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The southern river otter, huillín *Lontra provocax* (Thomas, 1908) and the marine otter, chungungo *Lontra felina* (Molina, 1782) (Mustelidae: Lutrinae) in the Southern Patagonian fjord and channel system: distribution and conservation problems

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ABSTRACT

The distribution of huillín (*Lontra provocax*) and chungungo (*Lontra felina*) in the marine environment of Aysén and Magallanes during 1977-82 and 2001-22 is analyzed. 85.3% of the huillín sightings were solitary individuals and 13.6% were females with 1-3 offsprings. 90% of the chungungo sightings were solitary animals and 10% were females with 1-2 young.

The huillín has a continuous distribution in fjords and southern channels, with a marine population probably greater than the continental one. The chungungo uses the ocean coast from the Guaitecas Islands to Cape Horn. Both species were found sympatrically on the Hermanas, Velasco, Mornington, Beauclerck and Contreras islands.

The Protected Areas in Chile are mostly terrestrial, and its importance for otter protection and its habitat is discussed. By their definition the Multiple Use Marine Protected Areas include productive activities, without certainty about their efficiency in protecting huillín/chungungo. The "Francisco Coloane" Marine Park, of only 1,506 hectares, represents the only sector in which the huillín has absolute protection, and the "Kawésqar" National Reserve, which covers the maritime territory around the "Kawésqar" National Park, brings together 82% of the salmon farming concessions in Magallanes, so its importance for the protection of huillín/chungungo is questionable.

Various activities and projects under development in the Aysén/Magallanes region are exempt from submission to the Environmental Impact Study System. The

El huillín [*Lontra provocax* (Thomas, 1908)] y el chungungo [*Lontra felina* (Molina, 1782)] (Mustelidae: Lutrinae) en el sistema de fiordos y canales patagónicos: distribución y problemas de conservación

Author contributions
All authors greatly contributed to the manuscript.

WS: coordination, sampling activity, data analysis, and manuscript writing.

JC: sampling activity, conceptualization, and manuscript reviewing.

JA: sampling activity, conceptualization, and manuscript reviewing.

AA: conceptualization, and manuscript reviewing.

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study of 1,563 projects related to marine and freshwater habitats, mentioned the huillín in only 5.4% and chungungo in 12.6% of the cases. 0.94% mentioned adverse effects, none of them on the huillín/chungungo, without mitigation, protection and/ or conservation measures for these species.

It is concluded that the situation of the huillín/chungungo in Southern Patagonia requires a thorough review of protection measures, with the establishment of protected areas and biological corridors between sectors and continental populations.

Key words: *Lontra provocax*, *Lontra felina*, Aysén, Magallanes, status and threats.

RESUMEN

Se analiza la distribución del huillín (*Lontra provocax*) y chungungo (*Lontra felina*) en el ambiente marino de Aysén y Magallanes para los períodos 1977-82 y 2001-22. El 85,3% de los huillínes fueron individuos solitarios y 13,6% fueron hembras con crías. El 90% de los avistamientos de chungungos fueron solitarios y 10% hembras con crías.

El huillín presenta una distribución continua en fiordos y canales australes, con una población marina probablemente mayor a la continental. El chungungo utiliza el litoral oceánico desde las islas Guaitecas al Cabo de Hornos. Ambas especies fueron encontradas en forma simpátrica en las islas Hermanas, Velasco, Mornington, Beauclerck y Contreras.

Las Áreas Protegidas del Estado de Chile son en su mayoría terrestres, y se discute su importancia para la protección de la nutria y su hábitat. Las Áreas Marinas Protegidas de Usos Múltiples incluyen por definición actividades productivas, sin certeza sobre su eficiencia en la protección del huillín/chungungo. El Parque Marino "Francisco Coloane", de sólo 1.506 hectáreas, representa el único sector en el que el huillín tiene protección absoluta, y la Reserva Nacional "Kawésqar", que cubre el territorio marítimo alrededor del Parque Nacional "Kawésqar", reúne el 82% de las concesiones de cultivo de salmón en la región, por lo que su importancia para la protección del huillín/chungungo es cuestionable.

Diversas actividades y proyectos productivos en desarrollo están exentos del sometimiento al Sistema de Estudio de Impacto Ambiental. De 1.563 proyectos

estudiados sólo 5,4% mencionó al huillín y 12,6% al chungungo. Sólo 0,94% mencionó efectos adversos, ninguno sobre huillín/chungungo, sin medidas de mitigación, protección y/o conservación para estas especies.

Se concluye que la situación del huillín/chungungo en la Patagonia sur requiere de revisión profunda sobre medidas de protección, con establecimiento de áreas protegidas y corredores biológicos entre sectores y las poblaciones continentales.

Palabras clave: *Lontra provocax*, *Lontra felina*, Aysén, Magallanes, estado y amenazas.

INTRODUCTION

Two otter species inhabit Southern South America: the southern river otter (huillín) [*Lontra provocax* (Thomas, 1908)] and the marine otter (chungungo) [*Lontra felina* (Molina, 1782)]. The huillín has the smallest distribution area among otters and has been historically associated with the continental water systems of Chile from 34° to 53°S (Gay, 1847; Reed, 1877; Tamayo & Frassinetti, 1980) and adjacent Argentinian territories (Chehebar, 1985; Chehebar *et al.*, 1986). However, later studies (Sielfeld, 1983, 1989, 1990, 2006; Sielfeld & Castilla, 1999; Sielfeld *et al.*, 1977) reported its presence and distribution in marine channels and fjords south of 44°S, area that probably houses the most important portion of the current population of the species.

The state of knowledge of the marine huillín population is precarious (Medina-Vogel, 1996; Medina-Vogel *et al.*, 2013) and classified as "endangered" (Ministry of the Environment (MMA), 2011), while the population associated with lakes and rivers presents serious conservation problems (González & Medina-Vogel, 2006; Medina-Vogel, 1996, 1998; Medina-Vogel *et al.*, 2003, 2008; Sepúlveda *et al.*, 2008, 2021), and represented by isolated groups restricted to the area between 39° and 44° S (Medina-Vogel, 1996). This population is considered "endangered" by the International Union for Conservation of Nature (IUCN) (Duplaix & Savage, 2018) and by the Species Classification Regulations (RCE) Wildlife of the Ministry of the Environment (MMA Supreme Decree no. 42/2011). From the Cachapoal River (34°S) to the Biobío River (39°S) it is considered an "extinct species" (MMA, 2011).

The increasing reduction in habitat quality due to vegetation removal, canalization of water courses, dredging of sand and stones for construction, predation by domestic dogs, fishing, added to the disturbance by livestock and illegal hunting practices (Chehebar, 1985; Chehebar *et al.*, 1986; Housse, 1953; Medina, 1996a; Medina-Vogel, 1996; Medina-Vogel, 2004; Porro & Chehebar, 1995), exacerbate the situation of the freshwater population. Additionally, more than 90% of the populations associated with fresh waters in Chile are outside the protected wildlife areas (Medina-Vogel, 2004; Medina-Vogel *et al.*, 2007), and land use change and watershed management have not contemplated biological corridors between these relict groups.

