

Identifying high-value areas to strengthen marine conservation in the Channels and Fjords of Southern Chile ecoregion

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TABLE S1 Experts consulted during workshops on conservation planning for the Channels and Fjords of Southern Chile ecoregion, and/or by personal interviews.

Name	Institution	Area of expertise
Acevedo, Jorge ²	Centro de Estudios del Cuaternario	Marine mammals
Acuña, Fernando ¹	Oficina Técnica del Borde Costero	Conservation planning
Aguayo, Anelio ²	Instituto Antártico Chileno	Marine mammals
Alidina, Hussein ¹	WWF Canada	Geographical information systems (GIS)
Álvarez, Ricardo ¹	Conservación Marina	Conservation planning and sea otters
Arancibia, Daniel ¹	WWF Perú	Conservation planning
Arata, Javier ^{1,2}	Instituto Antártico Chileno	Seabirds
Bello, Max ¹	OCEANA	Marine conservation
Cañete, Iván ²	Universidad de Magallanes	Marine benthic fauna
Casanova, Edgardo ²	Oficina Técnica del Borde Costero	Conservation planning
Castro, Claudio ^{1,2}	CONAMA	Conservation planning
Castro, Leonardo ¹	Universidad de Concepción	Oceanography
Céspedes, Renato ¹	Instituto de Fomento Pesquero	Demersal fisheries
Cornejo, Sergio ²	GEF Marino–CONAMA	Marine Protected Areas
Cruz, Eliecer ¹	WWF Galápagos	Conservation planning
De Andrade, Roberto ²	Comisión Nacional de Medio Ambiente	Marine Protected Areas
Delgado, Claudio ¹	Conservación Marina	Conservation planning and sea otters
Díaz, Susan ¹	WWF Chile	Communications
Drews, Carlos ¹	WWF International	Conservation planning
Espoz, Carmen ²	Universidad Santo Tomas	Marine benthic fauna
Farias, Jorge ¹	Subsecretaria de Pesca	Fisheries
Flores, Lorenzo ¹	Subsecretaria de Pesca	Demersal fisheries
Försterra, Günter ²	Fundación Huinay	Marine benthic fauna
Fuentes, Rodrigo ¹	Unidad de Fomento Productivo	Fisheries
Gasparrou, Cecilia ²	Fundación Cethus	Cetaceans
Gherzi, Fernando ¹	The Nature Conservancy	Conservation planning
Gibbons, Jorge ^{1,2}	Universidad de Magallanes	Marine mammals
González, Humberto ¹	Universidad Austral de Chile	Oceanography
González, Inti ²	Gestión Patagonia	GIS
Gorny, Matthias ²	OCEANA	Marine benthic fauna
Grange, Ken ¹	NIWA–New Zealand	Ecology of fjords

