et al.* (2003a; 2003b); Palacios *et al.* (2005); Van Waerebeek and Reyes (1994)
Long-beaked common dolphin	*Delphinus capensis*							SM19	SM19	Aguayo-Lobo *et al.* (1998); Bernal *et al.* (2003); Van Waerebeek *et al.* (1999; 1997; 1994); Van Bressem and Van Waerebeek (1996); Van Bressem *et al.* (2006; 1998; 2007b); Sanino *et al.* (2003a; 2003b); Van Waerebeek and Reyes (1994); García-Godos *et al.* (2004)
Fraser's dolphin	*Lagenodelphis hosei*		SM21							Vidal (1990)
Southern right whale dolphin	*Lissodelphis peronii*		SM21			SM22				Aguayo-Lobo *et al.* (1998); Van Waerebeek and Oporto (1990); Van Waerebeek and Reyes (1994); Van Waerebeek *et al.* (1991); Goodall (1978)
Commerson's dolphin	*Cephalorhynchus commersonii*		SM21			SM22				Aguayo-Lobo *et al.* (1998); Robineau *et al.* (2007); Pichler *et al.* (2001); Venegas (1996); Kastelein *et al.* (1993); Goodall *et al.* (1988b); Lescrauwaet *et al.* (2000); Venegas and Atalah (1987); Gibbons *et al.* (2000); Leatherwood *et al.* (1984); Goodall *et al.* (1988a); Van Bressem *et al.* (2007b); Goodall (1978; 1989)
Chilean dolphin	*Cephalorhynchus eutropia*	SM23	SM11, SM21, SM23, For Info 38		DW2, DW4, DW19	SM23	SM23	SM5	SM23	Aguayo-Lobo *et al.* (1998); Goodall *et al.* (1988b); Capella *et al.* (1999a); Christie (2005); Crovetto and Medina (1991); Fuentes (2005); Heinrich (2006); Molina and Reyes (1996); Pérez-Alvarez *et al.* (2007); Pichler *et al.* (2001); Reyes and Oporto (1994); Ribeiro *et al.* (2005); Ribeiro *et al.* (2007); Lescrauwaet and Gibbons (1994); Oporto (1989); Van Bressem *et al.* (2007b); Goodall (1994)
Melon-headed whale	*Peponocephala electra*	SM4	SM4							Vidal (1990); Van Waerebeek *et al.* (1988)
Pygmy killer whale	*Feresa attenuata*	SM4	SM4							Aguayo-Lobo *et al.* (1998); Vidal (1990); Félix *et al.* (1995); Van Waerebeek and Reyes (1988)
False killer whale	*Pseudorca crassidens*	SM4	SM4, SM21			SM22				Aguayo-Lobo *et al.* (1998); Flores *et al.* (2003); Alonso *et al.* (1999); Vidal (1990); Flórez and Capella (1995); Palacios and Mate (1996); Chiluiza *et al.* (1998); Sanino and Fowle (2006); Palacios *et al.* (2005)
Killer whale	*Orcinus orca*	SM4	SM4, SM7, SM21							Aguayo-Lobo *et al.* (1998); Flórez-Gonzalez *et al.* (1994); Capella *et al.* (1999b); Hucke *et al.* (2004); Vidal (1990); Flórez and Capella (1995); García-Godos (2004); Hückstädt and Antezana (2004); Merlen (1999); Goodall (2007)
Long-finned pilot whale	*Globicephala melas*		SM21							Aguayo-Lobo *et al.* (1998); Venegas and Sielfeld (1980); Sanino and Yañez (2001b); Guerra Correa *et al.* (1987); Van Waerebeek *et al.* (1988); Goodall (1978; 1989); Goodall and Macnie (1998a; 1998b)
Short-finned pilot whale	*Globicephala macrorhynchus*	SM4, SM7	SM4, SM7							Aguayo-Lobo *et al.* (1998); Vidal (1990); Félix and Samaniego (1994); Flórez and Capella (1995); Chiluiza *et al.* (1998); Sanino and Yañez (2001b); Guerra *et al.* (1987); Van Waerebeek *et al.* (1988); Van Waerebeek and Reyes (1994); Palacios *et al.* (2005)

Cont.

Common name	Scientific name	Abundance	Distribution	Population structure	Diseases	Ecology	Habitat	Directed takes	Bycatch	Previous information
Family Ziphiidae										
Sheperd's beaked whale	*Tasmacetus shepherdii*		SM21							Aguayo *et al.* (1998)
Arnoux's beaked whale	*Berardius arnuxii*		SM21							Aguayo-Lobo *et al.* (1998); Goodall (1978; 1989)
Longman's beaked whale	*Indopacetus pacificus*									Pitman *et al.* (1999)
Blainville's beaked whale	*Mesoplodon densirostris*	SM4	SM4							Aguayo-Lobo *et al.* (1998); Flórez and Capella (1995)
Layard's beaked whale	*Mesoplodon layardii*		SM21							Aguayo *et al.* (1998); Goodall (1978; 1989)
Ginkgo-toothed beaked whale	*Mesoplodon ginkgodens*									Palacios (1996); Palacios *et al.* (2005)
Hector's beaked whale	*Mesoplodon hectori*		SM21							Aguayo *et al.* (1998); Goodall (1978; 1989)
Andrews' beaked whale	*Mesoplodon bowdoini*		SM21							Goodall (1978; 1989)
Gray's beaked whale	*Mesoplodon grayi*		SM21							Aguayo-Lobo *et al.* (1998); Reyes (1990); Goodall (1978; 1989)
Cuvier's beaked whale	*Ziphius cavirostris*	SM4, SM7	SM4, SM7, SM21							Aguayo-Lobo *et al.* (1998); Vidal (1990); Flórez and Capella (1995); Sanino *et al.* (1996); Chiluiza *et al.* (1998); Palacios *et al.* (2005); Van Waerebeek *et al.* (1988); Goodall (1978; 1989)
Lesser beaked whale	*Mesoplodon peruvianus*	SM7	SM7							Reyes *et al.* (1991); Montes *et al.* (2004); Sanino *et al.* (2007); Van Waerebeek and Reyes (1994)
Spade-toothed beaked whale	*Mesoplodon traversii*									Reyes *et al.* (1995); Van Helden *et al.* (2002)
Southern bottlenose whale	*Hyperoodon planifrons*		SM21							Aguayo *et al.* (1998); Goodall (1978; 1989)

*These species are listed here following the practice of CPPS *et al.* (1991) to include species or populations inhabiting rivers and lakes of countries bordering the southeast Pacific region. Contributors listed alphabetically: Joanna Alfaro-Shigueto, Isabel C. Avila, Fernando Félix, Carolina García, R.P. Natalie Goodall, Sonja Heinrich, Ann-Katrien Lescrauwaet, Jeffrey C. Mangel, Carlos Olavarría, Daniel M. Palacios, Gian P. Sanino, Marie-Francoise Van Bressem, Koen Van Waerebeek, Francisco Viddi and José Zamorano-Abramson.

References

Aguayo-Lobo, A., Torres, D. and Acevedo, J. 1998. Los mamíferos marinos de Chile. I. Cetacea. *Serie Cientifica INACH* 48: 19-159.

Alonso, M.K., Pedraza, S.N., Schiavini, A.C.M., Goodall, R.N.P. and Crespo, E.A. 1999. Stomach contents of false killer whales (*Pseudorca crassidens*) stranded on the coasts of the Strait of Magellan, Tierra del Fuego. *Mar. Mammal Sci.* 15(3): 712-24.

Bernal, R., Olavarria, C. and Moraga, R. 2003. Occurrence and long-term residency of two long-beaked common dolphins, *Delphinus capensis* (Gray 1828), in adjacent small bays on the Chilean central coast. *Aquat. Mamm.* 29(3): 396-99.

Caballero, S., Jackson, J., Mignucci Giannoni, A.A., Barrios-Garrido, H., Beltran-Pedreros, S., Montiel-Villalobos, M.G., Robertson, K.M. and Baker, C.S. 2008. Molecular systematics of South American dolphins *Sotalia*: sister taxa determination and phylogenetics relationships, with insights into a multi-locus phylogeny of the Delphinidae. *Mol. Phylogenet. Evol.* 46(1): 252-68.

Caballero, S., Trujillo, F., Vianna, J.A., Barrios-Garrido, H., Montiel, M.G., Beltran-Pedreros, Marmontel, M., Santos, M.C., Rossi-Santos, M. and Baker, C.S. 2007. Taxonomic status of the genus *Sotalia*: species level ranking for the 'tucuxi' (*Sotalia fluviatilis*) and 'costero' (*Sotalia guianensis*). *Mar. Mammal Sci.* 23(2): 358-86.

Canepa, A.J., Sanino, G.P. and Yañez, J.L. 2006. Prelimianry note of the vocal repertoire of a resident population of common bottlenose dolphins, *Tursiops truncatus*, in Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 55: 41-49.

Capella, J., Gibbons, J. and Vilina, Y. 1999a. La orca, *Orcinus orca* (Delphindae) en aguas chilenas entre Arica y el Cabo de Hornos. *An. Inst. Patagonia* 27: 63-72.

Capella, J.J., Gibbons, J.E. and Vilina, Y.A. 1999b. Nuevos registros del delfin chileno, *Cephalorhynchus eutropia* (Gray, 1846) en Chile central, extremo norte de su distribucion. *Estud. Oceanol.* 18: 65-67.

Cassens, I., Van Waerebeek, K., Best, P.B., Crespo, E.A., Reyes, J. and Milinkovitch, M.C. 2003. The phylogeography of dusky dolphins (*Lagenorhynchus obscurus*): a critical examination of network methods and rooting procedures. *Mol. Ecol.* 12: 1781-92.

Cassens, I., Van Waerebeek, K., Best, P.B., Tzika, A., Van Helden, L.A., Crespo, E.A. and Milinkovitch, M.C. 2005. Evidence for male dispersal along the coasts but no migration in pelagic waters in dusky dolphins (*Lagenorhynchus obscurus*). *Mol. Ecol.* 14: 107-21.

Chiluiza, D., Aguirre, W., Félix, F. and Haase, B. 1998. Varamientos de mamiferos marinos en la costa continental ecuatoriana, periodo 1987-1995. *Acta Oceanografica del Pacifico, INOCAR, Ecuador* 9(1): 209-17.

Christie, C.A. 2005. Niveles de organizacion social del delfin chileno *Cephalorhynchus eutropia* (Gray, 1846) y delfin austral *Lagenorhynchus australis* (Peale, 1848) en la Isla de Chiloe, X Region, Chile, Universidad Austral de Chile, Valdivia. 83pp.

CPPS, PNUMA and UNEP. 1991. Plan de acción para la conservación de los mamíferos marinos en el Pacífico sudeste. *Informes y Estudios del Programa de Mares Regionales del PNUMA* 143: 15pp.
Crovetto, A. and Medina, G. 1991. The behaviour of the Chilean dolphin (*Cephalorhynchus eutropia* Gray, 1846) in the waters south of Chile. *Mammalia* 55(3): 329-38. In French.
Escorza-Treviño, S., Archer, F.I., Rosales, M., Lang, A. and Dizon, A.E. 2005. Genetic differentiation and intraspecific structure of Eastern Tropical Pacific pantropical spotted dolphins, *Stenella attenuata*, revealed by DNA analyses. *Conserv. Genet.* 6(4): 587-600.
Félix, F. 1994. Ecology of the bottlenose dolphin, *Tursiops truncatus*, in the Gulf of Guayaquil, Ecuador. *Invest. Cetacea* XXV: 235-56.
Félix, F. 1997. Organisation and social structure of the coastal bottlenose dolphin *Tursiops truncatus* in the Gulf de Guayaquil, Ecuador. *Aquat. Mamm.* 23(1): 1-16.
Félix, F., Haase, B. and Samaniego, J. 1995. Primeros registros de la orca pigmea *Feresa attenuata* (Cetacea, Delphindae) y del cachalote enano *Kogia simus* (Cetacea, Physeteridae) en Ecaudor continental. *Estud. Oceanol.* 14: 77-85.
Félix, F. and Samaniego, J. 1994. Incidental catches of small cetaceans in the artisanal fisheries of Ecuador. *Rep. int. Whal. Commn (special issue)* 15: 475-80.
Flores, M., Moraga, R., Pérez, M.J., Hanshing, E. and Olavarria, C. 2003. Occurrence of false killer whale *Pseudorca crassidens* (Owen, 1846) in Chile. *Revista de Biologia Marina y Oceanografia* 38(2): 81-85.
Flórez-González, L., Capella, J.J. and Rosenbaum, H.C. 1994. Attack of killer whales (*Orcinus orca*) on humpback whales (*Megaptera novaeangliae*) on a South American Pacific breeding ground. *Mar. Mammal Sci.* 10(2): 218-22.
Flórez, L. and Capella, J. 1995. Mamíferos acuáticos de Colombia. Una revisión y nuevas observaciones sobre su presencia, estado del conocimiento y conservación. *Informe del Museo del Mar (Universidad de Bogotá Jorge Tadeo Lozano, Bogotá, Columbia)* 39: 1-29. [In Spanish].
Fuentes, M. 2005. Estimacion de tasas de supervivencia del delfin chileno (*Caphalorhynchus eutropia*, Gray 1846) y del delfin austral (*Lagenorhynchus australis*, Peale 1848) a partir de individuos fotoidentificados en las Isla Grande de Chiloé, Region de los Lagos, Chile, Universidad de Valparaiso, Valparaiso. 93pp.
Garcia-Godos, I. 2004. Killer whale (*Orcinus orca*) occurrence off Peru, 1995-2003. *The Latin American Journal of Aquatic Mammals* 3(2): 177-80.
Garcia-Godos, I., Van Waerebeek, K., Reyes, J.C. and Alfaro, J. 2004. Comparative analysis of the diet of the long-beaked common dolphin (*Delphinus capensis*) with three other small cetaceans off central Peru. Paper SC/56/SM2 presented to the IWC Scientific Committee, July 2004, Sorrento, Italy (unpublished). 20pp. [Paper available from the Office of this Journal].
Gazitua, F., Gibbons, J. and Carcamo, J. 1999. Descripcion de un ejemplar de delfin cruzado, *Lagenorhynchus cruciger* (Delphindae), encontrado en el estrecho de Magallanes. *An. Inst. Patagonia* 27: 73-82.
Gibbons, J., Gazitua, F. and Venegas, C. 2000. Cetceos en al Estrecho de Magallanes y Senos Otway, Skyring y Almirantazgo. *An. Inst. Patagonia* 28: 107-18.
Goodall, N., Boy, C.C. and Schiavini, A.C.M. 2007. Historical and modern records of cetaceans self-stranding to escape killer whale attacks. Paper SC/59/SM17 presented to the IWC Scientific Committee, May 2007, Anchorage, USA (unpublished). 26pp. [Paper available from the Office of this Journal].
Goodall, R.N.P. 1978. Report on the small cetaceans stranded on the coasts of Tierra del Fuego. *Sci. Rep. Whales Res. Inst., Tokyo* 30: 197-230.
Goodall, R.N.P. 1989. The lost whales of Tierra del Fuego. *Oceanus* 32(1): 89-95.
Goodall, R.N.P. 1994. Chilean dolphin - *Cephalorhynchus eutropia* (Gray, 1846). pp.269-87. *In*: Ridgway, S. and Harrison, R. (eds). *Handbook of marine mammals*. Academic Press, London and San Diego. 416pp.
Goodall, R.N.P. 1997. Review of sightings of the hourglass dolphin, *Lagenorhynchus cruciger*, in the South American sector of the Antarctic and Subantarctic. 1001-13.
Goodall, R.N.P. 2002. Spectacled porpoises. pp.1158-61. *In*: Perrin, W.F., Wursig, B. and Thewissen, J. (eds). *Encyclopedia of Marine Mammals*. Academic Press, San Diego.
Goodall, R.N.P., Baker, A.N., Best, P.B., Meyer, M. and Miyazaki, N. 1997a. On the biology of the hourglass dolphin, *Lagenorhynchus cruciger* (Quoy and Gaimard, 1824). *Rep. int. Whal. Commn* 47: 985-99.
Goodall, R.N.P., de Haro, C., Fraga, F., Iñiguez, M.A. and Norris, K.S. 1997b. Sightings and behavior of Peale's dolphins, *Lagenorhynchus australis*, with notes on the dusky dolphins, *L. obscurus*, off southernmost South America. *Rep. int. Whal. Commn*: 757-75.
Goodall, R.N.P., Galeazzi, A.R., Leatherwood, S., Miller, K.W., Cameron, I.S., Kastelein, R.K. and Sobral, A.P. 1988a. Studies of Commerson's dolphins, *Cephalorhynchus commersonii*, off Tierra del Fuego, 1976-1984, with a review of information on the species in the South Atlantic. *Rep. int. Whal. Commn (special issue)* 9: 3-70.
Goodall, R.N.P. and Macnie, S.V. 1998a. A note on the behaviour of pilot whales in a Beagle Channel Bay, Tierra del Fuego. *Rep. int. Whal. Commn* 48: 559-63.
Goodall, R.N.P. and Macnie, S.V. 1998b. Sightings of pilot whales off South America south of 30°S: A review of data to 1988. *Rep. int. Whal. Commn* 48: 565-79.
Goodall, R.N.P., Norris, K.S., Galeazzi, A.R., Oporto, J.A. and Cameron, I.S. 1988b. On the Chilean dolphin, *Cephalorhynchus eutropia* (Gray, 1846). *Rep. int. Whal. Commn (special issue)* 9: 197-257.
Goodall, R.N.P., Norris, K.S., Harris, G., Oporto, J.A. and Castello, H.P. 1995a. Notes on the biology of the Burmeister's porpoise, *Phocoena spinipinnis*, off southern South America. *Rep. int. Whal. Commn (special issue)* 16: 317-47.
Goodall, R.N.P., Norris, K.S., Schevill, W.E., Fraga, F., Praderi, R., Iñiguez, M.A. and de Haro, J.C. 1997c. Review and update on the biology of Peale's dolphin, *Lagenorhynchus australis*. *Rep. int. Whal. Commn* 47: 777-96.
Goodall, R.N.P. and Schiavini, A.C.M. 1995. On the biology of the spectacled porpoise, *Australophocoena diotropica*. *Rep. int. Whal. Commn (special issue)* 16: 411-53.
Goodall, R.N.P., Würsig, B., Würsig, M., Harris, G. and Norris, K.S. 1995b. Sightings of Burmeister's porpoise, *Phocoena spinipinnis*, off southern South America. *Rep. int. Whal. Commn (special issue)* 16: 297-316.
Guerra, C.G., Van Waerebeek, K., Portflitt, G. and Luna, G. 1987. Presencia de cetaceos frente a la segunda region de Chile. *Estudios Oceanologicos* 6: 87-96. [In Spanish, with English abstract].
Guerra Correa, C., Van Waerebeek, K., Portflitt Kandora, G. and Luna Jorquera, G. 1987. The short-finned pilot whale, *Globicephala macrorhynchus* Gray, 1846, the first record for Chile. *Estudios Oceanológicos* 6: 97-102.
Harlin-Cognato, A.D., Markowitz, T., Würsig, B. and Honeycutt, R.L. 2007. Multi-locus phylogeography of the dusky dolphin (*Lagnorhynchus obscurus*): passive dispersal via the west-end drift or response to prey species and climate change? *BMC Evolutionary Biology* 7: 131.
Heinrich, S. 2006. Ecology of Chilean dolphins and Peale's dolphins at Isla Chiloé, southern Chile. PhD thesis, University of St. Andrews, St. Andrews, UK.
Hucke-Gaete, R., Moreno, C.A. and Arata, J. 2004. Operational interactions of sperm whales and killer whales with the Patagonian toothfish fishery off Southern Chile. *CCAMLR Science* 11: 127-40.
Hückstädt, L. and Antezana, T. 2004. Behaviour of southern sea lions in presence of killer whales during fishing operations in central Chile. *Scientia Marina* 68(2): 295-98.
Kastelein, R.A., McBain, J. and Neurohr, B. 1993. Information on the biology of Commerson's dolphin, *Cephalorhynchus commersonii*. *Aquat. Mamm.* 19(1): 13-19.
Leatherwood, S., Hammond, P.A. and Kastelein, R.A. 1984. Aerial estimates of numbers of Commerson's dolphins in a portion of the Northeastern Strait of Magellan, January-February 1984. Paper SC/36/SM7 presented to the IWC Scientific Committee, 1984 (unpublished). 15pp. [Paper available from the Office of this Journal].
Lescrauwaet, A.-K. 1996. Notes on the behaviour and ecology of the Peale's dolphin *Lagenorhynchus australis*, in the Magellan Strait, Chile. *Rep. int. Whal. Commn* 47: 747-55.