The chungungo inhabits marine exposed rocky coastline, covering sectors that reach up to 30 m inland and 150 m offshore along the southeastern Pacific coast (Castilla & Bahamondes, 1979; Ostfeld *et al.*, 1989). Its distribution extends from 6°S (near Chimbote, Peru) to 56°S (Cape Horn and Staten Islands, Argentina; Larivière 1998; Parera, 2002). In recent years the abundance of this species along the marine coast of central and southern Chile has been considered in decline (Medina-Vogel, 1995). Among the main causes of this decay are illegal hunting, habitat

destruction and anthropic interaction, due to an increase in human settlements and economic activities carried out in their habitat (Córdova *et al.*, 2009). Furthermore, they are accidentally caught in fishing nets used by artisanal fishermen (Rozzi & Torres-Murra, 1990).

In the marine environment south of the Corcovado Gulf (43°30'S), the condition of both otter species remains poorly documented and studied (*e.g.* Medina-Vogel *et al.*, 2006; Sielfeld, 2006), a situation that requires urgent attention regarding the growing development of activities capable of impacting the coastal marine ecosystem, and related mainly to fishing, aquaculture and the presence of wild salmonids in the environment.

The introduction of salmonids into fjords and channels of southern Patagonia and the subsequent installation of farming centers for both salmonids and mytilids, added to the effect of the various services associated with these activities is associated with various actions that significantly affect, inter- and subtidal communities (Thomas *et al.*, 2017), loss of benthic biodiversity and density (Häusserman, in: Carrere & Romo, 2021), and localized changes in the physical-chemical properties of sediments (Buschmann *et al.*, 2006).

However, the environmental impacts of aquaculture have not been foreseen, evaluated and/or mitigated by the current Environmental Impact Assessment System (SEIA) in force in Chile (Acevedo *et al.*, 2019; Thomas *et al.*, 2017).

Also, adaptation of *Oncorhynchus tschawyscha* (Walbaum, 1792) to the wild state and mass escapes of salmon that occurred in the Los Lagos Region (Salmonexpert, 2023; Sepúlveda *et al.*, 2009) and its effects on the local fauna have not been adequately studied. A study on free-living salmonids (chinook and coho salmons) in the Aysén Fjord (Oyarzún, 2011) concluded that they prey on nototheniid fish and prawns, items also identified in the diet of huillín and chungungo in fjords and channels of southern Chile (Sielfeld, 1989; Sielfeld & Castilla, 1999). Pequeño (in: Pizarro & Zolessi, 2003) estimates that, annually, the thousands of escaped salmon would consume between 1,460 to 1,825 tons of wild fish resources, consistent with Soto & Jara (1997; Soto *et al.*, 2001) who showed the existence of an inverse relationship between abundance of salmonids and accompanying fauna, both in number of species and biomass.

The installation of temporary camps by king crab fishers and artisanal hake fishers in pristine sectors, logging of the coastal forest, presence of dogs, garbage and waste and their effect on the otters has also not been evaluated.

In this note, background information on the distribution of huillín and chungungo in the marine environment of fjords and channels in Aysén and Magallanes is reported, and due to its endangered species category, its distribution in the context of the protected areas (National Parks and Reserves) is discussed. Also, the protection measures resulting from Environmental Impact Statements (DEI) and Environmental Impact Studies (EIA) of the Environmental Impact Assessment System (SEIA) associated with the environmental demands imposed by the General Law of Environmental Bases (Law 19,300 and its modifications) on projects in the marine environment of the Patagonian area, are discussed following Acevedo *et al.* (2019).

This information is discussed around the various productive activities of the area and the development of aquaculture promoted by the government in Regions X-XII, and the pressure

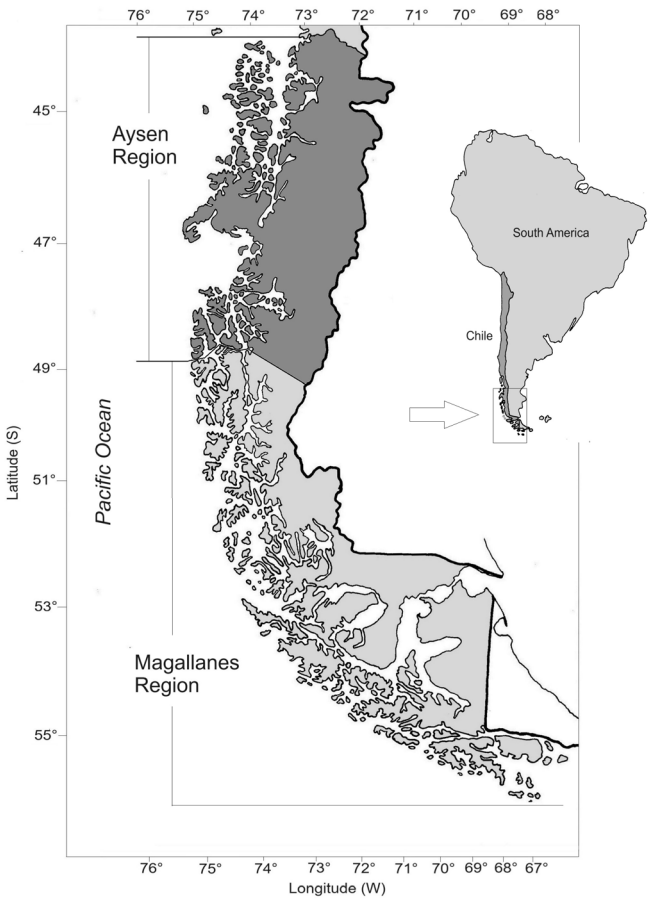


Fig. 1.
Study area in Southern Patagonia of Chile.

from the salmon industry to grant concessions within the National System of Protected Wild Areas (SNAP) derived from the drafting of Art. 158 of the current Fisheries and Aquaculture Law (Law 18,892 and its modifications) which indicates: "the lake, river and maritime areas that make up the national system of protected areas protected by the State in accordance with Law no. 18,362, will be excluded from all extractive fishing and aquaculture activities".

MATERIALS AND METHODS

Records of huillín and chungungo in fjords and channels of the Aysén and Magallanes region, from the Chonos archipelago (43°46'S) to the Cape Horn archipelago (56°00'S), and from the ocean coast to the fjords associated with continental ice fields are systematized (Fig. 1).

119 sectors (97 with conditions for huillín and 22 for chungungo) were surveyed (Appendix, Tables 1 and 2), according to previously established plans. The coordinates indicate a referential point for each of these sectors.