Gutiérrez, Cristián ²	OCEANA	Marine conservation
Guzmán, Marlys ²	Bienes Nacionales	Economy
Hucke-Gaete, Rodrigo ¹	Universidad Austral de Chile	Marine mammals
Iriarte, José Luis ¹	Universidad Austral de Chile	Oceanography
Matus, Ricardo ²	Natura Patagonia	Seabirds
Méndez, Martín ²	Fundación Aquamarina	Cetaceans
Menéndez, Rodrigo ²	Comisión Nacional de Desarrollo Indígena	Indigenous affairs
Miethke, Sandra ¹	The Nature Conservancy	Conservation planning
Montecinos, Yacqueline ¹	WWF Chile	GIS
Montiel, Américo ²	Universidad de Magallanes	Marine benthic fauna
Morello, Flavia ²	Universidad de Magallanes	Anthropology
Moreno, Paula ¹	WWF Chile	Aquaculture
Núñez, Nelly ²	Comisión Nacional de Medio Ambiente	Natural resources
Olavarría, Carlos ^{1,2}	Centro de Estudios del Cuaternario	Marine mammals
Opazo, Sergio ²	Universidad de Magallanes	GIS
Ortiz, Patricio ²	BirdLife–CODEFF	Marine Important Bird Areas
Owen, Emily ¹	WWF Chile	Conservation planning
Palacios, Mauricio ²	Universidad de Magallanes	Algae
Pantoja, Silvio ¹	Universidad de Concepción	Oceanography
Pequeño, Germán ¹	Universidad Austral de Chile	Fish
Pinto, Luis ¹	Universidad de Concepción	Oceanography
Pizarro, Gemita ²	Instituto de Fomento Pesquero	Phytoplankton
Quiñónez, Renato ¹	Universidad de Concepción	Oceanography and fisheries
Ramírez, Beatriz ²	Comisión Nacional de Medio Ambiente (CONAMA)	Biodiversity
Raya Rey, Andrea ²	CADIC- CONICET	Seabirds and marine mammals
Retamal, Marco Antonio ¹	Universidad de Concepción	Carcinology
Ríos, Carlos ²	Universidad de Magallanes	Marine benthic fauna
Rodrigo, Cristián ²	Instituto Antártico Chileno	Oceanography
Rodríguez, Álvaro ^{1,2}	Subsecretaría de Pesca	Marine Protected Areas
Rodríguez, Ignacio ²	BirdLife–CODEFF	Marine Important Bird Areas
Rovira, Jaime ²	CONAMA	Governance of Marine Protected Areas
Ruiz, Jorge ¹	Centro Ballena Azul	Seabirds
Sánchez, Javier ¹	Mares Chile	Fisheries
Sepúlveda, Maritza ¹	Universidad de Valparaíso	Marine mammals
Silva, Alejandra ²	Corporación Nacional Forestal	Protected areas
Silva, Nelson ¹	Pontificia Universidad Católica de Valparaíso	Oceanography
Vargas, Claudio ²	Instituto de Fomento Pesquero	Fisheries

Vela-Ruiz, Germainee ²	Gestión Patagonia	Conservation planning
Venegas, Claudio ²	Universidad de Magallanes	Seabirds and marine mammals
Vergara, Karina ²	Corporación Nacional Forestal	Protected areas
Wolodarsky, Alexia ¹	WWF Chile	Conservation planning
Yani, Gabriel ¹	Pontificia Universidad Católica de Valparaíso	Fish

¹ Attended the workshop in May 2009 in Santiago, Chile

² Attended the workshop in September 2009 in Punta Arenas, Chile

TABLE S2 Conservation features (spatial attributes and species), proposed targets and percentage of each feature actually included in a conservation area when remote and isolated planning units were removed from the High Conservation Value Areas portfolio (see Methods) obtained using *Marxan* analysis for scenario II in the channels and fjords of the southern Chile ecoregion (Fig. 1).

Spatial attribute	Species	Proposed target (%)	% protected
Fish			
Known spawning areas	Southern blue whiting <i>Micromesistius australis</i>	47*	51.8
Known spawning areas	Patagonian toothfish <i>Dissostichus eleginoides</i>	47*	48.5
Marine mammals			
Areas of known sighting	Burmeister's porpoise <i>Phocoena spinipinnis</i>	30*	32.8
	Southern right whale <i>Eubalaena australis</i>	30*	37.0
	Peale's dolphin <i>Lagenorhynchus australis</i>	10*	24.8
Known resting area	Chilean dolphin <i>Cephalorhynchus eutropia</i>	50*	50.1
	Commerson's dolphin <i>Cephalorhynchus commersonii</i>	30*	33.5
	Leopard seal <i>Hydrurga leptonyx</i>	90*	92.7
Potential feeding ground	Humpback whale <i>Megaptera novaeangliae</i>	10*	12.9
Known feeding ground	Humpback whale <i>M. novaeangliae</i>	40*	40.0
Known breeding areas	South American fur seal <i>Arctocephalus australis</i>	30*	31.0
Haul-out sites	<i>A. australis</i>	23*	25.3
Breeding areas	South American sea lion <i>Otaria flavescens</i>	32*	42.5
Haul-out sites	South American sea lion <i>O. flavescens</i>	32*	32.2
Known areas of presence	Sea otter (chungungo) <i>Lontra felina</i>	62	48.3
	River otter (huillin) <i>Lontra provocax</i>	70	64.9
Breeding area of Bahía Ainsworth	Southern elephant seal <i>Mirounga leonina</i>	90*	100.0
Seabirds			
Feeding grounds	Grey-headed albatross <i>Thalassarche chrysostoma</i>	23*	23.0
	Black-browed albatross <i>Thalassarche melanophris</i>	23*	23.4
Breeding colonies	Sooty shearwater <i>Puffinus griseus</i>	30	100.0
	Grey-headed albatross <i>T. chrysostoma</i>	50*	100.0