Lescrauwaet, A.C. and Gibbons, J. 1994. Mortality of small cetaceans and the crab bait fishery in the Magallanes area of Chile since 1980. *Rep. int. Whal. Commn (special issue)* 15: 485-94.
Lescrauwaet, A.C., Gibbons, J., Guzman, L. and Schiavini, A. 2000. Abundance estimation of Commerson's dolphin in the eastern area of the Strait of Magellan - Chile. *Revista Chilena de Historia Natural* 73: 473-4778.
Lescrauwaet, A.K. 1997. Notes on the behaviour and ecology of the Peale's dolphin, *Lagenorhynchus australis*, in the Strait of Magellan, Chile. *Rep. int. Whal. Commn* 47: 747-55.
Martin, A.R. and da Silva, V.M.F. 2004a. Number, seasonal movements and residency characteristics of river dolphins in an Amazonian floodplain lake system. *Can. J. Zool.* 82: 1307-15.
Martin, A.R. and da Silva, V.M.F. 2004b. River dolphins and flooded forest: seasonal habitat use and sexual segregation of botos (*Inia geoffrensis*) in an extreme ocean environment. *J. Zool., London.* 263: 295-305.
McGuire, T.L. and Aliaga-Rossel, E.R. 2006. Seasonality of reproduction in Amazon river dolphins (*Inia geoffrensis*) in three major river basins of South America. *Biotropica* 39(1): 129-35.
McKinnon, J. 1994. Feeding habits of the dusky dolphin, *Lagenorhynchus obscurus*, in the coastal waters of central Peru. *Fish. Bull.* 92(3): 569-78.
Merlen, G. 1999. The orca in Galapagos: 135 sightings. *Noticias de Galápagos* 60: 2-8.
Molina-Schiller, D., Rosales, S.A. and de Freitas, T.R.O. 2005. Oceanographic conditions off coastal South America in relation to the distrubtion of Burmeister's porpoise, *Phocoena spinipinnis*. *Latin American Journal of Aquatic Mammals* 4(2): 141-56.
Molina, D.M. and Reyes, J.C. 1996. Determinacion de edad en al delfin chileno *Cephalorhynchus eutropia* (Cetacea: Delphinidae). *Revista Chilena de Historia Natural* 69: 183-91.
Montes, D.I., Chavera, A.C., Van Bressem, M., Perales, R.C., Falcon, N.P. and Van Waerebeek, K. 2004. Descripcion y evaluacion anatomica de lesiones oseas craneo-mandibulares en cetaceos odontocetos del mar peruano. *Revista de Investigaciones Veterinarias del Peru* 15: 13-24.
Muñoz-Hincapié, M., Mora-Pinto, D.M., Palacios, D.M., Secchi, E.R. and Mignucci-Giannoni, A.A. 1998. First osteological record of the dwarf sperm whale in Colombia, with notes on the zoogeography of Kogia in South America. *Rev. Acad. Colom. Science* 22: 433-44.
Olavarria, C., Aguayo-Lobo, A. and Bernal, R. 2001. Distribution of Risso's dolphin (*Grampus griseus*, Cuvier 1812) in Chilean waters. *Revista de Biologa Marina y Oceanografia* 36(1): 111-16.
Oporto, J.A. 1989. Biología y status taxonómico del delfín chileno *Cephalorhynchus eutropia* (Gray, 1846). MSc thesis, Universidad Austral de Chile, Valdivia. 143pp. [In Spanish].
Palacios, D. and Salazar, S. 2002. Cetáceos. pp.291-304. *In*: Danulat, E. and Edgar, G.J. (eds). *Reserva Marina de Galapagos, Linea de Base de la Biodiversidad*. Fundacion Charles Darwin/Servicio del Parque Nacional Galapagos, Santa Cruz, Galapagos, Ecuador. [In Spanish].
Palacios, D.M. 1996. On the specimen of the ginkgo-toothed beaked whale, *Mesoplodon ginkgodens*, from the Galapagos Islands. *Mar. Mammal Sci.* 12(3): 444-46.
Palacios, D.M. and Day, D. 1995. A Risso's dolphin (*Grampus griseus*) carrying a dead calf. *Mar. Mammal Sci.* 11(4): 593-94.
Palacios, D.M. and Mate, B.R. 1996. Attack by false killer whales (*Pseudorca crassidens*) on sperm whales (*Physeter macrocephalus*) in the Galapagos Islands. *Mar. Mammal Sci.* 12(4): 582-87.
Palacios, D.M., Salazar, S.K. and Day, D. 2005. Cetacean remains and strandings in the Galpagos Islands, 1923-2003. *The Latin American Journal of Aquatic Mammals* 3: 127-50.
Paolo Sanino, G., Van Waerebeek, K., Van Bressem, M.F. and Pastene, L.A. 2005. A preliminary note on population structure in eastern South Pacific common bottlenose dolphins, *Tursiops truncatus*. *J. Cetacean Res. Manage.* 7(1): 65-70.
Perez-Alvarez, M.J., Alvarez, E., Aguayo-Lobo, A. and Olavarria, C. 2007. Occurrence and distribution of Chilean dolphin (*Cephalorhynchus eutropia*) in coastal waters of central Chile. *NZ J. Mar. Freshwater Res.* 41: 405-09.
Perrin, W.F., Goodall, R.N.P. and Cozzuol, M.A. 2000. Osteological variation in the spectacled porpoise (*Phocoena dioptrica*). *J. Cetacean Res. Manage.* 2(3): 211-15.
Pichler, F.B., Robineau, D., Goodall, R.N.P., Meyers, M.A., Olivarria, C. and Baker, C.S. 2001. Origin and radiation of Southern Hemisphere coastal dolphins (genus *Cephalorhynchus*). *Mol. Ecol.* 10: 2215-23.
Pitman, R.L., Palacios, D.M., Brennan, P.L.R., Brennan, B.J., Balcomb Iii, K.C. and Miyashita, T. 1999. Sightings and possible identity of a bottlenose whale in the tropical Indo-Pacific: *Indopacetus pacificus*? *Mar. Mammal Sci.* 15(2): 531-49.
Reyes, J.C. 1990. Gray's beaked whale *Mesoplodon grayi* in the south east Pacific. *Zeitschrift für Säugetierkunde - International Journal of Mammalian Biology* 55(2): 139-41.
Reyes, J.C., Mead, J.G. and Van Waerebeek, K. 1991. A new species of beaked whale *Mesoplodon peruvianus* sp. n. (Cetacea: Ziphiidae) from Peru. *Mar. Mammal Sci.* 7(1): 1-24.
Reyes, J.C. and Oporto, J.A. 1994. Gillnet fisheries and cetaceans in the southeast Pacific. *Rep. int. Whal. Commn (special issue)* 15: 467-74.
Reyes, J.C. and Van Waerebeek, K. 1992. Nuevos registros del genero *Kogia* en Péru. *Anales reunión de trabajo de especialistas en mamíferos acuáticos de América del Sud* III(25-30 de julio de 1988, Montevideo, Uruguay): 54-61.
Reyes, J.C. and Van Waerebeek, K. 1995. Aspects of the biology of Burmeister's porpoise from Peru. *Rep. int. Whal. Commn (special issue)* 16. 349-364.
Reyes, J.C., Van Waerebeek, K., Cárdenas, J.C. and Yáñez, J.L. 1995. *Mesoplodon bahamondi* sp.n. (cetacea, ziphiidae), a new living beaked whale from the Juan Fernández Archipelago, Chile. *Bol. Mus. Nac. Hist. Nat. Chile* 45: 31-44.
Ribeiro, S., Viddi, F., Cordeiro, J.L. and Freitas, T.R.O. 2007. Fine-scale habitat selection of Chilean dolphins (*Cephalorhynchus eutropia*): interactions with aquaculture activities in southern Chiloe Island, Chile. *J. Mar. Biol. Assoc. U.K.* 87: 119-28.
Ribeiro, S., Viddi, F. and Freitas, T.R.O. 2005. Behavioural responses of Chilean dolphins (*Cephalorhynchus eutropia*) to boats in Yaldad Bay, southern Chile. *Aquat. Mamm.* 31(2): 234-42.
Robineau, D., Goodall, R.N.P., Pichler, F. and Baker, C.S. 2007. Description of a new subspecies of Commerson's dolphin, *Cephalorhynchus commersonii* (Lacepede, 1804), inhabiting the coastal waters of the Kerguelan Islands. *Mammalia* 2007: 172-80.
Rosa, S., Milinkovitch, M.C., Van Waerebeek, K., Berck, J., Oporto, J., Alfaro-Shigueto, J., Van Bressem, M.F., Goodall, N. and Cassens, I. 2005. Population structure of nuclear and mitochondrial DNA variation among South American Burmeister's porpoises (*Phocoena spinipinnis*). *Conserv. Genet.* 6: 431-43.
Sanino, G.P. and Fowle, H.L. 2006. Study of whistle spatio-temporal distribution and repertoire of a school of false killer whales, *Pseudorca crassidens*, in the eastern South Pacific. *Boletin del Museo Nacional de Historia Natural (Chile)* 55: 21-39.
Sanino, G.P., Galaz, J.L., Capella, J. and Yáñez, J.L. 1996. Nuevo registro de ballena picuda de Cuvier, *Ziphius cavisrostris* Cuvier, 1823 en Chile y revision de los anteriores (Cetacea, ziphiidae). *Noticiario Mensual del Museo Nacional de Historia Natural* 325: 33-37.
Sanino, G.P., Hamilton-West, C., Rojas, A., Yañez, J.L. and Van Waerebeek, K. 2003a. Studies of three stranded *Delphinus delphis* and first record of focal *Pneumonia abscedativa* in Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 52: 103-77.