The data derive from the following projects and observers: Otter assessment south of Beagle Channel (W. Sielfeld: SERPLAC XII Region 1978/79) and Aysén (W. Sielfeld: FIC GORE

XI Region 2013/15 and 2020/23), otariid population assessment in Magallanes (W. Sielfeld: SERPLAC XII Region 1978/79 and FIP 2000-21), monitoring of marine mammals in the Marine Park AMCP-MU "Francisco Coloane" (J. Capella: Whalesound Ltda. & Foundation Yubarta 2001-2020), prospection of forest masses and vertebrates in protected areas of Magallanes (Sielfeld: CONAF/AONKEN, 1982/83), and baselines of marine farming projects in Magallanes (J. Capella & J. Acevedo: aquaculture farming centers of AQUACHILE Magallanes SpA, Australis Mar S.A., Salmones Blumar SpA. and Cormaq Chile S.A.). Part of this information was previously informed in technical reports (Acevedo & Sielfeld, 2014; Sielfeld, 1982, 1984), publications (Sielfeld, 1983, 1989, 1990, 1999) baseline reports (Capella, DIA "Environmental Impact Statements" and EIA "Environmental Impact Studies" of public access on the website of the Ministry of Environment) and theses (Bunster, 2023). Also, data of reports of public access (Raimilla, 2020), scientific publications (Sanino & Meza, 2016), data from the National Park Service, CONAF/Magallanes (Alejandra Silva) and georeferenced pictures and movies of otters in the AMCP "Pitipalena-Añihue" Protected Area, Aysén (Rafael Parra, Patricio Merino & Juan Carlos Cubillos) were included. Tables 3 and 4 identifies the direct observer of each of the records.

The presence of huillín/chungungo in these sectors was confirmed on visual records, by exploring the coastline on board of an inflatable boat driven by an outboard motor. Binoculars, and when possible, photography was used, according to the guidelines of the "Standard Method" recommended by the IUCNSSC Otter Specialist Group (Reuther *et al.*, 2000). The identification of huillín/chungungo was based on the specific characters indicated by Osgood (1943) and Sielfeld (1983) and the species identification key of *Lontra* Gray, 1843 by Lariviére & Walton (1998). In the water, attention was put on size, face coloration and muzzle characteristics (Fig. 2). In each sector the sites with feces, latrines, footprints and/or burrows were recorded, georeferenced and detailed in tables 3 and 4 of the appendix. The specific correspondence of indirect records (*e.g.*, spraints, feces, footprints) was attributed to the visually recorded species on each of the sites.

During the surveys of the 1977/82 period, in the eventual absence of visual reconnaissance, fox traps, adapted as "foothold traps" by installing a rubber protection were used. The traps were placed in the water, next to paths leading to the latrines in collaboration with professional otter hunters from Puerto Natales, who were hired for this purpose. The captured specimens were released once identified. In very exceptional cases, one or more individuals were hunted using a shotgun. This material was preserved and deposited in the zoological collection of the Patagonian Institute of Punta Arenas. In the sectors associated with the Beagle Channel, the northern coast of Hoste Island and Gable Island, an otter hunter of Yagan origin from Puerto Williams was hired, who operated with two dogs trained in locating otters.

The visits to these sectors lasted 2-4 days, except in the cases of Deceit Island, Wollaston Hoste, Olla Cove in the Beagle Channel, where camps lasting 20-30 days were set up.

It should be noted that the chungungo records are only referential due to logistical situations and access possibility to the oceanic shore of the region (*e.g.*, remoteness, extreme wind and sea conditions, and lack of adequate boats), needing complementary survey to understand their distribution in the area.

The analysis of salmon and mussel farming centers was based on the study of aquaculture concessions in protected areas by Farías *et al.* (2022), National Institute of Statistics-Chile: INE

Fig. 2.
General appearance and characteristics of the *rhinarium*: (a, b) *Lontra felina;* (c, d) *L. provocax.*

(2023) and in the report on regularization of aquaculture concessions in Aysén and Magallanes (Doppler, 2005; Ministry of Defense, 2016; Undersecretary of Fisheries and Aquaculture, 2024).

The geographical nomenclature used to identify the sites was based on the official navigation charts of the Hydrographic Institute of the Chilean Navy. The following abbreviations were used in site identification: Ba. = bay; C.=canal; Cta.= caleta; F.= fiord; G.= gulf; I.= island; Its.= islets; Pla.= peninsula; Pto.= port; Pta.= point; T.F. = Tierra del Fuego.

The information on number, location, and extension of the existing protected areas in Aysén and Magallanes was based on the official list of protected areas of the National Forestry Corporation (CONAF, 2019). The following acronyms were used: NP= National Park; MP=Marine Park; NR= National Reserve; FR= Forest Reserve; AMPC-MU= Multiple Use Marine Protected Area; AA= Areas Suitable for Aquaculture; MN= Natural Monument.

Fishing information was obtained from reports of the Fisheries Development Institute of Chile: IFOP (2019, 2021, 2022) and the National Fisheries Service of Chile: Sernapesca/Aysén (2022).

The information on environmental requirements and the compliance with legal obligations derived from the Environmental Law of Chile and its aquaculture project regulations was based on the results of the FIPA 2018-42 project "Methodological Standardization for the Development of Baselines and Environmental Monitoring of Marine Mammals in Chilean Jurisdictional Waters" (Acevedo *et al*., 2019) which considered the analysis of 1,476 initiatives (DIA and EIA) related to the coastal edge.

RESULTS

Origin of the data:

In 97 prospected sectors (Appendix: Table 1 and Fig. 3) 327 records (sightings + indirect signs) of huillín were made. Of these, 183 records correspond to the first period (1977-1982) and 144 to the second period (2001-2022). 85.3% of the records and 64.0% of the individuals corresponded to solitary individuals.

Species		*L. provocax*		*L. felina*	
Period	Year	Sightings (n)	%	Sightings (n)	%
	1977	2	0.61		
	1978	1	0.31		
1977-1982	1979	0	0.00		
	1980	0	0.00	2	6.7
	1981	14	4.28		
	1982	166	50.76	12	40.0
	2001	3	0.92		
	2002	5	1.53		
	2003	1	0.31		
	2004	2	0.61		
	2005	5	1.53		
	2006	6	1.83		
	2007	1	0.31		
	2008	3	0.92		
	2009	1	0.31		
	2010	1	0.31		
2001-2022	2011	1	0.31		
	2012	13	3.98		
	2013	48	14.68		
	2014	15	4.59	1	3.3
	2015	6	1.83		
	2016	5	1.53	7	23.3
	2017	11	3.36		
	2018	3	0.92		
	2019	0	0.00	4	13.3
	2020	0	0.00		
	2021	1	0.31		
	2022	13	3.98	4	13.3
	Total	327	100.00	30	100.00

Table 1.
Time scale of the otter records in Patagonian fjords and channels.