Spatial attribute	Species	Proposed target (%)	% protected
	Black-browed albatross <i>T. melanophris</i>	50	42.9
	Macaroni penguin <i>Eudyptes chrysolophus</i>	56*	58.7
	Rockhopper penguin <i>Eudyptes chrysocome</i>	51*	51.0
	Magellanic penguin <i>Spheniscus magellanicus</i>	53*	53.0
Feeding areas	Rockhopper penguin <i>E. chrysocome</i>	37*	37.1
	Magellanic penguin <i>S. magellanicus</i>	32*	33.3
Breeding colony in Islote Albatros	Black-browed albatross <i>T. melanophris</i>	100*	100.0
Algae			
Distinctive sites	<i>Lessonia</i> sp.	30	9.1
	<i>Macrocystis</i> sp.	15*	32.7
	<i>Durvillea</i> sp.	33	28.6
Invertebrates			
Area of high abundance of commercial invertebrates		53	48.3
Scleractinian cold-water corals		48	44.4
Stylasterid hydrocoral colonies		48	46.7
Stylasterid hydrocoral reef		100*	100.0
Habitats			
Seamounts		30*	30.2
Submarine canyons		50*	57.9
Fjords with glacial influence		21*	33.1
Fjords without glacial influence		32	31.0
Sand bottom habitats		20*	20.6
Sand and mud bottom habitats		20*	38.5
Gravel bottom habitats		20*	20.6
Gravel and sand bottom habitats		20*	20.3
Mud bottom habitats		20*	20.3
Other			
Top predators' feeding grounds		30*	40.4
Stop-over feeding areas for migrating birds		73*	75.8

*Target achieved

TABLE S3 Conservation features used to identify High Conservation Value Areas in the Channels and Fjords of Southern Chile ecoregion.

Spatial attribute	Data type	Unit of measure in planning unit
Fish		
Known spawning areas of southern blue whiting <i>Micromesistius australis</i>	Polygon	Area: reported distribution
Known spawning areas of Patagonian toothfish <i>Dissostichus eleginoides</i>	Polygon	Area: reported distribution
Marine mammals		
Areas of known sighting of Burmeisters' porpoise <i>Phocoena spinipinnis</i>	Point/Presence	Buffer area*
Areas of known sighting of southern right whale <i>Eubalaena australis</i>	Point/Presence	Planning units selected by point presence
Areas of known sighting of Peale's dolphin <i>Lagenorhynchus australis</i>	Point/Presence	Buffer area*
Areas of known sighting of Chilean dolphin <i>Cephalorhynchus eutropia</i>	Point/Presence	Buffer area*
Areas of known sighting of Commerson's dolphin <i>Cephalorhynchus commersonii</i>	Point/Presence	Area of highest concentration of sightings
Known resting area of leopard seal <i>Hydrurga leptonyx</i>	Presence	Used area of the fjord
Potential feeding ground of humpback whale <i>Megaptera novaeangliae</i>	Presence	Area: reported distribution based on points of presence
Known feeding ground of humpback whale <i>M. novaeangliae</i>	Presence	Area: reported distribution based on points of presence
Known breeding areas of South American fur seal <i>Arctocephalus australis</i>	Location of colonies	Buffer area*
Known breeding areas of South American sea lion <i>Otaria flavescens</i>	Location of colonies	Buffer area*
Haul-out sites of South American fur seal <i>A. australis</i>	Location of sites	Buffer area*
Haul-out sites of South American sea lion <i>O. flavescens</i>	Location of sites	Buffer area*
Known areas of presence of sea otter <i>Lontra felina</i>	Point/Presence	Buffer area*
Known areas of presence of southern river otter <i>Lontra provocax</i>	Point/Presence	Buffer area*
Breeding area of Bahía Ainsworth for southern elephant seal <i>Mirounga leonina</i>	Polygon	Used area of the Bay
Seabirds		
Feeding grounds of grey-headed albatross <i>Thalassarche chrysostoma</i>	Polygon	50 % utilization distribution contour of kernel analysis
Feeding grounds of black-browed albatross <i>Thalassarche melanophris</i>	Polygon	50 % utilization distribution contour of