Sanino, G.P., Van Waerebeek, K. and Yañez, J.L. 2003b. Review of the distribution of the genus *Delphinus* and documented records of *Delphinus capensis*, in Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 52: 97-102.
Sanino, G.P. and Yañez, J.L. 1997. Studies on a pygmy sperm whale, *Kogia breviceps* (De Blainville, 1838), stranded on the coast on Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 46: 81-93.
Sanino, G.P. and Yáñez, J.L. 2000. Efectos del turismo de observación de cetáceos en Punta de Choros, IV Región, Chile. *Revista Gestión Ambiental* 6: 41-53. [In Spanish].
Sanino, G.P. and Yáñez, J.L. 2001a. Nueva técnica de video identificación y estimación de tamaño poblacional en cetáceos, aplicada de delfines nariz de botella, *Tursiops truncatus*, de isla Choros, IV Región de Chile. *Bol. Mus. Nac. Hist. Nat. Chile* 50: 37-63. [In Spanish].
Sanino, G.P. and Yáñez, J.L. 2001b. Study of a *Globicephala melas* individual stranded in the III Region and review of the genus for Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 50: 21-36.
Sanino, G.P., Yañez, J.L. and Van Waerebeek, K. 2007. A first confirmed specimen record in Chile, and sightings attributed to the lesser beaked whale *Mesoplodon peruvianus*, Reyes, Mead and Van Waerebeek, 1991. *Boletin del Museo Nacional de Historia Natural (Chile)* 56: 89-96.
Schevill, W.E. and Watkins, W.A. 1971. Pulsed sounds of the porpoise *Lagenorhynchus australis*. *Breviora* 366: 1-10.
Schiavini, A.C.M., Goodall, R.N.P., Lescrauwaet, A.K. and Alonso, M.K. 1997. Food habits of the Peale's dolphin, *Lagenorhynchus australis*, review and new information. *Rep. int. Whal. Commn* 47: 827-34.
Sekiguchi, K., Olavarria, C., Morse, L., Olson, P., Ensor, P., Matsuoka, K., Pitman, R., Findlay, K. and Gorter, U. 2006. The spectacled porpoise (*Phocoena dioptrica*) in Antarctic waters. *J. Cetacean Res. Manage.* 8(3): 265-71.
Van Bressem, M.-F., Van Waerebeek, K., Raga, J.A., Godfroid, J., Brew, S.D. and MacMillan, A.P. 2001a. Serolical evidence of *Brucella* species infection in odontocetes from the south Pacific and the Mediterranean. *Vet. Rec.* 148: 657-61.
Van Bressem, M., Van Waerebeek, K. and Bennett, M. 2006. Orthopoxvirus neutralising antibodies in small cetaceans from the southeast Pacific. *Latin American Journal of Aquatic Mammals* 5(1): 49-54.
Van Bressem, M.F., Cassonnet, P., Rector, A., Desaintes, C., Van Waerebeek, K., Alfaro-Shigueto, J., Van Ranst, M. and Orth, G. 2007a. Gential warts in Burmeister's porpoise: characterization of *Phocoena spinipinnis* papillimavirus type 1 (PsPV-1) and evidence for a second, distantly related PsPV. *J. Gen. Virol.* 88: 1928-33.
Van Bressem, M.F. and Van Waerebeek, K. 1996. Epidemiology of poxvirus in small cetaceans from the eastern South Pacific. *Mar. Mammal Sci.* 12(3): 371-82.
Van Bressem, M.F., Van Waerebeek, K., Flemming, M. and Barrett, T. 1998. Serological evidence of morbilivirus infection in small cetaceans from the southeast Pacific. *Vet. Microbiol.* 2: 89-98.
Van Bressem, M.F., Van Waerebeek, K., Jepson, P.D., Raga, J.A., Duignan, P.J., Nielsen, O., Di Beneditto, A.P., Siciliano, S., Ramos, R., Kant, W., Peddemors, V., Kinoshita, R., Ross, P.S., Lopez-Fernández, A., EVans, K., Crespo, E. and Barrett, T. 2001b. An insight into the epidemiology of dolphin morbilivirus worldwide. *Vet. Microbiol.* 81: 287-304.
Van Bressem, M.F., Van Waerebeek, K., Piérard, G. and Desaintes, C. 1996. Genital and lingual warts in small cetaceans from coastal Peru. *Dis. Aquat. Org.* 26: 1-10.
Van Bressem, M.F., Van Waerebeek, K., Reyes, J., Félix, F., Echegaray, M., Siciliano, S., Di Beneditto, A.P., Flach, L., Viddi, F., Avila, I.C., Bolaños, J., Castineira, E., Montes, D., Crespo, E., Flores, P.A.C., Haase, B., Mendonca de Souza, S.M.F., Laeta, M. and Fragoso, A.B. 2007b. A preliminary overview of skin and skeletal diseases and traumata in small cetaceans from South American waters. *LAJAM* 6(1): 7-42.
Van Bressem, M.F., Van Waerebeek, K., Siebert, U., Wunschmann, A., Chavez-Lisambert, L. and Reyes, J.C. 2000. Genital diseases in the Peruvian dusky dolphin (*Lagenorhynchus obscurus*). *J. Comp. Pathol.* 122: 266-77.
Van Helden, A.L., Baker, A.N., Dalebout, M.L., Reyes, J.C., Van Waerebeek, K. and Baker, C.S. 2002. Resurrection of *Mesoplodon traversii* (Gray, 1874), senior synonym of *M. bahamondi* Reyes, Van Waerebeek, Cárdenas and Yáñez, 1995 (Cetacea: Ziphiidae). *Mar. Mammal Sci.* 18(3): 609-21.
Van Waerebeek, K. 1992a. Population identity and general biology of the dusky dolphin, *Lagenorhynchus obscurus* (Gray, 1828) in the Southeast Pacific, Institute for Taxonomic Zoology, University of Amsterdam. 160pp.
Van Waerebeek, K. 1992b. Records of dusky dolphins, *Lagenorhynchus obscurus*, (Gray, 1828), in the eastern South Pacific. *Beaufortia* 43(4): 45-61.
Van Waerebeek, K. 1993a. External features of the dusky dolphin *Lagenorhynchus obscurus* (Gray, 1828) from Peruvian waters. *Estudios Oceanológicos* 12: 37-53.
Van Waerebeek, K. 1993b. Geographic variation and sexual dimorphism in the skull of the dusky dolphin, *Lagenorhynchus obscurus*, (Gray, 1828). *Fish. Bull.* 91(4): 754-74.
Van Waerebeek, K. 1994. A note on the status of the dusky dolphins (*Lagenorhynchus obscurus*) off Peru. *Rep. int. Whal. Commn (special issue)* 15: 525-27.
Van Waerebeek, K., Canto, J., Gonzalez, J., Oporto, J.A. and Brito, J.L. 1991. The southern right whale dolphin, *Lissodelphis peronii*, off the Pacific coast of South America. *Zeitschrift für Säugetierkunde - International Journal of Mammalian Biology* 56: 284-95.
Van Waerebeek, K., Félix, F., Haase, B., Palacios, D.M., Mora-Pinto, D. and Muñoz-Hincapié, M.F. 1998. Inshore records of striped dolphin *Stenella coeruleoalba* from the Pacific coast of South America. *Rep. int. Whal. Commn* 48: 523-32.
Van Waerebeek, K. and Guerra, C.G. 1988. A southern record of the rough-toothed dolphin, *Steno bredanensis*, in the eastern Pacific. *Estudios Oceanológicos* 7: 75-79. In English.
Van Waerebeek, K. and Oporto, J. 1990. Observaciones preliminares sobre la biologia de *Lissodelphis peronii* (Delphinidae) en el Pacifico Sureste, Valdivia, Chile. 43pp.
Van Waerebeek, K. and Read, A.J. 1994. Reproduction of dusky dolphins, *Lagenorhynchus obscurus*, from coastal Peru. *J. Mammal.* 75(4): 1054-62.
Van Waerebeek, K. and Reyes, J.C. 1988. First record of the pygmy killer whale, *Feresa attenuata* Gray 1875, from Peru with a summary of distribution in the eastern Pacific. *Zeitschrift für Säugetierkunde - International Journal of Mammalian Biology* 53: 253-55.
Van Waerebeek, K. and Reyes, J.C. 1994. Post-ban small cetacean takes off Peru: A review. *Rep. int. Whal. Commn (special issue)* 15: 503-20.
Van Waerebeek, K., Reyes, J.C. and Luscombe, B.A. 1987. A second record of the pygmy sperm whale *Kogia breviceps* (de Blainville, 1838) (Cetacea, Physeteridae) from the Peruvian coast. *Zeitschrift für Säugetierkunde - International Journal of Mammalian Biology* 52(3): 192-94.
Van Waerebeek, K., Reyes, J.C. and Luscombe, B.A. 1988. Revisión de la distribución de pequeños cetáceos frente al Perú. pp.345-51. *In*: Salzwedel, H. and Landa, A. (eds). *Recursos y Dinámica del Ecosistema de Afloramiento Peruano*. Instituto del Mar del Perú, Callao, Perú. 382pp. [In Spanish with English abstract].
Van Waerebeek, K., Reyes, J.C., Read, A.J. and McKinnon, J.S. 1990. Preliminary observations of bottlenose dolphins from the Pacific coast of South America. pp.143-54. *In*: Leatherwood, S. and Reeves, R.R. (eds). *The Bottlenose Dolphin*. Academic Press, San Diego. 653pp.
Van Waerebeek, K., Santillan, L. and Reyes, J.C. 2002. An unusually large aggregation of Burmeister's porpoise *Phocoena spinnipinnis* off Peru, with a review of sightings from the eastern South Pacific. *Not. Mens. Mus. Nac. Hist. Nat. (Santiago)* 350: 12-17.
Van Waerebeek, K., Van Bressem, M.F., Alfaro-Shigueto, J., Sanino, G.P., Montes, D. and Ontén, K. 1999. A preliminary analysis of recent captures of small cetaceans in Peru and Chile. Paper SC/51/SM17 presented to the IWC Scientific Committee, May 1999, Grenada, WI (unpublished). 14pp. [Paper available from the Office of this Journal].

Van Waerebeek, K., Van Bressem, M.F., Félix, F., Alfaro-Shigueto, J., García-Godos, A., Chávez-Lisambarth, L., Ontón, K., Montes, D. and Bello, R. 1997. Mortality of dolphins and porpoises in fisheries off Peru and southern Ecuador in 1994. *Biol. Conserv.* 81: 43-49.
Van Waerebeek, K., Van Bressem, M.F., Reyes, J.C., García-Godos, A., Alfaro, J., Ontón, K., Bello, R. and Echegaray, M. 1994. Illegal exploitation of small cetaceans in Peru. Final Report, United Nations Environment Programme, Nairobi and Whale and Dolphin Conservation Society, Bath, UK. 76pp.
Van Waerebeek, K. and Würsig, B. 2002. Pacific white-sided dolphin and dusky dolphin (*Lagenorhynchus obliquidens* and *L. obscurus*). pp.859-61. *In*: Perrin, W.F., Würsig, B. and Thewissen, J. (eds). *Encyclopedia of marine mammals*. Academic Press, San Diego.
Venegas, C. 1996. Estimacion de la densidad poblacional, mediante transectos aereos en linea, de la tunina overa *Cephalorhynchus commersonii* en al Estrecho de Magallanes. *An. Inst. Patagonia* 24: 41-48.
Venegas, C. and Atalah, A. 1987. Prospección aérea otoñal de toninas overas (*Cephalorhynchus commersonii*) en el Estrecho de Magallanes. *An. Inst. Patagonia* 17: 69-75. [In Spanish].
Venegas, C. and Sielfeld, W. 1980. Un varamiento masivo de ballenas piloto (*Globicephala melaena* Traill) en Magallanes. *An. Inst. Patagonia* 2: 239-46. [In Spanish].
Vidal, O. 1990. Lista de los mamíferos acuáticos de Colombia. *Informe del Museo del Mar (Universidad de Bogotá Jorge Tadeo Lozano, Bogotá, Columbia)* 37: 1-18.
Viddi, F.A. 2002. Deleccion y uso de habitat del delfin austral, *Lagenorhynchus australis*, en la costa central de Estrecho de Magellanes, Punta Arenas, Universidad Austral de Chile, Valdivia. 70pp.
Viddi, F.A. and Lescrauwaet, A.K. 2005. Insights on habitat selection and behavioural patternsn of Peale's dolphin (*Lagenorhynchus australis*) in the Strait of Magellan, southern Chile. *Aquat. Mamm.* 31: 176-83.
Viddi, F.A., Van Bressem, M.F., Lescrauwaet, A.-K. and Bello, M.E. 2005. First records of skin lesions in coastal dolphins off southern Chile. 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego, California, USA, 12-16 December 2005.

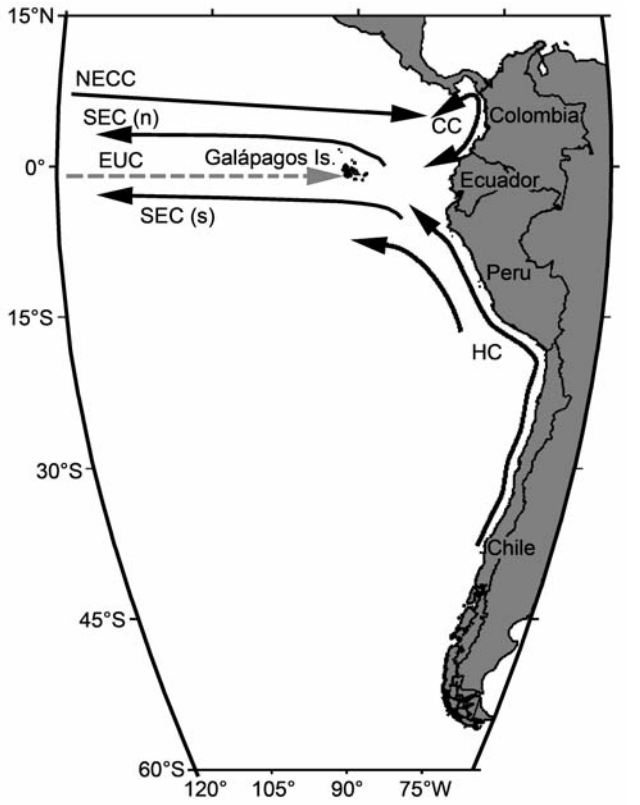

Fig. 1. Map of the Southeast Pacific region on a pseudo-cylindrical (sinusoidal) projection with a schematic representation of the current systems mentioned in the text: CC=the seasonally reversing Colombia Current occupying the Panama Bight; NECC=North Equatorial Countercurrent; SEC (n and s): northern and southern branches of the South Equatorial Current; EUC (dashed grey line)=Equatorial Undercurrent; HC=Humboldt Current.

The sub-committee noted that Chilean dolphins have a known distribution ranging from Valparaíso (33°S) to Navarino island near Cape Horn (55°S) and that the species was potentially more common in the open coast further north, but that other surveys have also found the species was rare and its distribution was patchy and restricted to selected areas (see Item 6.3), potentially leading to a discontinuous distribution.

SC/60/SM23 summarised findings on the distribution and abundance of small cetaceans in the coastal waters of the Chiloé Archipelago (42-43°S) in southern Chile. Since January 2001, systematic sighting surveys have been conducted from small inflatable boats during austral summer and autumn covering two study areas in central and southern Chiloé. Three species of small cetaceans were observed with limited small-scale spatial overlap between them. Chilean dolphins occurred mainly in several selected bays and channels in southern Chiloé. Peale's dolphins were distributed more widely, particularly in central Chiloé. Burmeister's porpoises (*Phocoena spinipinnis*) were sighted regularly in only two locations in central Chiloé characterised by deeper water and relatively steep relief, and in one channel in southern Chiloé. Absolute abundance could only be estimated for the delphinids using photo-identification techniques and closed population mark-recapture techniques. Local population size of Chilean dolphins was estimated at 59 individuals (CV=4%) in southern Chiloé. For Peale's dolphins estimates of local population sizes were 78 dolphins (CV=15%) in southern, and 123 dolphins (CV=19%) in central Chiloé. The sub-committee recognised the value of studies to estimate abundance and encouraged further studies like this.

Pérez-Álvarez *et al*. (2007) provided information on the occurrence and distribution of the Chilean dolphin along the central Chilean coast. Monthly land-based surveys were performed around the Maule River outlet (35°S) between 2000 and 2001. The northern area (north of Maule river outlet) was more influenced by an estuarine system than the southern area. Chilean dolphins were sighted in 83% of all surveys. The distribution of the sightings was non-uniform, with a higher number of sightings in the north (97% of all surveys) than in the south (48%). Relative abundance was significantly higher in the northern than the southern area (13.6 dolphins hr^{-1} versus 3.5 dolphins hr^{-1}). The authors suggested that the area located north of the Maule River was the preferred zone for Chilean dolphins within the study area. This study showed a year-round occurrence of Chilean dolphins in the study area, which is possibly a critical habitat for this species.

Dawson noted that in areas where access to the sea is gained by river mouths, concentrations of sightings from boat-based surveys can be a reflection of sighting effort rather than of the animals' distribution.

SC/60/SM18 presented information on the southern distribution range of inshore and offshore common bottlenose dolphins in the Southeast Pacific. Both inshore and offshore forms appear to occur off Peru and Chile. The inshore form in Chile is best documented from a single community resident around 29°S, while there is genetic evidence for a large, wide-ranging Peru-Chile offshore population. Heretofore, the accepted southernmost range for this species in the SE Pacific is based on an account given in Oliver (1946) who indicated that the common bottlenose dolphin was found in the Gulf of Arauco (at 37°06'S, 73°20'W). However, five recent records shift the focus further south to Región de Aisén. In August 2004 two common bottlenose dolphins stranded at Isla Quenu (41°49'.41S, 73°9'.01W). In addition to that, sightings of a mother-calf pair was reported inside a fjord at *ca*. 42°22'S, 72°24'W. These data suggested that the inshore form was present in the area. However, three new sightings of large groups (40-120 individuals) between 43°-45°S in January and December 2007 compelled the authors to re-evaluate the southern distribution range of the species and of each form/ecotype. These bottlenose dolphins were relatively large, with stocky bodies and short beaks and occurred in large groups. Video and still photographs were collected as voucher material. These records extend the summer range of common bottlenose dolphins in the SE Pacific south to 45°05'.597S, 73°19'.996W, Magdalena Island, however it is likely that additional survey effort may extend this farther.