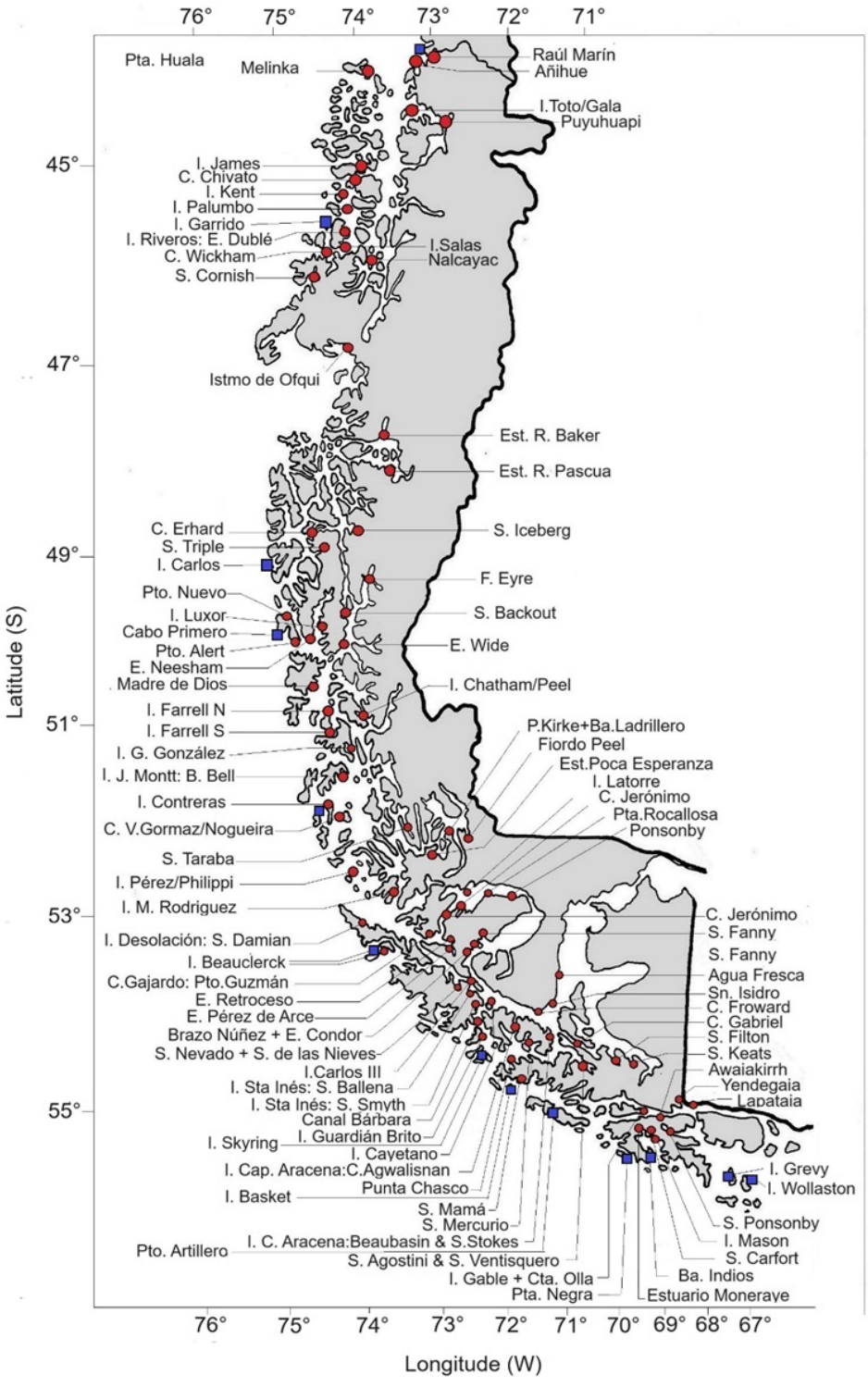


Fig. 3.
Presence of *Lontra provocax* (red dots) and *L. felina* (blue squares) along channels and fjords of Aysén and Magallanes regions.

Distribution of huillín and chungungo in fjords and channels:

The records on the huillín, prior to aquaculture development (1980-82) and during its full development (2012-14) in Aysén and Magallanes (Fig. 4), show a wide and extensive distribution, covering from the region from the fjords associated with the continental ice fields, through troughs and channels to the oceanic coast, where they are not common and replaced by chungungo (Fig. 1). Its presence in the area was recorded throughout the year, which corroborates the quality of a resident and non-migratory species.

In the northern part of Magallanes, the huillín records were concentrated mainly in sectors along the Smyth and Messier channels and islands to the west of them, with few records to the east, in the interior sectors of fjords and estuaries associated with the Southern Ice Field. Exceptions are the records from Iceberg and Eyre Fjords (Records 27 and 25 in Table 1 of the Appendix). In the other fjords associated with the Southern Ice Field (Falcon: 49°36'S; Ringdove: 49°45'S; Penguin: 50°00'S; Europa: 50°14'S; Estero Calvo: 50°37'S), even though they were visited during the surveys of the years 1978/79 and 1981/85, no records were made, so their abundance is probably very low or non-existent. A similar situation occurred in the Ventisquero, España and Romanche fjords in the Beagle Channel, corresponding to the Ice Field of the Darwin Mountain range of Tierra del Fuego, also visited during 1981/85 (Sielfeld, 1982).

The chungungo was recorded in sectors of the oceanic coast of Aysén and Magallanes, as far south as the Cape Horn Archipelago (Records 20, 21 and 22 in Table 2 of the Appendix).

Huillín and chungungo were recorded in sympatric conditions on the Hermanas Islands and Velasco Islands in the Pitipalena/Añihue sector (43°50'S/73°02'W), Mornington Island: Puerto Alert (49°50-53'S/ 75°15'W), Beauclerck Islands (53°10'S/73°56'W) and Contreras Island (51°38'S/74°51'S).

Contiguous findings of huillín (H) and chungungo (Ch) were observed in: 1.- Canal Darwin sector (Ch) and Islas Salas/Palumbo (H); 2.- Isla Carlos sector (CH) and Canal Erhard (H); 3.- Isla Capitán Aracena sector: Agwalisnan Channel (H) and Skyring Island (Ch); 4.- Seno Año Nuevo sector (H) and Bahía Indios (Ch) on Hoste Island.

The Chilean Protected Areas and the distributional area of huillín and chungungo:

Much of the islands, fjords, and channels of Aysén and Magallanes are part of the Protected Area System of Chile (SNASPE) (Fig. 4; Table 2), where due to their original conception, only the MP "Francisco Coloane" and the NR "Kawésqar", are extensive to the marine environment.

The NP "Bernardo O'Higgins" and the NP "Alberto de Agostini" mainly terrestrial in its origin, are currently considered to include internal Waters and the sea within its perimeter, and within which aquaculture is not possible [Dictamen de Contraloría de la República (Opinion of the National Comptroller) No. 38,429 of 06/18/2013]. According to the same opinion, this measure would not be extended to the concessions previously granted in these sectors. The inclusion of inland waters within the limits of the "Cape Horn" NP is currently under evaluation (pers. com. Alejandra Silva, CONAF XII Region). The NM "Los Pingüinos" near the second Narrow of the Magellan Strait is not included because there are no habitat conditions and reports of otters in this site.