Breeding colonies of sooty shearwater <i>Puffinus griseus</i>	Location of colonies	kernel analysis Area: planning units selected by presence
Breeding colonies of grey-headed albatross <i>T. chrysostoma</i>	Location of colonies	Area: planning units selected by presence
Breeding colonies of black-browed albatross <i>T. melanophris</i>	Location of colonies	Area: planning units selected by presence
Breeding colonies of macaroni penguin <i>Eudyptes chrysolophus</i>	Location of colonies	Buffer area*
Breeding colonies of southern rockhopper penguin <i>Eudyptes chrysocome</i>	Location of colonies	Buffer area*
Breeding colonies of Magellanic penguin <i>Spheniscus magellanicus</i>	Location of known colonies	Buffer area*
Feeding areas of southern rockhopper penguin <i>E. chrysocome</i>	Polygon	50 % utilization distribution contour of kernel analysis
Feeding areas of Magellanic penguin <i>S. magellanicus</i>	Polygon	50 % utilization distribution contour of kernel analysis
Breeding colony of black-browed albatross <i>T. melanophris</i> in Isote Albatros	Polygon	Polygon of the islet
Algae		
Distinctive sites of <i>Lessonia</i> sp.	Point/Presence	Area: planning units selected by presence
Distinctive sites of <i>Macrocystis</i> sp.	Point/Presence	Area: planning units selected by presence
Distinctive sites of <i>Durvillea</i> sp.	Point/Presence	Area: planning units selected by presence
Invertebrates		
Area of high abundance of commercial invertebrates	Point/Presence	Areas of high number of species obtained by overlapping 3.5 km of buffer areas from its locations
Scleractinian cold-water corals	Point/Presence	Area: planning units selected by presence
Stylasterid hydrocoral colonies	Point/Presence	Area: planning units selected by

Stylasterid hydrocoral reef	Point/Presence	presence Buffer area*
Habitats and ecosystems		
Seamounts	Point/Location	Buffer area of 20 km based on mean size
Submarine canyons	Polygon	Identified by bathymetry
Fjords with glacial influence	Polygon	Polygon of fjord
Fjords without glacial influence	Polygon	Polygon of fjord
Sand bottom habitats	Polygon	Reported distribution
Sand and mud bottom habitats	Polygon	Reported distribution
Gravel bottom habitats	Polygon	Reported distribution
Gravel and sand bottom habitats	Polygon	Reported distribution
Mud bottom habitats	Polygon	Reported distribution
Other		
Top predators feeding grounds	Polygon	50 % utilization distribution contour of kernel analysis
Stop-over feeding areas for migrating birds	Line	Shoreline

*Based on published data and/or expert opinion

TABLE S4 Description of the High Conservation Value Areas (HCVAs) proposed in the conservation portfolio for the Channels and Fjords of Southern Chile marine ecoregion.