The sub-committee noted that 'inshore' and 'offshore' types of common bottlenose dolphins are specific to geographic regions and do not correspond to common sets of traits worldwide. It was noted that better understanding of population structure would allow more effective conservation efforts.

SC/60/SM21 reviewed 33 years (1974-1975 to 2007-08) of periodic beach surveys of the coasts of Tierra del Fuego (TF), Argentina, for dead animals; 1,775 specimens (not all of them complete) of small cetaceans were collected. A few of these were from the Provincia de Santa Cruz, Argentina, and TF, Chile. Most of the smaller species died in artisanal nets set perpendicular to the shore in areas with wide intertidal areas. Larger animals, especially mass strandings found at Bahía San Sebastián, were probably trapped by the high tides (to 10.7m) and extensive mud flats of that region; other specimens may have died at sea and been washed ashore. The RNP Goodall collection is stored at the Museo Acatushún de Aves y Mamíferos Marinos Australes at Estancia Harberton in TF. Twenty three species of small cetacean have been recorded, comprising 12 dolphin species, two porpoises species, eight beaked whales and one specimen of a pygmy right whale. In the classical paper on this area, Brownell (1974) reported only nine species from sightings or strandings. The most numerous species in the collection is Commerson's dolphin (*n*=808 specimens, TF Argentina only), followed by the spectacled porpoise (283), the long-finned pilot whale (120) Risso's and Peale's dolphins (66), southern right whale dolphin (20). Unexpectedly, no Chilean dolphins were recorded, even though they are known to occur to the west and south of TF Argentina. The beaked whales are represented by Cuvier's (*n*=35 specimens); Gray's (26); Layard's (22); southern bottlenose whale (18); and in lesser numbers, Shepherd's, Arnoux's, Hector's and Andrew's beaked whales. Some of these include juvenile animals, so some breeding and births may take place in this area. Species that were unexpected for TF included 74 Risso's dolphins (12 mass and 13 single strandings), false killer whales (two mass and several single strandings), bottlenose dolphins (a mass stranding of four, one with a large foetus, and three singles); and one common dolphin. SC/60/SM21 mentioned some strandings in Chilean TF and Magallanes up to 1980 (Sielfeld, 1980), but did not include recent data.

The sub-committee noted the extensive and long-term nature of the dataset. In discussion, the possibility of currents bringing some of the carcasses to the area was raised. Goodall replied that several species are not seen in the area (e.g. beaked whales) or are rare (e.g. spectacled porpoise) so it is possible that some of the specimens have drifted into the area. Goodall also noted sightings forms are provided to the cruise-ship passengers in the area which are collated and that an aerial survey has recently been conducted in the area. The sub-committee noted that a potential use of the data reported in SC/60/SM21 would be to examine changes in species composition over time, possibly related to environmental changes; the sub-committee encouraged such work.

The sub-committee noted that in general, large parts of the southeast Pacific coast of South America have not been covered by surveys. The sub-committee **recommended** that further surveys be conducted at regional and local scales to better quantify the abundance and distribution of small cetacean species in these areas. The sub-committee noted that while platforms of opportunity (e.g. oceanographic surveys) are not a substitute for dedicated surveys to estimate abundance, they may be a practical means for determining seasonal patterns in distribution and abundance. The sub-committee welcomed existing initiatives and **encouraged** more countries to place marine mammal observers on platforms of opportunity. The sub-committee also noted that there is little information on distribution and abundance of many of the coastal species, which are likely more impacted by anthropogenic activity, including Burmeister's porpoise, Peale's dolphin, bottlenose dolphin, and the Chilean dolphin and **recommended** that surveys be conducted to obtain information on abundance, distribution and residency patterns of these species.

The sub-committee was concerned at the apparent rarity of Chilean dolphins, particularly in light of rapidly developing aquaculture and coastal industry (SC/60/SM23). While groups are resident in some local areas, it appears that abundance in the Chilean fjords is very low. Very little information exists on abundance and distribution patterns of Chilean dolphins along the open coast north of 41°S. The

sub-committee **recommended** that well-designed line transect surveys of the Chilean fjords and outer coast be conducted in order to estimate the species' abundance and assess its conservation status.

6.2 Population structure

SC/60/SM10 presented a preliminary morphological comparison of skulls of common bottlenose dolphins from Peru and Ecuador. Variability in terms of ecotypes (inshore and offshore) was described previously by Van Waerebeek *et al*. (1990) for Peruvian waters. In order to avoid any other source of variability, only mature skulls were considered and tested for sexual dimorphism. Of the 35 measurements, five were excluded, based on sexual dimorphism. Multivariate analysis determined a clear separation among three different forms: offshore Peruvian skulls, inshore Peruvian skulls and the whole Ecuadorian group. Most of the Ecuadorian skulls were collected in coastal areas of Golfo de Guayaquil, and were found to be very different to the Peruvian inshore ecotype. That difference was also reinforced by the occurrence (at low prevalence) of *Crassicauda* lesions in Peruvian inshore specimens and their absence from Ecuadorian specimens. It was thought that some Ecuadorian skulls included in the analysis could belong to a non-resident group described by Félix (1994) which may include offshore specimens. In that scenario, the Ecuadorian offshore group appears to be different to the large Peruvian-Chilean offshore stock defined by Sanino *et al*. (2003a). Sanino *et al*. (2003b) also found a difference between inshore Peruvian specimens and offshore specimens from Peru and Chile. Sanino noted that a genetic analysis of inshore and offshore specimens from Peru and Chile is underway.

The sub-committee noted that published information is available on stock structure in the region for Burmeister's porpoise (Rosa *et al*., 2005), dusky dolphins (Van Waerebeek, 1993a; 1993b) and common dolphins. Some genetic analysis has commenced on Chilean dolphins by Pichler (2001) and Olavarría and colleagues. These analyses include the sequencing of 594bp mtDNA control region of 37 samples, including teeth and biopsies (CEQUA). In addition, Gibbons and colleagues collected and sequenced for mtDNA control region 7 samples from Chilean dolphins in the Magellan region. Peale's dolphins samples have also been collected for genetic analysis in the Guaticeas archipelago and Magallanes regions.

The sub-committee noted that studies of population structure are valuable and important in determining conservation status and **recommended** that morphometric and genetic analyses be extended to include data from as wide a study area as possible for all species in the Southeast Pacific region, but particularly for the more coastal species.

6.3 Life history

The sub-committee noted that in general there was limited information available on the life history of small cetaceans in the region. There is published information on Burmeister's porpoise and the dusky dolphin in Peru (Table 1). A stranding programme has existed in Ecuador since the late 1980s associated with a museum, and the programme collaborates with researchers. Sanino reported on a stranding network in Chile with an online form for people to report strandings. The form has been online for 10 years. The most recent version is a centralised online database that all agencies can access, which is linked to GIS software and developed in a free open-source format. The data from this programme have been used to support research by the fisheries agency and natural history museum and several papers have been published on this research.

The sub-committee noted that stranded specimens provide important information about life history and that the collection of skeletal remains may provide information on species that occur in isolated or remote areas where other types of studies are difficult. It noted that it is important to keep even incomplete skulls and skeletons, as they may be useful for DNA and isotope research (and new procedures may be developed in the future). The sub-committee **encouraged** the continuation of current strandings programmes and the initiation of new stranding programmes in areas and countries without them. The sub-committee also noted that a centralised depository of specimens would facilitate research and collaboration. Finally, the sub-committee **recommended** that fresh specimens from strandings, direct and incidental catch events should be collected and sampled when possible for *inter alia* life history, genetic and contaminant studies.

6.4 Ecology

SC/60/SM22 presented the preliminary results of a study on the trophic ecology of small cetaceans of the southwestern-most South Atlantic as revealed by stable isotope analysis. Small bone samples were taken from 371 specimens of the RNP collection (SC/60/SM21), from four 'offshore' and four 'inshore' species of small cetaceans. These were processed and studied for $\delta^{13}C$ and $\delta^{15}N$ stable isotope values. The results showed Peale's dolphin as the most inshore species, feeding very near the coast, where it is known to feed on small octopi among the kelp fronds (Schiavini *et al*., 1997). Commerson's dolphins and Burmeister's porpoises were also considered coastal, but in addition, had ratios consistent with feeding over the Patagonian shelf and even over the continental slope. The southern right whale dolphin appears to forage over the slope and in deep waters, but sometimes comes onto the shelf, as does the false killer whale. However, the latter is normally found in warmer waters, for which prey samples were not yet available for analysis.

The 48 Risso's dolphin specimens separated as two groups, possibly indicative of a latitudinal difference rather than a difference in prey species, although prey items need to be analysed. The isotope values for the hourglass dolphin and spectacled porpoise are consistent with known distribution from sightings in cold waters near the Antarctic Convergence; again, prey specimens from that area are needed to confirm their food habits.

The sub-committee welcomed this paper, which represents a cross-species comparison, and in discussion, noted that it would be valuable to analyse the isotope composition of prey species. The sub-committee also **encouraged** the inclusion of other cetacean species in such analyses to better understand the trophic ecology over the wider geographical range.

6.5 Habitat

SC/60/SM23 presented summary results of habitat modelling which showed a distinct pattern of spatial habitat partitioning among Chilean dolphins, Peale's dolphins and Burmeister's porpoises in the Chiloé Archipelago, southern Chile. Chilean dolphins preferred shallow waters (<20m) close to shore (>500m) and in the vicinity of rivers (with estuarine influence). This area overlapped extensively with shellfish farming. Peale's dolphins also selected shallow nearshore waters but seemed to roam over wider areas.

The sub-committee noted that a larger-scale analysis including areas with fewer rivers would be useful for further examination of the relationship between the occurrence of Chilean dolphins and rivers. The sub-committee noted that more than 800 salmon farms might be developed in Chile in the next four years, and that studies of the habitat use by small cetaceans prior to this development would be crucial in assessing the potential for habitat exclusion.

The sub-committee **expressed concern** regarding habitat degradation and the exclusion of small cetaceans from their habitat by aquaculture developments. The sub-committee was informed about an initiative by the Chilean environmental commission (Comision Nacional del Medio Ambiente) to compile information on the spatial distribution of cetaceans and the salmon farming industry. The sub-committee **encouraged** this work with a view to improved spatial planning of the aquaculture industry.

6.6 Directed takes

In the 1970s and 1980s directed takes of small cetaceans for bait constituted an important threat to small cetacean populations in southern Chile, but these seem to have deceased due to the availability of alternative bait products. However, some directed kills may continue in low levels in some parts (SC/60/SM5). Sanino *et al*. (2007) presented information on the intentional killing of a lesser beaked whale (*Mesoplodon peruvianus*) in Chilean waters. The skull of a stranded male individual (May 1995, 29°S) presented two wounds that were attributed to 9mm gun shots after analysis at a forensic laboratory. The finding was consistent with interviews of local inhabitants that declared the individual stranded after it was shot from a fishing boat. The dorsum to ventrum direction of the wounds supported the hypothesis that they were made when the individual was alive.

SC/60/SM5 presented a review of the crab bait related exploitation of small cetaceans in Magallanes and Tierra del Fuego (Chile) with an update on the current situation. Since 1996, substantial progress was achieved in the management of the crab fishery in Magallanes and Tierra del Fuego (Chile) through improved legislation, administration measures, increased control, and in particular on the availability and distribution of legal bait. Official reports suggest that the directed take of marine mammals and birds has currently ceased or is close to zero. Still, uncertainties remain and the accuracy of the estimates of required bait needs to be improved. The official reports, the drastic decrease in populations of sea lions and the status of the most commonly distributed cetacean in the region (Peale's dolphin), suggest that levels of exploitation of marine mammals may have had a significant impact on the populations. The predicted shortage of bait is of concern and the sub-committee emphasised that continued attention must be paid to controlling and improving the mechanisms to obtain, distribute and predict the need for bait.

SC/60/SM6 evaluated dolphin hunting for bait in Bahía Solano, Chocó, Colombia, from July 2005 to April 2006. 122 fishermen were interviewed (18.2% of the registered fishermen in a 890km^2 zone) and data were obtained from landings at a fishing company. Only fishermen using longlines (n=94; 37.3%) confirmed using dolphins for bait. From 94 interviewed longline fishermen, 3.2% indicated that they hunted dolphins whenever it was possible, 12.8% hunted dolphins only occasionally when there was no other bait available, 36.2% supposedly never hunt dolphins, and the other 47.8% did not offer information on the issue. It was not possible to obtain additional information about date, specific location or dolphin species, but the species most probably captured were bottlenose dolphins and pantropical spotted dolphins, since these are the most commonly encountered species in coastal waters. A minimum of nine dolphins was reported killed during the study period (1 dolphin/month). Extrapolating these numbers to all fishermen using longlines in the region (250), an estimated minimum of 24 dolphins might have been taken during the study period (2.7 dolphins/month). Presumably many fishermen, even if they hunted dolphins, did not communicate this to the interviewers, because hunting is restricted in Colombia. As information about population parameters of dolphins in the region is not available, it is impossible to estimate the effect of the mortality inflicted by the directed takes (minimum 1 dolphin/month) on the population long-term viability. Fish species captured with dolphin bait include *Brotula clarkae*, *Cephalopholis acanthistius*, *Epinephelus cifuentesi*, *Mustelus lunulatus* and *Lobotes pacificus*. One adult dolphin was reported to provide enough bait for two fishing boats, capturing between 75kg and 152kg of fish.

The authors of SC/60/SM6 noted that the hunting of dolphins for bait is a relatively new practice and could become more common as traditional taboos are overcome. Interviewees said that the practice came from other countries. The occurrence of hunting dolphins is much more common in some areas than others. Some interviewees said they preferred to hunt spotted dolphins rather than bottlenose because they were easier to kill.

SC/60/SM21 presented information on directed takes of small cetaceans in Tierra del Fuego (TF), Argentina since 1974-1975. Four Burmeister's porpoises died in nets set for crab (*Lithodes antarctica*) in 1975, and at least nine Peale's dolphins were harpooned for bait for crab traps (in 1978, after the nets were banned). There has been no known recent directed take.

The sub-committee recognised that directed take for bait is a conservation issue for small cetaceans in some parts of the region. The sub-committee **encouraged** relevant organisations and governments to help reduce the use of cetaceans as bait through cooperation with fishermen. The sub-committee noted that in some areas fishermen generally prefer fish bait when it is available, whereas in the Magallanes and TF dolphins are traditional bait as this bait is thought to last longer than fish bait. The sub-committee **recommended** that non-wildlife bait be made available as widely as possible and that there be further development of alternative long-lasting bait such as perforated plastic bottles containing fish offal. A bioeconomic model of the use of different baits in fisheries may provide useful insight. Improved education and awareness of conservation might also help to reduce directed takes.

The sub-committee also **encouraged** observer programmes to monitor the use of cetacean meat as bait. The sub-committee noted that observers could use separate boats in situations where placing observers on fishing boats is not practical.

6.7 Incidental takes

García-Godos (2007) presented information on interactions between cetaceans and the marine fishery in Peru and perspectives for their conservation. Interaction between cetaceans and marine fisheries is an issue of growing concern for government and private organisations in Peru. When compared with the 1980s and early 1990s, a decrease of at least one order of magnitude is clear in landings of small cetaceans. However, current catch rates are impossible

to estimate due to black market activity. It is supposed that annual takes may be between 1,000 and 3,000 individuals. Competition for food between small cetaceans and fisheries and incidental catch are issues that must be investigated. There has been an increase in recent years in government efforts to monitor Peruvian fishery operations, implement control measures for incidental catch and improve research on this issue. Alfaro noted a need to improve estimation of incidental catch in anchovy purse-seiners, and that there is now some information on this incidental catch.

SC/60/SM19 presented information on small cetacean captures and catch per unit effort estimates in artisanal fisheries operating from a port in northern Peru from 2005-2007. The study showed that in at least one port in northern Peru, incidental catch and harpooning of small cetaceans persist at high levels and on a regular basis, particularly in driftnet vessels, despite the existence since the mid-1990s of a national ban on the capture of small cetaceans and commerce in their products. Interactions observed from a port in northern Peru from 2005-2007 consisted of 231 animals caught in gillnets, 1 in a longline and 21 directed takes by harpooning for use as bait. The most commonly captured species were long-beaked common dolphins *Delphinus capensis*, dusky dolphins *Lagenorhynchus obscurus*, common bottlenose dolphins (offshore stock) and Burmeister's porpoises *Phocoena spinipinnis*. Based upon total fishing effort for the port, the authors estimated the average of small cetacean incidental catch at 2,623 animals yr^{-1} for 2002-07. The formerly unknown practice of at-sea discarding of carcasses stands in sharp contrast with current, high small cetacean discard rates found in this study.