Region	National Parks	Marine Parks	National Reserves	Marine Protected Areas
Aysén	NP Isla Guamblin		NR Katalyxar	AMPC-MU Pitipalena-Añihue
	NP Isla Magdalena		NR Guaitecas	
	NP Laguna San Rafael			
	NP Queulat			
	NP Melimoyu			
Magallanes	NP Alberto de Agostini	MP Francisco Coloane	NR Kawésqar	AMPC-MU Seno Almirantazgo
	NP Kawésqar	MP Diego Ramírez-Paso Drake		AMPC-MU Francisco Coloane
	NP Yendegaia			
	NP Bernardo O'Higgins			
	NP Cabo de Hornos			
	NP Karukinka			

Table 2. Protected areas of the state protected areas system (SNASPE) with coastal and island sectors of the southern zone of Chile (CONAF, 2019; Jarpa *et al*., 2019).

The AMPC-MU "Francisco Coloane" is extensive to a portion of the Strait of Magellan, between the Seno de la Nieves (excl.) at the entrance of the Bárbara Channel, and the Jerónimo Channel, up to Estero Bending (Ministry of Defense, 2003). It includes habitat and presence of huillines. The MP "Francisco Coloane" is located inside the previous area, and only covers 1,506 hectares between Carlos III Island and Rupert Island.

The NR "Kawésqar" corresponds to the marine expanse of the exclusively terrestrial NP "Kawésqar" (Friedlander *et al*., 2021), includes 196 aquaculture concessions, granted or in process, of which 144 are salmon farms (Table 3), and 23 other areas considered suitable for aquaculture (AAA) but not yet concessioned, and another 2 partially concessioned (Table 4).

The AMCP-MU "Pitipalena-Añihue", AMCP-MU "Seno Almirantazgo" and AMCP-MU "Francisco Coloane" are subject to a "multiple use" regime, which does not exclude the development of sustainable activities, such as tourism, shipping traffic, artisanal fishing management areas, among others. These areas only include huillines.

Unlike the other two Coastal Marine Protected Areas, the AMCP-MU "Pitipalena-Añihue", which extends in the northern part of Aysén, from Punta Huala to the Guaquel Islands, passing through the estuary of the Palena River and the Refugio channel, housing huillines and chungungo in sympatry (Sanino & Meza, 2016).

The various National Parks and National Reserves are administered by the National Forestry Corporation (CONAF). Its supervision and administration will be transferred to the recently created Biodiversity and Protected Areas Service (SBAP) dependent on the Ministry of the Environment, for which there is a period of 3 years from the creation of that service, which has a deadline to become operational until September 2024 (Law 21600 of December 23, 2023, of the MMA). The transfer must be completed by September 2027.

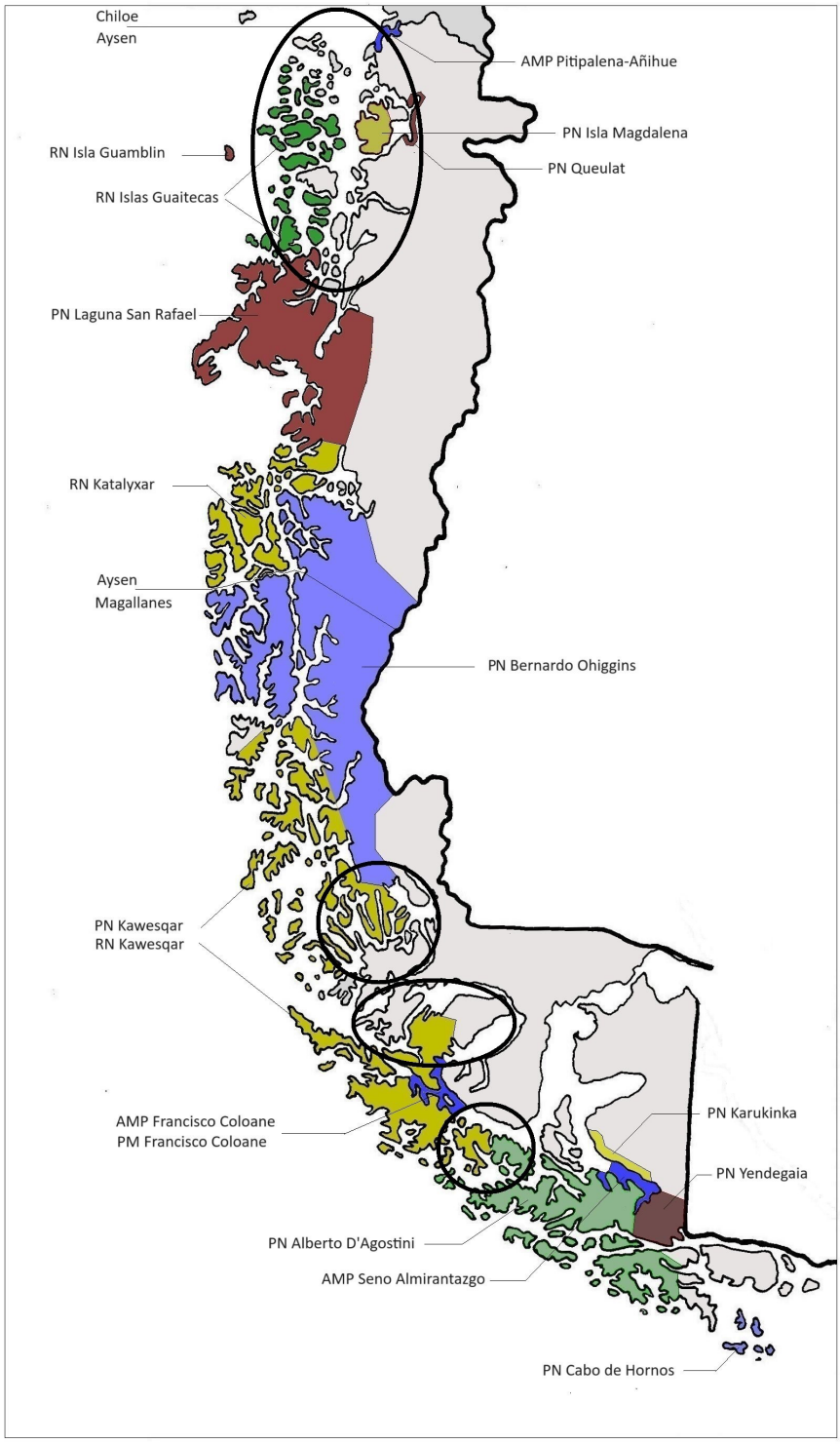


Fig. 4:
Protected Areas of Aysén and Magallanes Region showing actual sectors with salmon culture

The NP "Kawésqar" deserves a special mention, whose creation (Supreme Decree no.6 of January 26, 2018) was based on the disaffection of the FR "Alacalufes" by Supreme Decrees no.135, April 24, 1985, and no.618, December 3, 1987. Of these conservation units, the FR "Alacalufes" included bays, estuaries, and sea inlets. With the development of the Law of Environmental Bases of Chile (Law 19,300, of March 9, 1994), this is reaffirmed in its article 36, which states "the portions of the sea will be part of the protected areas of the Protected Areas System, beach lands, sea beaches, lakes, lagoons, reservoirs, water courses, swamps, and other wetlands, located within its perimeter. However, the disaffection of the FR "Alacalufes" and the creation of the NP "Kawésqar" (Supreme Decree No. 6) states explicitly that only the land surfaces of the FR "Alacalufes" will be considered, losing all significance for the conservation and protection of the huillín, the chungungo, and their coastal habitats. Furthermore, the decree adds that the marine part of the former FR "Alacalufes" will remain as the NR "Kawésqar", under the administration and management of the National Forestry Corporation (CONAF).