HCVA	Area (km ²)	Conservation features & percentage of target met in each HCVA
1, Baker Channel ¹	259.01	Fjord with glacial influence (5%); presence of scleractinian cold-water corals (11%) & stylasterid hydrocorals (13%)
2, Messier Channel–Juan Stuven Island ¹	181.22	Presence of scleractinian cold-water corals (15%) & stylasterid hydrocorals (7%)
3, Messier Channel–Farauhac Island ¹	282.29	Presence of scleractinian cold-water corals (11%) & stylasterid hydrocorals (7%); watching areas for Chilean dolphin <i>Cephalorhynchus eutropia</i> (7%) & Peale’s dolphin <i>Lagenorhynchus australis</i> (1%); fjord with glacial influence (3%)
4, Fallos Channel ¹	85.64	Presence of stylasterid hydrocorals (13%) & southern river otter <i>Lontra provocax</i> (2%)
5, Ladrillero Channel: continental shelf area ¹	4,263.40	Spawning area of southern blue whiting <i>Micromesistius australis</i> (51%); presence of sea otter <i>Lontra felina</i> (13%), southern river otter (8%), scleractinian cold-water corals (7%) & stylasterid hydrocorals (7%); haul-out (5%) & breeding areas (6%) of South American fur seal <i>Arctocephalus australis</i> , haul-out areas of South American sea lion <i>Otaria flavescens</i> (10%) & breeding colonies of rockhopper penguin <i>Eudyptes chrysocome</i> (11%); presence of submarine canyons (5%)
6, Ladrillero Channel: oceanic area ²	8,562.96	Critical area for the conservation of seamounts (11%) & submarine canyons (53%)
7, Wide Channel ¹	154.07	Potential feeding ground of humpback whale <i>Megaptera novaeangliae</i> (13%); watching areas for Chilean dolphin (4%)
8, Trinidad Channel ¹	323.31	Presence of sea otter (13%) & southern river otter (7%)
9, Madre de Dios ¹	194.82	Stylasterid hydrocoral reef (100%)
10, Última Esperanza Sound ¹	28.59	Fjords without glacial influence (2%)
11, Estero Worsley ¹	45.46	Fjords without glacial influence (2%)
12, Almirante Montt Gulf	186.86	Fjords without glacial influence (11%)
13, Estero de las Montañas - Santa María Channel ^{1,3,4}	98.37	Fjords without glacial influence (5%)
14, Montt Channel ^{1,4}	50.31	Presence of southern river otter (4%)