The sub-committee welcomed the results of this study, which provides the first direct, at-sea monitoring of small cetacean interactions with Peruvian artisanal gillnet and longline vessels. Olavarria noted that incidental and directed takes of the magnitude observed in Peru have not been documented in the neighbouring countries of Ecuador and northern Chile. The sub-committee noted that a lack of documentation does not necessarily imply that they do not occur.

Incidental mortality in fishing gear has been observed for Chilean dolphins, Peale's dolphins and Burmeister's porpoises in the Chiloé Archipelago, but bycatch rates have not been quantified to date (SC/60/SM23). The only study to evaluate by-catch in Chile was conducted in one fishing port along the open coast north of Valdivia in the late 1980s (Reyes and Oporto, 1994). Since then, no systematic information has been collected on by-catch of small cetaceans in any type of fishery in Chile. Anecdotal and localised observations show that Chilean dolphins are prone to incidental entanglement in coastal gillnets and shore-based set nets, like most other small cetacean species. In recent years, evidence of entanglement has been reported from most areas where systematic studies of these dolphins are underway, e.g. near Constitucíon and off Chiloé.

Alfaro noted that there had been efforts to estimate the impact of gillnets on turtles in Chile and these efforts are expanding to other fisheries. The sub-committee **encouraged** such programmes to also record marine mammal catches. Hucke-Gaete *et al*. (2004) reported on the interaction between cetaceans and the Patagonian toothfish fishery. Entanglement was documented in industrial and artisanal fisheries.

SC/60/SM21 presented information on incidental takes of small cetaceans in TF, Argentina since 1974-1975. Incidental catch mainly involved Commerson's dolphins (808 specimens collected and many others lost in Argentine TF), spectacled porpoises, Peale's dolphins and Burmeister's porpoises. Coastal fishing is mainly on the northern coasts where the flat beaches permit the setting of nets in the intertidal zone. The take of Commerson's dolphins is very high for such a small area (this fishing also occurs in certain areas of southern Patagonia and Chilean TF), ranging from about 30 to over 100 dolphins per season (not all specimens could be collected). Since population levels are unknown, this may be a cause for concern. It is not known if all or even most stranded spectacled porpoises are taken in nets, but the areas where they are found are where fishermen work. Peale's dolphins are taken occasionally, but being stronger, they can sometimes tear the nets and escape. It was noted that for all the smaller cetacean species taken in these nets, subadult males are those most often captured.

SC/60/SM21 also reported on a 631cm adult male Shepherd's beaked whale that stranded with four longline hooks in its stomachs and intestines, which may have contributed to its death. This may be the first record of a beaked whale feeding on longlines. Although the animal was found on Argentine shores of the southwestern South Atlantic, the hooks are not those used in Argentine fisheries.

The sub-committee noted that incidental catch of several species has been documented in various fisheries in the region including small-scale artisanal and large-scale industrial fisheries. In many cases extrapolation to fleet level is not possible, either because of a lack of a systematic approach to estimating bycatch and/or lack of information on fishery statistics (total fishing effort and landings). The sub-committee **encouraged** efforts to improve estimates of incidental catch in these fisheries. While observer programmes often provide the most accurate estimates of bycatch, they are most easily implemented in large-scale industrial fisheries. Rapid assessment approaches, similar to some of the work presented to the sub-committee, can provide useful information about smaller fisheries in remote areas. Rapid assessment approaches include interviews, visits to fishing ports and inspections of fishing boats. It was noted that in many countries of the region artisanal fishermen require a license which helps in locating and communicating with them regarding incidental catch issues. Observers could use separate boats in situations where placing observers on fishing boats is not practical. The sub-committee **encouraged** countries to cooperate with fishermen to obtain information on incidental catch and noted that antagonistic approaches can result in fishermen hiding this information. The sub-committee noted that information on declines of other marine species (e.g. turtles) might indicate areas where incidental catch of cetaceans could potentially be an issue.

Mitigation of incidental catch of small cetaceans in fisheries was discussed. The sub-committee noted that potential approaches include acoustic deterrent devices and spatial and temporal fishery closures to reduce overlap between the distribution of fishing effort and cetaceans.

6.8 Other

Van Bressem *et al*. (2007) reviewed and documented new cases of diseases of the skin and the skeletal system, and external traumata in cetaceans from Ecuador, Colombia, Peru, Chile, Argentina, Uruguay, Brazil and Venezuela. The survey revealed 590 cases diagnosed with a significant pathology, injury or malformation on a total of 7,635 specimens of 12 odontocete species examined or observed in 1984-2007. Tattoo skin disease (TSD), lobomycosis-like disease (LLD) and cutaneous diseases of unknown aetiology seem to be emerging in several populations. TSD was

confirmed in eight species from the SE Pacific and SW Atlantic. LLD affected only coastal common bottlenose dolphins but was found in four tropical countries, namely Colombia, Ecuador, Peru and Brazil. Lobomycosis was confirmed by histology in one male bottlenose dolphin from the Tramandaí estuary, Brazil. All LLD affected specimens were encountered in the vicinity of major ports and cities and a possible association with chemical or organic water pollution was suspected. Whitish velvety cutaneous marks associated with scars occurred in coastal common bottlenose and guiana dolphins (*S. guianensis*) and a single false killer whale. Large, rounded lesions were seen in a calf Chilean dolphin and one Commerson's dolphin. Cutaneous wounds and scars as well as body traumata possibly related to net entanglements and boat collisions were observed in 73 delphinids and Burmeisters porpoise. Traumatic injuries resulted in the partial or complete amputation or other disfiguring scars of appendages in 17 cases. Fractures of the skull, ribs and vertebrae thought to be caused by violent, fisheries-related interactions or boat collisions were seen in single individuals of long-beaked common (*Delphinus capensis*), dusky (*Lagenorhynchus obscures*), bottlenose and guiana dolphins and Cuvier's beaked whale. Prevalence of osteopathology in small cetaceans from Peru, Brazil and Venezuela ranged widely, from 5.4% to 69.1%. In four species from Peru cranial lytic lesions were the most frequently observed disease (5.4%-42.9%), followed by hyperostosis and ankylosing spondylitis in, respectively, offshore (31%, *n*=42) and inshore (15.4%, *n*=26) common dolphins. Fractures and other bone traumata were seen in 47.2% of 53 axial skeletons of guiana dolphins from northern Rio de Janeiro State (Brazil) in 1987-1998. A high prevalence (48.4%, *n*=31) of, apparently congenital, malformations of cervical vertebrae observed in a 2001-2006 sample may be explained by a hypothetical genetic bottleneck in this population. Malformations with deficient ossification would clearly increase susceptibility to fractures.

This approach demonstrates that the use of a continent-wide analysis discerns epizootiological trends more readily than any local study could provide. In discussion the sub-committee noted that information on skin lesions of all cetaceans of south America had been presented in a Workshop prior to the main Scientific Committee meeting, where a number of specific recommendations are presented (see Annex K). The sub-committee **recommended** focussed research on the effects of human activities on the spread of diseases in cetaceans, particularly in near-shore populations that utilise highly degraded coastal habitats.

6.9 Consideration of status and general recommendations

Marine and coastal environments in the southeast Pacific contain diverse habitats which are increasingly subject to anthropogenic stress. Known and potential threats to small cetaceans in this region include bycatch and directed take, especially for bait (e.g. SC/60/SM5, SM6), and habitat degradation or loss from coastal development, including aquaculture and port development (SC/60/SM23).

The waters around the Southeast Pacific are highly productive, with intense fishing activity, both artisanal and industrial. In all states (Colombia, Ecuador, Peru, Chile), there is evidence that small cetaceans are caught in different gear types and in some areas, directly hunted for bait. In most areas and for most fisheries, the level of bycatch has not been quantified. The sub-committee **recommended** that nations establish small cetacean by-catch monitoring programmes (on board monitoring) as part of their regular fisheries monitoring and that they report them to relevant regional and international agencies (e.g. IWC, CPPS). Furthermore, the sub-committee **recommends** continuation of existing bycatch monitoring programmes, particularly in relation to mitigation efforts.

The sub-committee recognised that a number of species of small cetaceans, particularly those having small coastal populations, including bottlenose dolphins, Peale's dolphins and pantropical spotted dolphins, may be threatened by unregulated and undocumented directed takes (e.g. in Colombia). The sub-committee **recommended** that the impacts of such removals be assessed and that the status of affected populations be documented. Furthermore, the sub-committee **recommended** the development of alternative non-wildlife bait and that this bait be made available as widely as possible.

While some work has been carried out to understand and document the impacts of fishery bycatch and directed catches on cetacean populations in some areas, this work is hampered by the lack of abundance estimates. Noting the almost complete lack of abundance estimates (with the exception of some small coastal populations), the sub-committee urges scientists to collaborate in developing programmes to estimate cetacean abundance throughout the region. The sub-committee **recommended** that particular attention should be given to small vulnerable populations of coastally distributed cetaceans, including Chilean dolphins, Burmeister's porpoises, pantropical spotted dolphins, Peale's dolphins and bottlenose dolphins.

There is a paucity of studies on stock structure in this region, which also hampers our ability to determine status (see Table 1). In particular, small coastal populations may be fragmented and more vulnerable to anthropogenic removals. It is **recommended** that samples (e.g. skin, bone) are collected from stranded and bycaught specimens and analysed to elucidate stock structure for all species in the region, but particularly for endemic species such as Peale's dolphin, Burmeister's porpoise, Commerson's dolphin and the Chilean dolphin.

The sub-committee encouraged the continued development of existing strandings monitoring programme that incorporate standardised protocols and **recommended** further collaboration in the establishment of new stranding programmes. It further **recommended** the collection of tissue samples for studies of life history parameters and feeding ecology. The potential impacts of chemical pollution and the link to health and disease status in small cetaceans in this region deserve greater attention, including a careful analysis of stranded and bycaught animals and consistent effort in assessing their exposure to contaminants. The sub committee **recommends** that whenever possible data are collected in ways that allow and facilitate investigation of the causes of morbidity and mortality. Having baseline data will be crucial in the event of unusual mortality events involving marine mammals in the region.

The unregulated growth and expansion of industrial activities in coastal waters, including port development and aquaculture, are cause for concern. Major threats to small coastal cetaceans arise from physical exclusion from critical habitat, incidental entanglement in aquaculture gear, gillnetting to recapture escaped salmon, pollution, and increased maritime traffic. Of particular concern is the currently ongoing large-scale intensification and expansion of fish farming and associated industrial activity in southern Chile. The sub-committee was informed about an initiative by the Chilean environmental commission to compile

information on the spatial distribution of cetaceans and the salmon farming industry. The sub-committee **encouraged** this work with a view to improved spatial planning of the aquaculture industry.

The sub-committee **recommended** that collaborative research projects with on-going or planned regional programmes consider the inclusion of small cetaceans as appropriate. It noted that the upcoming CPPS meeting for the regional implementation of integrated coastal area management of IOC/UNESCO had amongst its objectives to develop both national and regional data and information systems and indicator-based assessments as a backbone to prioritise issues in coastal area management. This type of approach should incorporate small cetaceans, and would likely require spatially explicit data on the presence, abundance and conservation status of coastal species.

The sub-committee urges researchers to continue to develop regional networks, collaborative studies and training activities to promote scientific understanding of the cetacean fauna of the region and to further develop the scientific and technical capacity of the region.

7. PROGRESS ON PREVIOUS RECOMMENDATIONS

IWC Resolution 2001-13 (IWC, 2002a) directs the Scientific Committee to review progress on previous recommendations relating to critically endangered stocks of cetaceans on a regular basis.

7.1 Vaquita

The sub-committee received new information on the highly endangered vaquita (*Phocoena sinus*). SC/60/SM3 described a quantitative analysis of the data accumulated between 1997 and 2007, applying passive acoustic techniques to study the population trend of vaquitas. A total of 790 hours of effort was applied in 63 stations sampled all around the potential distribution area of vaquita. However, the species was only detected in a small area near the west coast of the Upper Gulf, in about 20% of the total area surveyed. The measure obtained was acoustic encounter rate (number of acoustic encounters/effort time). SC/60/SM3 described a temporal trend analysis of the effort applied only in the zone where vaquitas were detected. This data set comprises 46 stations totalling 520 hours of effort. A total of 76 acoustic encounters with vaquitas was obtained in 21 stations. A regression analysis was used to describe the trend of the acoustic encounter rate. A logarithmic link function was used to fit the intercept and slope parameters (under a Bayesian framework), and four different error models were used (Poisson and Negative Binomial, both zero inflated and non-inflated). All four models produced a very similar slope, which reflects a reduction of the acoustic encounter rate during the study period. Using the regression adjusted with the non-inflated binomial model, the current encounter rate was estimated to have declined by 58.1% from 1997. Due to the importance of echolocation for odontocetes, the highly turbid environment of the Upper Gulf, and the behaviour of vaquitas forming very small groups, it is assumed that the acoustic data are a reliable indicator of a decreasing trend in vaquita abundance. In 1997 it was estimated using line transect methodology that 567 vaquitas inhabited the Upper Gulf (Jaramillo-Legorreta *et al*., 1999). The population decline reported in SC/60/SM3 suggests an estimate of 119 animals for year 2007 (assuming that each acoustic detection represents two individuals, the average group size for this species). This figure closely agrees with the other estimate of current abundance, which was made using a simple population model incorporating known fishing effort (Jaramillo-Legorreta *et al*., 2007). The results in SC/60/SM3 support the inference of a recent and further reduction of the population. The Mexican Government is currently implementing a program to eliminate fishing effort with gillnets in the region, as recommended by the vaquita recovery team (CIRVA).

In discussion, the sub-committee noted that the current vaquita population size was considered by most, including the Mexican Government, to be around 150 animals. This represents an extraordinarily rapid decline of approximately 75% in a decade. If this scale of fishery mortality continues, it would likely result in the effective extinction of the species within five years. The sub-committee **welcomed** information that the government of Mexico is taking measures to eliminate the fishery gear that is drowning vaquitas, and was told that the phasing out of the gear would be completed within three years. The sub-committee considered that this may not be a rapid enough response to prevent extinction, and certainly that if this schedule was to slip, then extinction of the vaquita was probable in a short time. The sub-committee reiterated its **extreme concern** about the conservation status of the vaquita, and expressed its frustration that despite more than a decade of warnings, this species has continued on a rapid path towards extinction due to a lack of effective conservation measures in Mexico. It **strongly recommended** that, if extinction is to be avoided, all gillnets should be removed from the upper Gulf of California immediately, and certainly within the three year timetable starting in 2008. In order to meet this schedule, the sub-committee **encouraged** the international community including member countries and NGOs, to assist the government of Mexico in the task.

7.2 Harbour porpoise

Bjørge advised the sub-committee that gillnet fisheries for cod and anglerfish in coastal Norwegian waters were monitored for bycatch in 2006 and 2007, using a sample of 18 vessels across five ICES areas. Harbour porpoise (*Phocoena phocoena*) was the only cetacean species reported captured; 159 and 166 in 2006 and 2007, respectively. No attempt has yet been made to extrapolate from this sample to provide an estimate of the total bycatch. The sub-committee was advised that these data were reported by fishermen under contract, because their small vessels were unable to take independent observers on fishing trips lasting more than one day. Discussion focussed on whether self-reporting would be a reliable means of gathering accurate bycatch information from this, or any other fishery. However, Bjørge reported that during the first two years of the programme there was no evidence that reported effort, catch or bycatch differed between trips with and without observers on board. The sub-committee looked forward to seeing an extrapolation of the sample data to the entire fishery at next year's meeting.

In discussion, the sub-committee reiterated that the best way to obtain reliable bycatch information is through observer programmes. It also noted that observers could use separate boats, e.g. patrol or coastguard vessels, in situations where placing observers on fishing boats is not practical.