Productive activity within the distributional area of the huillín and chungungo:

The Regions of Aysén and Magallanes support an important productive activity of hydrobiological resources, which focuses on crops and extraction of fishing resources by the artisanal and industrial sector. These activities are summarized as follows.

Aquaculture:

Aysén and Magallanes together have 561 marine concessions with 339 operational salmon farming centers. Fig. 4 shows the areas of concentration of these concessions and their relationship with the Protected Areas.

Inside the protected areas of the Aysén Region there are 346 granted + in process aquaculture concessions and 119 relocations of centers from Chiloé Region (Table 3), all of them directed to salmon farming, except for 28 concessions without indications. The region does not have centers dedicated to mytiliculture. All concessions are in channels and fjords associated with the National Reserves and National Parks of the region (Fig. 4). Of the current concessions, 293 salmon farming centers are operational, all of them located north of the Taitao peninsula (47°S).

The Magallanes Region has 215 aquaculture concessions, of which 163 are for salmon farming, 46 for mussel farming and 6 for algae cultivation (Table 3). Of these, 191 concessions (= granted + in process + relocations) (= 88.8%) are in the MR "Kawésqar". Only 19 concessions, all for salmon farming, are in sounds and channels of the NP "Alberto de Agostini". 4 salmon farming concessions granted in 2005 for the Beagle Channel, were subsequently expired in in mid-2009. The seawater salmon farming industry is still in development phase in Magallanes, now with 46 operational centers.

The aquaculture potential of both regions remains underutilized, with the Aysén region having 35 Areas Suitable for Aquaculture (AAA), not yet concessioned, and another 8 only partially concessioned, all of them around the NR "Guaitecas", while in the Region of Magallanes within the NR "Kawésqar", 23 non-concessioned AAAs and 2 partially concessioned AAAs stand out (Table 4).

AYSÉN REGION					
Granted + in process	S	M	A	Nd	TOTAL
NR Guaitecas	337				337
NP I. Magdalena	4				4
NP Laguna San Rafael	3				3
NR Katalyxar	1				1
NR Bernardo O´Higgins	1				1
Subtotal	346				346
Relocations					
NR Guaitecas	90			25	115
NP I. Magdalena	1			1	2
NP Laguna San Rafael				2	2
Subtotal	91			28	119

MAGALLANES REGION						
	Granted + in process	S	M	A	Nd	TOTAL
NR Kewéskar	I. Chatham			6		
	NE Pla. Staines	7				
	Pla. Roca: Estero Resi		1			
	Pla. Roca: Estero Borcosky		3			
	Pla. Las Montañas: Seno Taraba	13				
	Pla. Antonio Varas: I. Donoso	1				
	Pla. Barros Arana: Ba. Ladrillero	3	2			
	Pla. Barros Arana: E Estero Poca Esperanza	13	2			
	Pla. Barros Arana: W Estero Poca Esperanza	10	6			
	SW Pla. Muñoz Gamero		8			
	Ba. Beaufort: Canales y esteros	21	16			
	I. Desolación: Estero Córdova	13				
	Golfo Xaultegua: Ensenada Colocolo	10				
	Golfo Xaultegua: Pta. Frontón	3	5			
	Golfo Xaultegua: Pta. Spoerer	8				
	Golfo Xaultegua: Ba. Buckle	2				
	Golfo Xaultegua: Pta. Guzmán	1				
	Canal Gajardo: Pto. Gómez		1			
	Seno Skyring: Canal Bertrand e I. Grande	22				
	Subtotal	127	43	6		176
	Relocations					

Table 3. Existing aquaculture concessions in Aysén and Magallanes (data from Farías *et al.*, 2022). S= salmoniculture; M= mytiliculture; A=algiculture; Nd= not defined. I= island; Pla. = peninsula; Ba. = bay; Pta.= point; Pto. = port.

	I. Clarence: Seno Dineley	5			
	I. Clarence: Canal Pedro	6			
	I. Clarence: Canal Agwalisnan	3			
	I. Clarence: Seno sector S	1			
	Subtotal	15			15
	Surrounding the RN				
	Sector Última Esperanza	2	3		
	Subtotal	2	3		5
	Total RN Kewésqar	144	46	6	196
NP A. de Agostini	I. Capitán Aracena: Seno Petite	3			3
	I. Capitán Aracena: Seno Lyell	3			3
	Pla. Brecknock: Seno Chascos	4	0		4
	Subtotal	19			19
	TOTAL				215

Table 4. Areas Suitable for Aquaculture (AAA) by protected areas and not yet concessioned, either partially or totally (data from Farías *et al*., 2022).

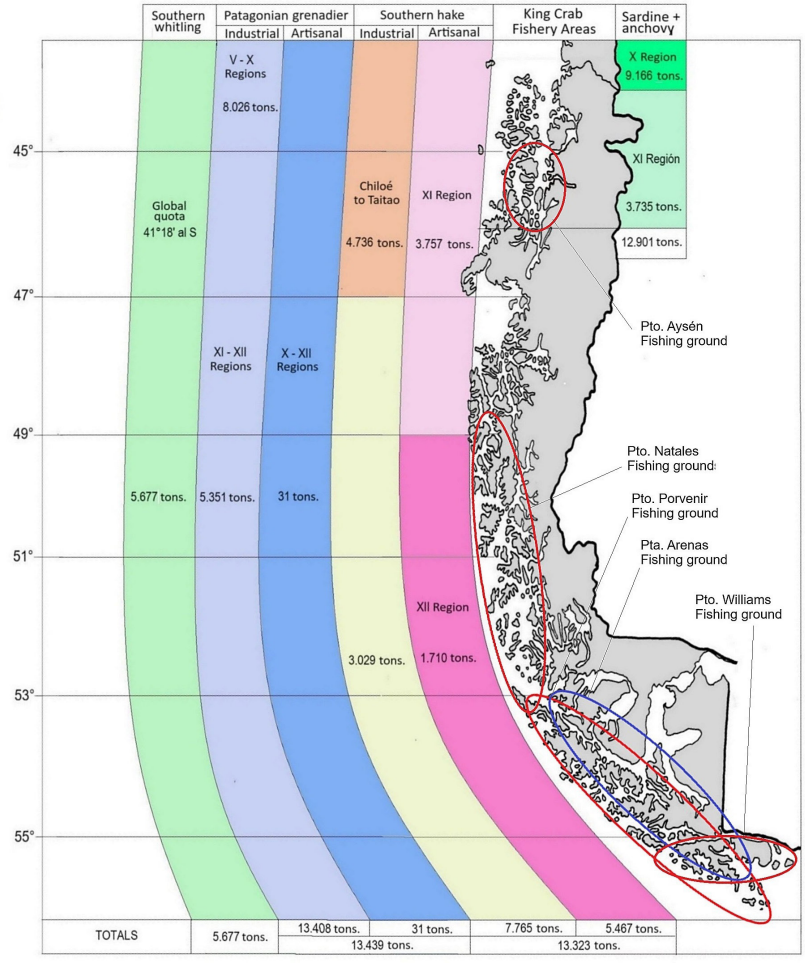
Sectors	Not concessioned AAA	partially concessioned AAA	Total
NR Guaitecas	35	8	43
NP Isla Magdalena			
NP Laguna San Rafael			
NR Katalyxar			
NR Bernardo O'Higgins			
NR Kewasqar	23	2	25
NP Alberto de Agostini			
Total	58	10	68