15, Obstrucción Sound ⁴	170.16	Fjords without glacial influence (10%)
16, Loma Bay ³	768.83	Stop-over feeding areas for migrating birds (76%); watching areas for Commerson's dolphin <i>Cephalorhynchus commersonii</i> (16%); bottom habitats of sand (2%), gravel (6%) & mixed gravel & sand (5%)
17, Santiago Bay	100.00	Watching areas for Commerson's dolphin (3%); bottom habitats of gravel (5%)
18, Desolación ¹	900.00	Bottom habitats of sand (11%) & mixed gravel & sand (3%); breeding colony of macaroni penguin <i>Eudyptes chrysolophus</i> (4%), rockhopper penguin (3%) & South American fur seal (2%); presence of seamounts (1%)
19, Magellan Strait ^{1,4}	1,989.24	Relevant area for cetacean distribution; watching areas for Burmeister's porpoise <i>Phocoena spinipinnis</i> (12%), Commerson's dolphin (15%), southern right whale <i>Eubalaena australis</i> (30%), Peale's dolphin (4%) & Chilean dolphin (3%); breeding colonies of South American sea lion (6%) & Magellan penguin <i>Spheniscus magellanicus</i> (11%); area of high abundance of commercial invertebrates (21%); presence of <i>Lessonia</i> sp. (9%), <i>Macrocystis</i> sp. (10%); bottom habitats of sand (6%), mud (18%) & mixed gravel & sand (16%)
20, Francisco Coloane ^{1,3,4}	1,643.79	Relevant area for cetacean distribution; feeding ground of humpback whale (30%); watching areas for Burmeister's porpoise (2%), Peale's dolphin (2%) & Chilean dolphin (6%); breeding colonies & haul-out areas of South American fur seal (5%); haul-out sites of South American sea lion (8%); breeding colonies of Magellan penguin (6%); presence of southern river otter (11%), <i>Durvillea</i> sp. (14%) & <i>Macrocystis</i> sp. (2%); area of high abundance of commercial invertebrates (5%); presence of bottom habitats of mud (6%), gravel (7%) & mixed sand & gravel (8%)
21, Langiord Sound ¹	323.73	Watching areas for Chilean dolphin (8%)
22, Magdalena Sound ¹	453.48	Relevant area for cetacean distribution; feeding ground of humpback whale (9%); watching areas for Chilean dolphin (10%) & Peale's dolphin (2%); presence of <i>Durvillea</i> sp. (14%), <i>Macrocystis</i> sp. (3%); bottom habitats of mud (14%)
23, Magdalena Channel ^{1,4}	71.16	Area of presence of southern river otter (4%); feeding ground of humpback whale (2%)
24, Ainsworth Bay–Brokes Bay ^{1,3,4}	509.27	Fjords with glacial influence (8%); reproduction area for southern elephant seal <i>Mirounga leonina</i> (100%); watching areas for Chilean dolphin (1%) & Peale's dolphin (1%); area of presence of southern river otter (5%); high abundance of commercial invertebrates (6%)
25, Islote Albatros ^{1,4}	13.52	Breeding colony of black-browed albatross <i>Thalassarche melanophris</i> (100%)
26, Agostini Sound ^{1,4}	89.79	Area of presence of southern river otter (6%)
27, Parry Bay ^{1,4}	128.62	Fjords with glacial influence (3%); resting area for leopard seal <i>Hydrurga leptonyx</i> (93%)

28, Basket Island ^{1,4}	66.45	Area of presence of sea otter (9 %)
29, Beagle Channel–Punta Navarino ^{1,4}	183.39	Watching areas for Burmeister’s porpoise (19 %)
30, North-east and south-east areas of Beagle Channel ^{1,4}	764.08	Fjords with glacial influence (10%); presence of southern river otter (9%); watching areas for Chilean dolphin (9 %) & Peale’s dolphin (2%); breeding (2% & 1%) & haul-out areas (2% & 4%) of South American sea lion & South American fur seal; area of high abundance of commercial invertebrates (2%)
31, Año Nuevo Sound ^{1,4}	165.63	Area of presence of southern river otter (9 %)
32, Southern Cone Seas: continental shelf area ^{1,3,4}	30,709.68	Spawning area of Patagonian toothfish <i>Dissostichus eleginoides</i> (46%); feeding grounds of top predators (27%), in particular black-browed albatross (20%), grey-headed albatross <i>Thalassarche chrysostoma</i> (5%), rockhopper penguin (12%) & Magellan penguin (33%); breeding colonies of sooty shearwater <i>Puffinus griseus</i> (100%), grey-headed albatross (100%), black-browed albatross (29%), macaroni penguin (53%), rockhopper penguin (35%), Magellan penguin (33%), South American fur seal (21%) & South American sea lion (27%); haul-out sites of South American sea lion (14%); watching areas for southern right whale (7%) & Peale’s dolphin (8%); presence of sea otter (13 %) & <i>Macrocystis</i> sp. (12%)
33, Southern Cone Seas: oceanic area ^{2,3,4}	45,665.00	Presence of seamounts (16%); feeding grounds of top predators (13%), in particular grey-headed albatross (15%) & rockhopper penguin (25%)

¹Partially or totally included in priority areas identified at coarse-scale by IEB (2010)

²Partially or totally included in priority areas identified at coarse-scale by Leiva et al. (2010)

³Partially or totally included in priority areas identified at coarse-scale by CONAMA (2002)

⁴Partially or totally included in priority areas identified at coarse-scale by Tognelli et al. (2009)