Palka introduced SC/60/SM2, which investigated the effects of pingers on harbour porpoise and seal bycatch in the US Northeast gillnet fishery. Since the 1999 implementation of a plan that requires pingers in specified times and areas, over 24,000 gillnet hauls have been observed in this fishery. In times and areas that require

pingers, the harbour porpoise bycatch rate (animals per metric tons of landings) from hauls without pingers were on average twice the rate from hauls that used the required number of pingers. In addition, the rate from hauls with some but not all of the required number of pingers was on average twice that rate from hauls without pingers; it is not clear why this pattern occurred. During years with a high level of compliance to the pinger requirement, about 87% of the tested pingers were functional. This is in contrast to about 36% functional pingers during years with low compliance. There was no evidence for temporal trends (over years or over months within a year) in the bycatch rates over the time period that pingers have been required; suggesting that harbour porpoises and seals have probably not habituated to the pingers. Seal bycatch in hauls with pingers in gillnets south of Cape Cod was generally higher than for hauls without pingers, and the landings in pingered nets was less than in non-pingered nets; suggesting evidence of the 'dinner-bell' effect in the gillnets south of Cape Cod.

The sub-committee welcomed this excellent and significant analysis, one of the first to show the effect of pinger use in a real fishery. In discussion, it was noted that properly-maintained pingers did reduce bycatch, but that the level of reduction was much less than had been reported in early experiments (Kraus and Brault, 1997). It was also notable that this study confirmed earlier results elsewhere – that malfunctioning pingers could actually increase the bycatch compared to nets without any pingers.

Williams presented information on potential limits to mortality of three small cetacean species (harbour and Dall's porpoise and Pacific white-sided dolphins) in coastal waters in British Columbia (BC), Canada, as well as for a transboundary stock-structure scenario that combined abundance of harbour porpoise in southern BC and adjacent inland waters of Washington State, USA (Williams *et al*., 2008). Quantitative conservation objectives were not available for these species in BC, so mortality limits were estimated using objectives from the United States Marine Mammal Protection Act and the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas. Limits were calculated as functions of: a minimum estimate of abundance (2004/2005); maximum rate of population increase; and a range of uncertainty factors to account for potential bias in abundance estimates and uncertainty in estimates of mortality. Best estimates of current annual mortality in salmon gillnet fisheries varied substantially according to entanglement rates measured from observer coverage data and license-holder interviews. Estimated bycatch mortality in 2004 and 2005 exceeded only the most precautionary limits, and only for the two porpoise species. There is some evidence for a high rate of live release of entangled harbour porpoise, which warrants additional attention. Future research priority will be given to determining small cetacean stock structure in BC and refining species-specific and area-specific probabilities of entanglement. The sub-committee welcomed this study as a commendable first step in the process of understanding the impact of bycatch on populations of small cetaceans in this region.

7.3 Franciscana

Flores presented SC/60/SM15 on behalf of the authors. This paper reviewed available information on franciscanas (*Pontoporia blainvillei*) in the Babitonga Bay estuary, Brazil (26°28'S, 48°50'W). Franciscanas are present in the estuary all the year-round and are sympatric there with Guiana dolphins. Stomach contents from eight specimens suggested that there are local differences in prey species between franciscanas living in the estuary and those found along the outer coast. There is also preliminary evidence to suggest differences in the prevalence and intensity of parasite infestations and in stable isotope signatures between the franciscanas inside and outside the estuary. This small, possibly resident population is thought to be at risk from harbour development activities in the estuary, which include dredging, blasting, toxic contamination, noise and mangrove degradation or destruction. The ICMBio (Government Environmental Agency) has proposed the establishment of a wildlife reserve (Reserva de Fauna Baía da Babitonga) to reduce the impacts of development on dolphins and other biota.

The sub-committee welcomed the information provided in SC/60/SM15 and shared the authors concern about this small, relatively accessible franciscana population. The sub-committee **encouraged** the authors to continue their efforts to study the franciscanas in the Babitonga Bay estuary.

In a recent paper on franciscana population genetics in northern Argentina, Mendez *et al*. (2008) found strong quantitative evidence for at least two genetically recognisable populations of franciscanas (San Clemente and Claromeco) within Franciscana Management Area (FMA) IV, the southernmost of four FMAs defined by Secchi *et al*. (2003). Mendez *et al*. (2008) also found support for the genetic isolation of animals in FMA IV from those in the FMAs in Brazil and Uruguay, as proposed previously by other investigators. They also found suggestive evidence that bycatch in gillnet fisheries has a differentially heavy impact on mothers and calves in the San Clemente area and that population sizes are declining.

The sub-committee welcomed the results of this study and encouraged this international collaboration to continue and expand their investigations of franciscana population structure and its implications for conservation.

7.4 Boto

At its previous meeting (SC/59), the sub-committee expressed great concern regarding the illegal takes of botos (*Inia geoffrensis*) and recommended that the Government of Brazil make every effort to determine the numbers killed and the geographic extent of the hunt, and to assess the impact of removals on the boto population (IWC, 2008, p.315).

SC/60/SM17 summarised current understanding of the taking of botos for catfish bait. The catfish *Calophysus macropterus*, known mainly as 'piracatinga' in Brazil and as 'mota', 'simi' or 'mapurite' in Colombia, Peru and Venezuela, is a scavenger species that was, until recently, sold and consumed on a commercial scale only or primarily in Colombia. It was marketed mainly as a replacement for another catfish species (*Pimelodus grosskopfii*), known as 'capaz', which has been reduced by over-fishing. The catch of this catfish has increased and expanded geographically over the last decade, with much of the catch in other countries exported to Colombia. An internal market for piracatinga has also developed recently in Brazil. Boto carcasses are a preferred source of bait in the fishery and an estimated 600 dolphins/year (1994-2007) have been killed illegally for this purpose in and around Mamirauá Sustainable Use Reserve in the central Brazilian Amazon (Da Silva and Martin, 2007).

It is now evident that the geographic scale of boto hunting for catfish bait is far greater than previously recognised, encompassing areas within Brazil, Colombia, Peru and Venezuela. Little or no information is available on the

magnitude of the take in most places. Where such data are available (e.g. parts of the Brazilian Amazon) it appears that the hunt is unsustainable and that dolphin numbers have declined by more than 50% in less than a decade (Martin, pers. comm.). The sub-committee noted that range states had become increasingly aware of the scale and severity of this hunt over the past year and had convened meetings of scientists, fishery managers and enforcement agencies to discuss how to address the problem. It was encouraging to learn that management of the piracatinga fishery and enforcement of existing laws protecting the boto could, if properly implemented, lead to a rapid reduction and even cessation of the boto hunt in at least three of the four countries – Brazil, Peru and Venezuela.

The sub-committee expressed appreciation to Flores and Martin for bringing this new information on the boto hunt to its attention, and also welcomed the fact that Brazil and the other range states have acknowledged that there is a problem. The sub-committee is **concerned** about the conservation status of the boto, and the fact that directed killing of this species continues without restriction or limit. The sub-committee **recommends** that immediate steps be taken by Brazil, Colombia, Peru and Venezuela to stop this hunt, and that range states provide information to next year's meeting on progress in this regard.

7.5 Dall's porpoise

SC/60/SM24 once again drew the attention of the sub-committee to the hand-harpoon hunt for Dall's porpoises in the western North Pacific near Japan (see IWC, 2008, p.315). This hunt targets a population of *truei*-type porpoises as well as a population of *dalli*-type porpoises found in the Sea of Japan and the southern Okhotsk Sea. The sub-committee has previously expressed concern for the conservation of these populations (IWC, 1992; 1993; 2002b; 2008). One recommendation, made repeatedly, is that new surveys should be conducted to update the abundance estimates from 1991. Since last year's meeting, new estimates of abundance have been calculated from Japanese survey data collected in 2003 – 173,638 (CV=0.21) for *dalli*-type porpoises and 178,157 (CV=0.23) for *truei*-type porpoises. However, the paper in which the estimates were calculated has not been made available to the Scientific Committee for review. The new estimates are lower than those from 1991. Although the quotas for the hunt have been adjusted slightly in recent years, they have not been lowered substantially. The full abundance estimates from the 2003 survey include extrapolations into un-surveyed areas based on 1991 survey data and other old data.

SC/60/SM24 updated the information presented to the sub-committee last year (IWC, 2008, p.315), using various methods to calculate thresholds used for scientific evaluation of catch levels. The average catch over the most recent 5 years for which data are available (2002-2006) represents 3.6% (*dalli*-type) and 4.5% (*truei*-type) of the new abundance estimates. This catch is 1.8 (*dalli*-type) and 2.3 (*truei*-type) times higher than the largest alternative threshold calculated, and is more than 4 times higher than the more conservative thresholds, such as a 'potential biological removal' (PBR) calculated with a 'recovery factor' of 0.5. Total removals from these populations are likely higher than the reported catches because struck-and-lost porpoises are not included nor are porpoises killed incidentally in fisheries.

The sub-committee noted that the calculation of new abundance estimates was a positive development but also that extrapolation of density and abundance into unsurveyed areas was undesirable. Therefore, the sub-committee **recommended** that a complete survey of the ranges of the populations be undertaken as soon as feasible.

The sub-committee **reiterated its concern** for these stocks and **repeated its previous recommendation** that catches be reduced to sustainable levels as soon as possible. The sub-committee also **repeated its recommendation** for research to quantify by-catches, investigate the accuracy of the catch estimates, and investigate population structure of Dall's porpoises in the Okhotsk Sea (see IWC, 2002b, for further details). Finally, the sub-committee noted that a full assessment of the status of these stocks, as recommended in 2002, had not been undertaken, and therefore the sub-committee **repeated its recommendation** that a full assessment of the status of each affected population be conducted as soon as possible.

The sub-committee welcomed this analysis and thanked Wade and colleagues for their work in drawing together the limited data and other information available on the fishery and the affected stocks.

In discussion it was pointed out that boundary disputes and difficulties getting permission to work in Russian waters had precluded complete surveys of Dall's porpoise populations in the past. However, surveys for minke whales and large whales have been carried out in the Sea of Okhotsk during the 2000s so it appears that the previous problems might be surmountable to a greater degree now than in the past. Kasuya referred to a statement by Miyashita in the North Pacific minke whale working group that data on sightings of small cetaceans were recorded during the recent minke whale cruises but that Japan's national policy regarding small cetaceans prevents the release of those data. Given their potential relevance, the sub-committee **recommended** that the sightings data on Dall's porpoises collected during whale surveys be incorporated in the proposed new assessment.

7.6 Other

SC/60/SM12 presented a quantitative assessment of proposed protection measures for Hector's dolphins announced by the New Zealand Minister of Fisheries on 29 May 2008, to be implemented in October 2008. The approach of Martien *et al*. (2004) and Slooten (2007) was used to predict population sizes in 2050 under the proposed protection measures, compared with current management practices and with a scenario of total protection. SM12 estimated that by 2050 populations would decline to 5,369 if current management continues and recover to 15,776 if fishery mortality is reduced to zero. The corresponding estimates from a National Institute of Water and Atmosphere analysis (Davies *et al*., 2008) are very similar, at 5,631 and 14,379 respectively.

The proposed protection measures are a major step forward, substantially reducing the overlap between gillnets (both commercial and recreational) and Hector's dolphins (including the North Island subspecies, also known as Maui's dolphin). Hector's dolphin populations in areas with a year-round gillnet ban extending offshore to at least 4 n.miles are predicted to increase slowly. However, populations in areas not included in the protection measures and in areas with a relatively low level of protection (e.g. west coast of South Island, with protection to only 2 n.miles offshore for 3 months of the year), are predicted to continue to decline. The species population of Hector's dolphins is expected to decline by a further 600 individuals to 7,168

individuals in 2050. Therefore, although the proposed measures represent significant progress they may not ensure the conservation and recovery of Hector's dolphins.

SC/60/SM12 identified seven specific ways in which the situation could be further improved. Of special note are those related to the highly endangered North Island subspecies (Maui's dolphin). The proposed measures would provide no protection from gillnetting off Taranaki where Maui's dolphins used to occur regularly and where they are still seen occasionally; this area of high gillnetting effort may be functioning as a sink for Maui's dolphins. Also, although the proposed measures would provide protection for Maui's dolphins in harbour entrances, most of the harbour habitat of the subspecies would still be open to gillnetting. Trawling would be prohibited within 2-4nmi in areas of the North Island where Maui's dolphins currently occur regularly. Also, trawling is prohibited in selected areas of the South Island, with increased bycatch monitoring in most areas.

The proposed measures include four new marine mammal sanctuaries and the extension of the existing Banks Peninsula sanctuary; these measures, in combination, would result in a total sanctuary area of approximately 1.9 million hectares covering 3,165km of coastline. The proposed sanctuaries and extension would manage habitat threats posed by seabed mining and seismic survey. The proposed sanctuaries do not currently include any additional regulation of fisheries. In addition to the suite of proposed measures and sanctuaries, a major increase in bycatch monitoring, including onboard observers, has been proposed.

The sub-committee expressed its appreciation for the analysis provided in SC/60/SM12 and also commended New Zealand for the large investment by government agencies in the development and implementation of the proposed protection measures. The sub-committee noted however, that additional measures may likely be required to ensure recovery of the species.

The conservation status of killer whales was reviewed by the sub-committee at its meeting in 2007. SC/60/SM8 provided an update of killer whale distribution in Venezuelan waters between 2001-2008, all in December through May and off the central or northeastern coast in depths of 10-1,500m. Four of the sightings were documented with photographs or videotape. Adult males were present in all but one of the sightings, and the group sizes ranged from 1-5 individuals. A videotaped attack by two killer whales (an adult female and a juvenile) on a leatherback turtle (*Dermochelys coriacea*) was particularly noteworthy.

Kock called the sub-committee's attention to new developments in the mitigation of longline depredation by killer whales in the Southern Ocean, identified as a potential conflict with fisheries issue last year (see summary of SC/60/O9 in the report of the bycatch sub-committee).

8. CONSIDERATION OF REVISION OF IWC CETACEAN LIST

8.1 Replacement of name from *Mesoplodon pacificus* (Longman's beaked whale) to *Indopacetus pacificus*

Brownell summarised the nomenclatural history of this taxon. When the first IWC List of Recognised Cetacean Species was developed, the Longman's beaked whale, described as *Mesoplodon pacificus* Longman, 1926 had been placed in the new genus *Indopacetus* (Moore 1968). However, the new generic name was not widely accepted and the original *M. pacificus* was retained.

Recently, Dalebout *et al*. (2003) reconsidered the genetic distinctiveness of Longman's beaked whale and concluded that this species should be considered a species outside the genus *Mesoplodon* and that it should be the sole member of the genus *Indopacetus*. All authors since Dalebout *et al*. (2003) have considered the Longman's beaked whale as *I. pacificus*.

The sub-committee proposed that the widely accepted genus *Indopacetus* be formally recognised and therefore that the name for Longman's beaked whale in the IWC List of Recognised Cetacean Species be changed from *Mesoplodon pacificus* to *Indopacetus pacificus*.

8.2 Common English name of *Sotalia guianensis*

At SC/59 it was agreed that two species of *Sotalia* should be recognised and that *S. guianensis* should be added to the IWC List of Recognised Cetacean Species. Flores presented SC/60/SM16 on behalf of a long list of Latin American co-authors who proposed Guiana dolphin as the preferred English common name. The main reason given was that this name is associated with the geographic location where the species was first described. In recognition of the broad consensus among researchers working on the species, the sub-committee endorsed this proposal.

9. OTHER PRESENTED INFORMATION

The sub-committee briefly reviewed other presented information. Iñiguez presented SC/60/SM1 on behalf of the authors. The paper summarised the results of a photo-identification study of common bottlenose dolphins in the northern Gulf of San Matías, Patagonia, Argentina, between 2006-2008. A total of 199 land-based surveys were conducted, with total effort of 825h of which 106 was spent with 158 dolphin groups. A photo-identification catalogue was developed containing 47 different individuals. Preliminary evidence suggests some degree of residency in the Natural Protected Area Bahía de San Antonio and also that individuals move throughout the entire northern part of the gulf including the estuary of the river 'Rio Negro'. The sub-committee thanked the authors and encouraged them to continue this work.

SC/60/SM9 reported two sightings of long-beaked common dolphins off the central coast of Venezuela some 250km west of what is considered the typical range of common dolphins in the Caribbean Sea. A stranding in 2002 at Peninsula de la Guajira, near the Colombia-Venezuela border, also was noted. In discussion, the importance of validating such records of 'range extension' with documentary evidence (e.g. photographs) was noted.