Fishing:

The Aysén Region has 19 Areas for the Management and Exploitation of Benthic Resources (AMERB), of which the Melinka and Repollal sectors in the Islas Guaitecas commune, Puerto Gaviota, Puerto Cisnes, Puyuhuapi, Melimoyu, Isla Gala, Isla Toto and Puerto Santo Domingo, in the commune of Cisnes, stand out in the distribution area of the huillín.

Added to the above is the operation of 25 Southern king crab trapper vessels and 37 marble jaiva [*Metacarcinus edwardsii* (Bell, 1835)] fishermen that operate in the canal system north of Paso Tres Cruces (45°60'S).

The Magallanes Region does not have management areas assigned to artisanal fishing, a sector focused mainly on the extraction of Southern king crab [*Lithodes santolla* (Molina, 1782), false Southern king crab [*Paralomis granulosa* (Hombron & Jacquinot, 1846)], pink cusk-eel [*Genypterus blacodes* (Schneider, 1801) and scallops [*Austrochlamys natans* (Philippi, 1895) and *Zygochlays patagonica* (King, 1832)]. These activities include the installation of seasonal fishing



Southern hake	13.323 tons.
Patagonian grenadier	13.439 tons.
Southern whitling	5.677 tons.
Sardine & anchovy	12.901 tons.
TOTAL	45.340 tons.

Figure 5. Southern Chilean Fisheries and Southern King Crab fishing grounds (sources: SERNAPESCA, 2023; IFOP, 2019-2021).

camps on the coast of the islands of the NPs "Bernardo O'Higgins", "Kawésqar", "Alberto de Agostini" and "Cabo de Hornos", and the fishing areas assigned to Puerto Natales, Punta Arenas and Porvenir largely overlap with the NR "Kawésqar" (Fig. 5).

Finally, the zone also supports the so-called "Southern Fisheries" focused on the extraction of Southern blue whiting (*Micromesistius australis* Norman, 1937), Patagonian grenadier (*Macruronus magellanicus* Lönnberg, 1907), Southern hake (*Merluccius australis* (Hutton, 1872), with an industrial regime that operates outside the island sectors, and an artisanal regime inside channels, gulfs and bays. Fig 3 shows authorized catch quotas and the respective fishing areas. In the Los Lagos Region: in particular the Chiloé Inland Sea and Corcovado Gulf, and in the Aysén

Region: part of the Corcovado Gulf and Moraleda Channel, artisanal purse seine fishing is also carried out for southern sardines [*Sprattus fueguensis* (Jenyns, 1842)] with an annual catch of around 13,000 tons per year.

The applicable legal framework:

The hunting of huillín and chungungo was prohibited in Chile by Ordinance 17 of August 29, 1892, of the President of the Republic, Manuel Montt Álvarez, and its subsequent renewal in 1893 for 4 years through Law No.83. Faced with the continuous pressure for the reopening of seal and otter hunting, the government of the President of the Republic, Germán Riesco rewoked the Ordinance in December 24, 1903, so that hunting only remains regulated by the prescriptions of Title IV, Book 2 of the Civil Code.

In February 1922 the hunting regulations established a "total hunting ban" for huillín and chungungo, the captures stop. The subsequent Law 4,601 of June 18, 1929, that "Establishes the provisions by which hunting will be governed in the territory of the Republic", its replacement by the Hunting Law no. 19,473 of September 27, 1996, and the current Fishing Law and Aquaculture (Law no.18,892 of 1989) maintain the hunting ban for huillín and chungungo. Despite this, in the period 1910 to 1984, 38,263 otter skins were produced in Chile (Iriarte & Jaksic, 1986).

Currently, the main problem that the huillín and chungungo populations face in Chile is not hunting, but the reduction and destruction of their habitat due to the rapid advance of urban and agricultural edges on wild areas, the intervention of the marine coastal environments due to fishing, shellfish extraction, intensive aquaculture, watershed management and intervention, among many other aspects associated and related with provisions of the Environmental Law, and the Fisheries and Aquaculture Law of Chile.

Thus, the development of aquaculture in the southern zone of Chile responds to the implementation of the National Aquaculture Policy (PNA) approved by Supreme Decree No.125 of August 1, 2003, of the Ministry of Economy, Development and Reconstruction, where the main objective establishes to "Promote the highest possible level of economic growth of Chilean aquaculture over time, within a framework of environmental sustainability and equity in access to the activity." The way in which the PNA achieves this general objective, and its principles is through the development of various specific policies and concrete actions, where economic development and public-private partnership fundamentally prevail, and the environmental issue only appears as a phrase "in a framework of environmental sustainability", without further details about the interpretation and scope of that concept.

Each aquaculture project must be submitted to the Environmental Impact Study System (SEIA) as established in Art. 10, letter n): Projects of intensive exploitation, cultivation, and processing plants of hydrobiological resources (Environmental Bases Law of Chile, No.19,300). Regarding the relevance of preparing an Environmental Impact Study (EIA), Art. 10, letter f, refers as a reference to what is stated in the Regulation of the Environmental Assessment System regarding significant adverse effects on the quality and quantity of natural resources. In any case, the legislation does not provide a clear and precise definition of what should be understood as "significant" adverse effects, leaving it to the interpretation of the project owners.

The Environmental Impact Regulation (RIA) refers in its Title I: General Provisions, Art. 3.- Types of projects or activities, to projects or activities likely to cause environmental impact, in any of their phases, freeing them from submission to the SEIA to the following types of activities related to the cultivation of hydrobiological resources (it does not clarify production times!):

Letter no. 1: Macroalgae crops with a production of less than five hundred tons (500 t) and/or cultivation area equal to or greater than one hundred thousand square meters (100,000 m^2);

Letter no. 2: Filter-feeding mollusks with a production of less than five hundred tons (500 t) and/or culture area equal to or greater than one hundred thousand square meters (100,000 m^2) in the case of macroalgae.