Carretta and Enriquez (2007) reported the 2006 bycatch of short-beaked and long-beaked common dolphins, California sea lions, and loggerhead sea turtles in the California/Oregon large mesh drift gillnet fishery for thresher shark and swordfish. Bycatch estimates from this fishery have been documented since 1990 and regularly reported to the sub-committee. It was observed that the entanglement rates (animals per set fished) of short-beaked common dolphins is lower (3.5 animals per 100 sets) since the introduction of acoustic pingers, as compared to sets without pingers (5.9 animals per 100 sets). This is consistent with results presented elsewhere to the sub-committee in

relation to harbour porpoise (SC/60/SM2). At the same time, entanglement rates of California sea lions have been higher in the years following the use of pingers (2.6 animals per 100 sets) versus years without pingers (1.0 animals per 100 sets). A number of factors that may be responsible for these changes in sea lion entanglement include habituation, attraction to pingers, changing in population sizes, shifts in the distribution of prey and a 2001 area closure that shifted fishing effort into southern California waters.

SC/60/SM13 was presented by Ridoux on behalf of the authors. Marine mammal bycatch in the SW Indian Ocean was reviewed, based on the results of a workshop in Mayotte, France, 13-15 November 2006 held under the auspices of the Western Indian Ocean Marine Science Association. The paper covered marine mammal diversity and status, fisheries, marine mammal bycatch and bycatch mitigation measures in most of the countries in the SW Indian Ocean, namely: Kenya, Tanzania, Mozambique, the Federation of Comoros, Madagascar, the Seychelles, Mauritius and the French islands of Mayotte and Réunion. Data came mostly from opportunistic reports, stranding records and interview surveys. The review underlined the highly variable level of marine mammal bycatch across the region and the generally poor and heterogeneous level of information available. However, it appeared that coastal species (Indo-Pacific bottlenose dolphin *Tursiops aduncus*, Indo-Pacific humpbacked dolphin *Sousa chinensis*, and the highly endangered dugong, *Dugong dugon*) were most at risk along the coasts where extensive gill-net fisheries operate and, in some places, there are also directed takes. The authors recommended that all possible effort be made to allow a better assessment of the bycatch issue in this region, and especially in those coastal areas with extensive gillnetting. They encouraged the use of interview-based 'rapid bycatch assessment' methodology and the implementation of observer programs where feasible. Also, they emphasised the importance of population estimates and demographic studies.

The sub-committee welcomed this work and recognised it as a good first step towards quantifying levels of incidental mortality of small cetaceans in this long-neglected region. It **encouraged** the continuation of the cooperative approach reflected in SC/60/SM13 and emphasised the need not only for rapid assessment but also for the implementation of appropriate mitigation measures where needed.

The cetacean fauna of the NW coast of Africa is known principally from opportunistic reports of strandings, and there is little information on the taxonomic status, biology and ecology of some of the species. For at least a decade, it has been known that common dolphins with both long and short beaks are present, and this has led to the general belief that both common and long-beaked common dolphins coexist in the region. However, a recent genetic study (Natoli *et al*., 2006) including a small sample of individuals from Mauritania suggested that these individuals were differentiated from the Eastern North Pacific population defined as long beaked common dolphins by Rosel *et al*. (1994), and it challenged the accepted hypothesis of a single long-beaked lineage worldwide. More locally, it raised questions about the identity of the *Delphinus* population off NW Africa.

SC/60/SM20 investigated population structure of *Delphinus* in this region using two independent tools: the relative abundance of nitrogen and carbon stable isotopes in different individuals and the morphometrics of the skull in comparison with other North Atlantic populations. The stable isotope analysis on a total of 66 individuals showed large variability in both N and C signatures, and this was interpreted as suggesting substantial differences in habitat use, with some dolphins occupying near-shore waters and others offshore waters. Individuals feeding at higher trophic levels were presumed to be more pelagic and prone to feed over the continental slope, whereas those foraging at lower trophic levels were presumed to feed over the continental shelf or around the shelf edge. Moreover, the variability in relative beak lengths was large compared to *Delphinus* populations studied in other parts of the world. Indeed, the range of variation was only slightly less than that of the two North Pacific species, common and long-beaked common dolphins combined. Stable isotope signatures were correlated with rostral length, i.e. it was inferred that individuals with shorter beaks fed at lower trophic levels in coastal waters while those with longer beaks consumed prey in the water column offshore and higher in the food web. This pattern was opposite to what would be expected by analogy with common dolphins in the eastern North Pacific.

The isotopic and morphometric data, when considered together, did not cluster into two distinct groups as is typical in studies of skull morphometrics from the eastern North Pacific and other areas. Rather, the authors of SC/60/SM20 found that the distribution of the two groups of variables formed a cline, leading them to conclude that although two morphotypes of common dolphins do coexist off Mauritania, they belong to a single cohesive population and, therefore, the length of the beak is not a straightforward marker to distinguish the two species of the genus.

During the discussion following Aguilar's presentation of SC/60/SM20, participants raised a number of questions regarding the conclusiveness of its results. In general, it was agreed that although extremely interesting, the analysis did not entirely rule out the possibility of multiple populations off NW Africa. Considering the small sample size analysed by Natoli *et al*. (2006) further genetic investigations are needed. It was suggested that cranial morphometrics in addition to the rostral length/zygomatic width ratio should be included in any further taxonomic analyses.

It was generally agreed that SC/60/SM20 represented a valuable contribution as it adds an ecological line of evidence to ongoing discussions of how to resolve the taxonomy of the *Stenella-Tursiops-Delphinus* complex. It gives further reason for caution against the tendency to assume that long-beaked and short-beaked common dolphins outside the eastern North Pacific fall into the same model as described for that region by Heyning and Perrin (1994). Sequeira called the sub-committee's attention to an ongoing PhD study in Portugal of *Delphinus* genetics worldwide and indicated that some results from it could be expected at next year's meeting.

In response to a question concerning the value and feasibility of investigating potential differences in contaminant concentrations between the two morphotypes in Mauritania, Aguilar explained that although he agreed that such an investigation could be informative given the differences found in isotopic signatures, it was particularly difficult to obtain soft tissue from dolphins in Mauritania due to the hot, arid conditions. SC/60/SM20 depended entirely on samples from the bones of stranded carcasses.

The sub-committee thanked Aguilar and his colleagues for their interesting paper and **recommended** that more work be carried out, particularly genetics, on the taxonomy and systematics of common dolphins.

SC/60/O2 provided preliminary abundance estimates of cetaceans in offshore European Atlantic waters. The objectives of the Cetacean Offshore Distribution and

Abundance in the European Atlantic (CODA) project are to map summer distribution, generate unbiased abundance estimates, and investigate habitat preferences for several cetacean species in offshore waters of the European Atlantic. A shipboard survey was conducted using a 'trial configuration' (or 'BT mode'). The survey area was stratified in 4 blocks and almost 10,000km were searched on effort. For short-beaked common and striped dolphins and for pilot whales there were enough duplicate sightings for a mark-recapture line transect (MRLT) analysis, therefore estimating $g(0)$, accounting for responsive movement, and yielding unbiased estimates. The bottlenose dolphin and beaked whale sightings were analysed using a conventional line transect (CLT) sampling approach, and thus results should be considered potentially negatively biased. Such bias is likely large in the case of beaked whales given their long dive times. The final pooled abundance estimates for the 4 blocks were: 162,266 (CV 0.46) common dolphins; 82,585 (CV 0.54) striped dolphins; 282,749 (CV 0.38) for combined group of common, striped and a common/striped category; 83,441 (CV 0.47) long-finned pilot whales; 86,722 (CV 0.46) for a combined pilot whale category which includes long-finned, short-finned and a *Globicephala* spp category; 19,295 (CV 0.25) bottlenose dolphins; and 9,771 (CV 0.44) beaked whales (including individuals identified as Cuvier's or Sowerby's beaked whales and unidentified beaked whales). All of these abundance estimates should be considered preliminary. Remaining issues to explore before they can be finalised include the potential for positive bias as a result of the effects of truncation, and the effect of duplicate classification on the estimates. Abundance will also be estimated using density surface modelling.

The sub-committee **welcomed** the preliminary abundance estimates, noting that they provide estimates for the first time for some species in this region and look forward to receiving the updated analysis next year.

SC/60/O16 provided an update of Cañadas *et al*. (2006) on planning for surveys of the Mediterranean Sea, contiguous Atlantic waters and the Black Sea (the ACCOBAMS region). The main objective of the proposed survey is to obtain baseline information on abundance and distribution for all species throughout the region. All parts of the ACCOBAMS area will be covered. This includes 27 countries, which together with the large diversity of cultures and political conditions, make the design, planning, and funding of these surveys a considerable challenge. The planned data collection methods are (a) aerial survey in the Aegean Sea, central and northern Adriatic Sea and offshore Black Sea and (b) visual and acoustic shipboard survey with BT method (for visual survey) in the rest of the areas. Visual survey data will be analysed both with conventional distance sampling methods and with density surface modelling. A meeting was held at SMRU in St Andrews, Scotland, in December 2006 to refine the methods for the survey and the survey blocks and to resolve logistic issues. A workshop was held in Monaco in May 2008 with the participation of the Initial Steering Group, experts on visual and acoustic survey methods, National Representatives from 18 riparian countries, representatives of intergovernmental organisations and several local researchers. A working document was presented including details of the proposed structure of the project and its actions. Positive feedback was obtained from the National Representatives present, including some preliminary offers of matching funds and vessels. It was agreed that the intention is to realise the survey in 2010 or 2011. The main next steps in the preparation of this project are to officially contact National Authorities from all riparian countries to seek their support (political, financial and/or in-kind), to identify and approach funding agencies, and to finalise and submit the project proposal.

The sub-committee thanked Cañadas and colleagues for their hard work towards realisation of this long-overdue, much-needed survey programme, and **recommended** that planning and implementation proceed as quickly as possible.

Williams, Lusseau and Hammond (in review) presented data on killer whale usage of a small marine protected area in Johnstone Strait, British Columbia, Canada that has been included in designated critical habitat for the population. Concern has been expressed about this population's vulnerability to stochastic catastrophic events, such as oil spills, because individuals form permanent social units that tend to aggregate temporarily in summer. Johnstone Strait is frequently used by killer whales, but it is also a very narrow passageway that serves as a bottleneck for shipping traffic (SC/60/BC8). Whales were observed in the study area on 75% of days of observation during summer months from 1995-2003. While the study area comprises only 0.001% of the whales' range, an average of 6.5% of the population was present on days that whales were seen. Frequently, >50% of the total population visited the study area on one day. Given the very small population size (~200 animals during the 9-year study), potential annual mortality limits, such as those calculated under PBR, will be very small (2-3 individuals). Mean group size exceeded PBR limits on 56% of days overall, and 99% of days when restricting the analyses to days when whales visited the study area. The whales' social structure and their high reliance on an area that comprises only a negligible fraction of their range mean that one stochastic, catastrophic event could affect a large fraction of this small population. On 20 August 2007, a barge carrying logging equipment and a bulk fuel truck sank in the study area, exposing ~25% of the killer whale population to spilled diesel. The authors encourage methodological development to incorporate aggregations and social structure explicitly into models of extinction risk for highly social odontocetes. The sub-committee noted that social structure and the tendency of social cetaceans to aggregate is an important consideration in conservation efforts.

10. TAKES OF SMALL CETACEANS

The sub-committee reviewed the compilation of information on takes of small cetaceans found in national progress reports (see Annex O) and thanked the Secretariat for compiling the records. The sub-committee welcomed the information submitted by some member countries and encouraged others to contribute data. It was agreed that the table should include a statement regarding incompleteness, noting that it contains only the information as reported in the available progress reports taken at face value.

The sub-committee noted the apparent paucity of bycatch monitoring bycatch data from European fisheries since the EU regulation 812 2004, and **recommended** that information on the efficacy of this regulation be submitted to the scientific committee for evaluation.

Funahashi provided an English compilation of the direct catches of small cetaceans in Japan from 1997-2006 as reported on the National Research Institute of Far Seas

Fisheries, Fisheries Research Agency website. The sub-committee agreed that this compilation should be included as part of its report (see Appendix 2).

Flores reported that large numbers of Guiana dolphins are bycaught in gillnets in the Brazilian states of Pará and Amapá northwest of the Amazon River Delta. The artisanal fishery based mainly in the town of Vigia (Pará) employs gillnets as long as 6-8km, which are often set together, thus making the total panel length greater than 20km. This is far in excess of the legal limit of 2.5km as specified in Brazilian legislation. A preliminary onboard survey by researchers who observed 12 fishing trips and about 100 net sets found that catches by a single set ranged from none to as high as 88 dolphins. Because of controversy surrounding this information, the Government of Brazil has initiated a regulatory review of the issue.

The sub-committee thanked Flores for bringing this problem to its attention and requested that further information and data be provided at its next meeting.

The sub-committee noted the recent spate of live-captures and exports of Indo-Pacific bottlenose dolphins in the Solomon Islands. At least 28 dolphins were captured and exported in 2007 and more exports are expected. Concerns have been expressed by numerous NGOs and by the IUCN Cetacean Specialist Group about the quality and validity of the 'nondetriment findings' required by CITES for exports of Appendix II specimens. Although the exporter in the Solomon Islands has initiated a research programme on *Tursiops aduncus*, the results have not been independently reviewed and the documentation provided in the 'nondetriment findings' to date has not been considered adequate. A workshop to develop a case study on how such island-associated populations of small cetaceans can be assessed to determine lack of detriment is being planned for later this year in Samoa under the aegis of the IUCN Cetacean Specialist Group.

Sequeira noted that a potentially large live-capture operation is also being planned in Guinea-Bissau, apparently targeting common bottlenose dolphins. No population assessment has ever been made for this region and available data suggest that recent takes are unsustainable (van Waerebeek *et al*., 2000).

The sub-committee **reiterated its previous concerns** about direct takes, including live-captures, from populations of small cetaceans that have not been properly assessed.

11. WORK PLAN

The sub-committee reviewed its schedule of priority topics. Those currently held by the sub-committee are as follows.

(1) Systematics and population structure of *Tursiops*.
(2) Status of ziphiids in the Southern Ocean.
(3) Status of common dolphin (*Delphinus* spp.).
(4) Status of small cetaceans of the eastern tropical Atlantic.
(5) Fishery depredation by small cetaceans.

The committee noted that there was a considerable need for a review of the population structure, systematics and status of *Delphinus* spp. Given that next year's meeting will be held in Madeira, and considering the large and recent research efforts and the availability of new data on stock structure, abundance estimates, life history data and bycatch estimates, the sub-committee agreed to adopt a review of the systematics, population structure and status of common dolphins as its priority topic for next year. No new items were added to the list of topics to consider in future meetings.

12. ADOPTION OF AGENDA

The report was adopted at 10.18 on 8 June 2008. On behalf of the sub-committee, Rogan thanked the invited participants and local scientists for their contribution to the review, Koen Van Waerebeek for all his tremendous help and support in preparing for this meeting and the rapporteurs for their hard work and assistance with the report.

REFERENCES

Badan-Dangon, N.A. 1998. Coastal circulation from the Galapagos to the Gulf of California. pp.315-43. *In*: Robinson, A.R. and Brink, K.H. (eds). *The sea. Ideas and observations on progress in the study of the seas. Vol. 11. Global ocean regional studies and synthesis*. John Wiley and Sons, Inc., New York.

Brownell, R.L., Jr. 1974. Small odontocetes of the Antarctic. pp.13-19. *In*: Bushnell, V. (eds). *Antarctic Mammals. Antarctic Map Folio Series. Folio 18*. American Geographical Society, New York. 19pp.

Cañadas, A., Fortuna, C., Birkun, A. and Donovan, G. 2006. Plans for surveying the Mediterranean and Black Seas (the ACCOBAMS region). Paper SC/58/O12 presented to the IWC Scientific Committee, May 2006, St. Kitts and Nevis, West Indies (unpublished). 11pp. [Paper available from the Office of this Journal].

Carr, M.E. and Kearns, E.J. 2003. Production regimes in four Eastern Boundary Current systems. *Deep-Sea Res. II* 50: 3199-221.

Carretta, J. and Enriquez, L. 2007. Marine mammal and sea turtle bycatch in the California/Oregon thresher shark and swordfish drift gillnet fishery in 2006. *SWFSC Admin. Rep. No*. LJ-07-06: 9pp.

Chaigneau, A., Abarca del Rio, R. and Colas, F. 2006. Lagranigan study of the Panama Bight and surrounding regions. *J. Geophys. Res*. 111: C09013, doi: 10.1029/2006JC003530.

Da Silva, V.M.F. and Martin, A. 2007. Impact of human activities upon two species of dolphins in Amazonian flooded forest, Brazil. Paper presented to the 17th Biennial Conference on the Biology of Marine Mammals, Cape Town, South Africa, 29 November – 3 December 2007.

Dalebout, M.L., Ross, G.J.B., Baker, C.S., Anderson, R.C., Best, P.B., Cockroft, V.G., Hinsz, H.L., Peddemors, V. and Pitman, R.L. 2003. Appearance, distribution and genetic distinctiveness of Longman's beaked whale, *Indopacetus pacificus*. *Mar. Mammal Sci*. 19(3): 421-61.

Davies, N.M., Bian, R., Starr, P., Lallemand, P., Gilbert, D.A. and McKenzie, J. 2008. Risk analysis for Hector's dolphin and Maui's dolphin subpopulations to commercial set net fishing using a temporal-spatial age-structured model. Ministry of Fisheries, Wellington, New Zealand, *www.fish.govt.nz/en-nz/Consultations/Hector+new/default.htm*.

Félix, F. 1994. Ecology of the bottlenose dolphin, *Tursiops truncatus*, in the Gulf of Guayaquil, Ecuador. *Invest. Cetacea* XXV: 235-56.

Fiedler, P.C. and Talley, L.D. 2006. Hydrography of the eastern tropical Pacific: a review. *Prog. Oceanogr*. 69: 143-80.

García-Godos, I. 2007. Revisión de las interacciones entre cetáceos y la pesquería marina peruana: perspectivas para la conservación de cetáceos en Perú [Interactions between cetaceans and the marine fishery in Peru and perspectives for their conservation]. pp.77-82. *In*: Félix, F. (eds). *Memorias del Taller de Trabajo sobre el Impacto de las Actividades Antropogénicas en Mamiferos en el Pacifico Sudeste*, Bogotá, Colombia. 98pp.

Heyning, J.E. and Perrin, W.F. 1994. Evidence for two species of common dolphins (Genus *Delphinus*) from the eastern North Pacific. *Contrib. Sci. [Los Angeles]* 442: 1-35.

Hucke-Gaete, R., Moreno, C.A. and Arata, J. 2004. Operational interactions of sperm whales and killer whales with the Patagonian toothfish fishery off Southern Chile. *CCAMLR Science* 11: 127-40.

International Whaling Commission. 1992. Report of the Scientific Committee. Annex G. Report of the Sub-Committee on Small Cetaceans. *Rep. int. Whal. Commn* 42:178-234.

International Whaling Commission. 1993. Report of the Scientific Committee, Annex G. Report of the sub-committee on small cetaceans. *Rep. int. Whal. Commn* 43:130-45.

International Whaling Commission. 2002a. Chair's Report of the 53rd Annual Meeting. Annex C. Resolutions Adopted During the 53rd Annual Meeting. Resolution 2001-13. Resolution on small cetaceans. *Ann. Rep. Int. Whaling Comm*. 2001:60.

International Whaling Commission. 2002b. Report of the Scientific Committee. Annex K. Report of the Standing Sub-Committee on Small Cetaceans. *J. Cetacean Res. Manage. (Suppl.)* 4:325-38.

International Whaling Commission. 2008. Report of the Scientific Committee. Annex L. Report of the sub-committee on small cetaceans. *J. Cetacean Res. Manage. (Suppl.)* 10:302-21.
Jaramillo-Legorreta, A.M., Rojas-Bracho, L., Brownell, R.L., Read, A.J., Reeves, R.R., Ralls, K. and Taylor, B.L. 2007. Saving the vaquita: immediate action, not more data. *Conserv. Biol.* 21(6): 1653-55.
Jaramillo-Legorreta, A.M., Rojas-Bracho, L. and Gerrodette, T. 1999. A new abundance estimate for vaquitas: first step for recovery. *Mar. Mammal Sci.* 15(4): 957-73.
Kessler, W.S. 2005. The circulation of the eastern tropical Pacific: a review. *Prog. Oceanogr.* 69: 181-217.
Kraus, S. and Brault, S. 1997. A field test of the use of pingers to reduce incidental mortality of harbor porpoises in gill nets. Paper SC/49/SM42 presented to the IWC Scientific Committee, September 1997, Bournemouth (unpublished). 12pp. [Paper available from the Office of this Journal].
Mendez, M., Rosenbaum, H.C. and Bordino, P. 2008. Conservation genetics of the franciscana dolphin in northern Argentina: population structure, by-catch impacts, and management implications. *Conserv. Genet.* 9(2): 419-35.
Minton, G. 2004. Population Ecology and Conservation of Cetaceans in Oman, with particular reference to humpback whales (*Megaptera novaeangliae*), University of London, University Marine Biological Station, Millport.
Natoli, A., Cañadas, A., Peddemors, V.M., Aguilar, A., Vaquero, C., Fernández-Piqueras, P. and Hoelzel, A.R. 2006. Phylogeography and alpha taxonomy of the common dolphin (*Delphinus* sp.). *J. Evol. Biol.* 19: 943-54.
Oliver Schneider, C. 1946. Catálogo de los mamíferos de la Provincia de Concepción. *Bol. Soc. Biol. Concepción* 21: 67-83.
Palacios, D.M. 2004. Seasonal patterns of sea-surface temperature and ocean color around the Galapagos: regional and local influences. *Deep-Sea Res. II* 51(1-3): 43-57.
Pennington, J.T., Mahoney, K.L., Kuwahara, V.S., Kolber, D.D., Calienes, R. and Chavez, F.P. 2006. Primary production in the eastern tropical Pacific: a review. *Prog. Oceanogr.* 69: 285-317.
Perez-Alvarez, M.J., Alvarez, E., Aguayo-Lobo, A. and Olavarria, C. 2007. Occurrence and distribution of Chilean dolphin (*Cephalorhynchus eutropia*) in coastal waters of central Chile. *NZ J. Mar. Freshwater Res.* 41: 405-09.
Pichler, F.B., Robineau, D., Goodall, R.N.P., Meyers, M.A., Olivarria, C. and Baker, C.S. 2001. Origin and radiation of Southern Hemisphere coastal dolphins (genus *Cephalorhynchus*). *Mol. Ecol.* 10: 2215-23.
Reyes, J.C. and Oporto, J.A. 1994. Gillnet fisheries and cetaceans in the southeast Pacific. *Rep. int. Whal. Commn (special issue)* 15: 467-74.
Rodriguez-Rubio, E., Schneider, W. and Abarca del Rio, R. 2003. On the seasonal circulation within the Panama Bight derived from satellite observations of wind, altimetry and sea surface temperature. *Geophys. Res. Lett.* 30(7): 1410.
Rosa, S., Milinkovitch, M.C., Van Waerebeek, K., Berck, J., Oporto, J., Alfaro-Shigueto, J., Van Bressem, M.F., Goodall, N. and Cassens, I. 2005. Population structure of nuclear and mitochondrial DNA variation among South American Burmeister's porpoises (*Phocoena spinipinnis*). *Conserv. Genet.* 6: 431-43.
Rosel, P.E., Dizon, A.E. and Heyning, J.E. 1994. Genetic analysis of sympatric morphotypes of common dolphins (genus: Delphinus). *Mar. Biol.* 119(2): 159-67.
Sanino, G.P., Hamilton-West, C., Rojas, A., Yañez, J.L. and van Waerebeek, K. 2003a. Studies of three stranded *Delphinus delphis* and first record of focal *Pneumonia abscedativa* in Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 52: 103-77.
Sanino, G.P., van Waerebeek, K. and Yañez, J.L. 2003b. Review of the distribution of the genus *Delphinus* and documented records of *Delphinus capensis*, in Chile. *Boletin del Museo Nacional de Historia Natural (Chile)* 52: 97-102.
Sanino, G.P., Yañez, J.L. and van Waerebeek, K. 2007. A first confirmed specimen record in Chile, and sightings attributed to the lesser beaked whale *Mesoplodon peruvianus*, Reyes, Mead and Van Waerebeek, 1991. *Boletin del Museo Nacional de Historia Natural (Chile)* 56: 89-96.
Schiavini, A.C.M., Goodall, R.N.P., Lescrauwaet, A.K. and Alonso, M.K. 1997. Food habits of the Peale's dolphin, *Lagenorhynchus australis*, review and new information. *Rep. int. Whal. Commn* 47: 827-34.
Secchi, E.R., Danilewicz, D. and Ott, P.H. 2003. Applying the phylogeographic concept to identify franciscana dolphin stocks: implications to meet management objectives. *J. Cetacean Res. Manage.* 5(1): 61-68.
Sielfeld, W. 1980. Mamíferos marinos en colecciones y museos de Chile. *An. Inst. Patagonia* 11: 272-80. [In Spanish].
Slooten, E. 2007. Conservation management in the face of uncertainty: effectiveness of four options for managing Hector's dolphin bycatch. *Endangered Species Research* 3: 169-79.
Strub, P.T., Mesias, J.M., Montecino, V., Rutllant, J. and Salinas, S. 1998. Coastal ocean circulation off western South America. pp.273-313. *In*: Robinson, A.R. and Brink, K.H. (eds). *The sea. Ideas and observations on progress in the study of the seas. Vol. 11. Global coastal ocean regional studies and syntheses*. John Wiley and Sons, Inc., New York.
Tomczak, M. and Godfrey, J.S. 2003. *Regional Oceanography: An Introduction*. 2nd ed. Daya Publishing House, Delhi. 390pp.
Van Bressem, M.F., Van Waerebeek, K., Reyes, J., Félix, F., Echegaray, M., Siciliano, S., Di Beneditto, A.P., Flach, L., Viddi, F., Avila, I.C., Bolaños, J., Castineira, E., Montes, D., Crespo, E., Flores, P.A.C., Haase, B., Mendonca de Souza, S.M.F., Laeta, M. and Fragoso, A.B. 2007. A preliminary overview of skin and skeletal diseases and traumata in small cetaceans from South American waters. *LAJAM* 6(1): 7-42.
Van Waerebeek, K. 1993a. External features of the dusky dolphin *Lagenorhynchus obscurus* (Gray, 1828) from Peruvian waters. *Estudios Oceanológicos* 12: 37-53.
Van Waerebeek, K. 1993b. Geographic variation and sexual dimorphism in the skull of the dusky dolphin, *Lagenorhynchus obscurus*, (Gray, 1828). *Fish. Bull.* 91(4): 754-74.
van Waerebeek, K., Ndiaye, E., Djiba, A., Diallo, M., Murphy, P.F., Jallow, A.O., Camara, A., Ndiaye, P. and Tous, P.T. 2000. *A Survey of the Conservation Status of Cetaceans in Senegal, The Gambia and Guinea-Bissau*. UNEP/CMS Secretariat, Bonn, Germany. 80pp.
Van Waerebeek, K., Reyes, J.C., Read, A.J. and McKinnon, J.S. 1990. Preliminary observations of bottlenose dolphins from the Pacific coast of South America. pp.143-54. *In*: Leatherwood, S. and Reeves, R.R. (eds). *The Bottlenose Dolphin*. Academic Press, San Diego. 653pp.
Williams, R., Hall, A. and Winship, A. 2008. Potential limits to anthropogenic mortality of small cetaceans in coastal waters of British Columbia. *Can. J. Fish. Aquat. Sci.* 65: 1867-78.
Williams, R., Lusseau, D. and Hammond, P.S. In review. Killer whale habitat use and the mixed blessing of critical habitat: the role of social aggregations and protected areas in cetacean conservation. 20pp.

Appendix 1

AGENDA

1. Opening remarks
2. Election of Chair
3. Adoption of Agenda
4. Appointment of rapporteurs
5. Review of available documents
6. Review conservation issues regarding small cetaceans in the Southeast Pacific
   - 6.1 Abundance and distribution
   - 6.2 Population structure
   - 6.3 Life history
   - 6.4 Ecology
   - 6.5 Habitat
   - 6.6 Directed takes
   - 6.7 Incidental takes
   - 6.8 Other
   - 6.9 Consideration of status

7. Progress on previous recommendations
   - 7.1 Vaquita
   - 7.2 Harbour porpoise
   - 7.3 Franciscana
   - 7.4 Boto
   - 7.5 Dall's porpoise
   - 7.6 Other
8. Consideration of revision of IWC Cetacean List
   - 8.1 Replacement of name from *Mesoplodon pacificus* (Longman's beaked whale) to *Indopacetus pacificus*
   - 8.2 Common English name *Sotalia guianensis*
9. Other presented information
10. Takes of small cetaceans
11. Work plan
12. Adoption of report

Appendix 2

DIRECT TAKES OF SMALL CETACEANS IN JAPAN BY TYPE OF FISHERY AND PREFECTURE OF DEPARTURE PORT, 1997-2006

Table 1

Direct takes of small cetaceans in Japan by type of fishery and Prefecture of departure port, 1997-2006.

	Prefecture	Quota	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Baird's beaked whale												
SW	Hokkaido	14	1	2	10	10	10	10	10	10	14	12
SW	Miyagi+Chiba	54	26/27	26/26	26/26	26/26	26/26	26/26	26/26	26/26	26/26	25/26
Short-finned pilot whale (northern form)												
SW	Miyagi	36	50	35	60	50	47	47	42	13	22	7
Short-finned pilot whale (southern form)												
SW	Chiba+Wakayama	36	5/22	3/46	13/31	7/49	4/36	1/35	-/27	-/29	1/24	-/10
D	Wakayama	300	204	84	211	109	210	55	55	62	40(2)	198(8)
H	Okinawa	100	66	61	79	89	92	38	36	72	90	56
Risso's dolphin												
SW	Wakayama	20	20	20	12	20	17	12	19	7	8	7
D	Wakayama	300	60	157	250	367	350	220	186	437	340	232
H	Wakayama	250	148	265	227	119	107	154	168	60	46	105
False killer whale												
D	Wakayama	40	25	37	-	-	18	7	12	-	-	30(24)
H	Okinawa	10	3	8	5	8	8	-	4	3	1	5
Striped dolphin												
D	Shizuoka	70	-	-	-	-	-	-	-	-	-	-
D	Wakayama	450	545	376	520	235	418	565	382	554	397(2)	479
H	Chiba	80	-	-	-	-	-	-	-	-	-	-
H	Wakayama	100	57	73	76	65	66	77	68	83	60	36
Bottlenose dolphin												
D	Shizuoka	75	-	-	71	-	-	-	-	9	-	-
D	Wakayama	890	234	143	511	1,271	195	688	105	475	285(36)	285(80)
H	Wakayama	100	57	95	68	79	44	38	52	43	66	75
H	Okinawa	10	8	7	8	8	8	3	7	10	10	12
Spotted dolphin												
D	Shizuoka	455	-	-	-	-	-	-	-	-	-	-
D	Wakayama	400	-	397	-	27	-	400	102	-	-	400(13)
H	Wakayama	70	23	63	38	12	10	18	30	2	13	5
Dall's porpoise *(dalli*-type)												
H	Hokkaido	1,500	999	994	670	1,203	1,413	1,328	1,655	647	1,240	719
H	Aomori	20	2	-	-	-	-	-	-	-	-	-
H	Iwate	7,200	7,433	4,116	5,632	6,106	6,960	6,057	6,427	3,796	5,394	3,312
H	Miyagi	280	99	193	77	204	57	229	226	171	246	181
Dall's porpoise *(truei*-type)												
H	Hokkaido	100	31	69	57	69	100	89	84	66	51	44
H	Iwate	8,300	9,976	6,013	8,371	8,589	8,120	8,243	7,325	9,109	7,733	7,758
H	Miyagi	20	-	-	-	-	-	3	3	-	-	-
Rough-toothed dolphin												
H	Okinawa	-	-	-	1	-	-	-	-	-	-	-
Killer whale												
H	Okinawa	-	1	-	-	-	-	-	-	-	-	-

*(N) shows number sold alive within all catch, and including research use. *SW=Small-type whaling. *D=Drive fishery. *H=Hand-harpoon fishery.
Source: Small Cetacean Fisheries and Resource Study (in Japanese), Fisheries Research Agency: Fisheries Agency, *http://kokushi.job.affrc.go.jp/H19/H19/H19_44.pdf.*