Letter n.3. Fishes, echinoderms, crustaceans, no filtering mollusks, and other species, through an intensive production system. A production of less than thirty-five tons (35 t).

By omission, in the updated version of the RIA (Decree no. 40 MMA, December 12, 2013), projects for the intensive exploitation of hydrobiological resources (= fisheries) that have management plans (explicit under Letter n in the initial version of the RIA: D.S. No.30, March 27, 1997) are also exempt from submission to the SEIA. In this case, it is assumed that regulation is carried out through management plans, the ecosystem approach and bycatch monitoring.

Under the previous legal framework, in practice most productive activities carried out in the huillín distribution area are not obliged to be submitted to the SEIA, except for the various services associated with these activities such as personnel transfers, inputs, silage, harvest, garbage, food, disinfections, treatment of networks, etc.

The Fisheries and Aquaculture Law (LGPA) oversees the conservation and sustainable use of hydrobiological resources (which includes huillín and chungungo) through the application of the precautionary approach, an ecosystem approach in the new fishing regulation that allows safeguarding marine ecosystems. where those resources exist. The extractive activities of the industrial quotas and the artisanal fraction of the global quota are exempt from submission to the SEIA as indicated above.

In the case of the exploitation of coastal benthic resources, the law (Paragraph 3, Art. 55a) considers a regime of Areas for the Management and Exploitation of Benthic Resources (AMERB), whose operation will be established by a Regulation (Art. 55d).

The regulation on AMERB (Decree 355/1995 and 572/2000, both from the Ministry of Economy and Reconstruction of Chile) exclusively considers aspects related to the operation and exploitation of the resources considered in the area. However, Art 15° formulates the need for a "Base Situation Study" of the area, which in point 1 b indicates "identification of the main species or species with their common and scientific name, in point 2 b "description of the benthic communities in the area, identifying the most relevant secondary species associated with them" and in point 2 c "direct quantification of the main species or species of the management project." Consequently, no reference to the presence of reptiles, birds, and mammals, in particular huillín and/chungungo is not required.

In the case of aquaculture in Chile, the environmental regulation is delivered to the fishing authority, with reference to the legal obligations contained in the Fishing and Aquaculture Law of Chile (LGPA). In compliance with this function, the ministerial authority (Ministry of Economy) has issued a group of supreme decrees that contain the specific obligations of four areas of environmental regulation for aquaculture, which are: Methodology and Application Standards: An Environmental Regulation for Aquaculture (RAMA); a regulation of Measures for the Protection, Control and Eradication of High Risk Diseases for Hydrobiological Species (RESA) and the Regulation on Hydrobiological Pests.

Of these, only the RAMA has direct relationship with the huillín and other marine mammals, which in its Art. 2 defines two types of reports: a Preliminary Site Characterization report (CPS), and a Periodic Environmental Report that validates the environmental information (INFA).

The Preliminary Site Characterization (CPS) will only be required for projects of bottom and water sectors that must be submitted to the Environmental Assessment System (SEIA) of Law 19,300 and will contain the elements that the fishing authority considers relevant for its evaluation (Title III, Art. 15°) and will be set by resolution of the Undersecretary of Fisheries.

This resolution may only establish requirements related to the description of the location and topography of the center, hydrographic characteristics of the sector, number and location of sampling sites, visual record of the area, information related to exotic benthic species, parameters and environmental variables in the sediment and water column, and their limits of acceptability, and the technical conditions under which the obtaining, transfer and analysis of the samples must be carried out (Title III, Art. 16).

Aquaculture projects in water and bottom sectors, or their modifications, that do not have to be submitted to the Environmental Impact Assessment System to obtain the sectoral environmental pronouncement, must provide information on environmental parameters and variables of the sediment contained in the resolution and referred to in article 16 of these regulations (Title III, Art. 18). Currently, these requirements are detailed in Exempt Resolution No. 361/2009 and the modifications of Exempt Resolution 1917/2023, of the Ministry of Economy, Development and Reconstruction of Chile, which do not refer to vertebrate fauna.

DISCUSSION

Data characteristics:

All the records of huillín and chungungo presented here are from after their captures for fur purposes during the first half of the last century, activity that ceased in the 1970s. The here presented 1977/82 records are prior to the intensive development of aquaculture, fundamentally salmon farming, and the records of the 2001/22 period correspond to the beginning phase of aquaculture in the regions of Aysén and Magallanes. In that way they represent a robust baseline for the environmental evaluation of these activities and other projects planned in the two southernmost regions of Chile.

This information is also essential to address the environmental risks associated with land-based salmon farming (RAS) projects that constitute the next level of development of that

activity (Fothergill, 2020), already under development in Norway in Indre Rossøy. This type of activities operates based on a water recirculation system that reduces pollution and eutrophication of the marine environment but is associated with a process of profound modification of the coastal environment, both by the cultivation facilities and those of the associated services (roads, buildings, piers and ports).

Distribution of huillín and chungungo:

The wide distribution of the huillín in the estuarine/marine environment of the Southern fjords and channels shows that the marine distributional area of the huillín is greater than the freshwater continental distributional area, and that the marine population presents a continuous and very different from the distribution through isolated patches that characterizes the species in the continental environment (Medina-Vogel *et al.*, 2023).

The low productivity of the continental water systems south of the Taitao Peninsula (47°S), fed mainly by meltwater and rainwater, also determines a trophic spectrum made up of estuarine and marine species (Sielfeld, 1989, 2006), an aspect that fully supports its consideration in the group of marine mammals of Chile (Sielfeld & Castilla, 1999).

The presence and distribution of the huillín in estuarine/marine environments is a condition also described for other lutrinid species from rivers and lakes, as for example *L. canadensis* on the Pacific coasts of Trinidad Bay, California (Shannon, 1997); Atlantic coast of Newfoundland in Canada (Cote *et al.*, 2008; Nolet *et al.*, 1993), *Lutra lutra* in fjords of Norway (Heggberget, 1993), Scotland (McMahon & McCafferty, 2006) and the coasts of Wales, England (Liles, 2009); coasts of Portugal (Beja, 1996); and *Aonyx capensis* on the southeast coast of South Africa facing the Indian Ocean (van der Zee, 1982 a & b).

The interior sectors of the fjords associated with the Southern Ice Field and the Darwin Mountain Range and presented an absence/scarcity of huillines, are generally characterized by the vertical stratification of the water column, whose salinity generates two characteristic layers. Of these, the surface level can reach up to 15-20 m depth, with very low salinity due to melting ice, that can reach values lower than 1 psu at the head of the fjords (Sievers & Prado, 1994; Silva *et al.*, 1997) and low nutrient concentration (0.0-0.8 µM phosphate, 0.0-0.8 µM nitrate) (Silva, 2008). Furthermore, the presence of constrictions at the outlets of the fjords alters the tidal wave, which in some cases can be attenuated by up to 88%, ceasing to be a determining factor for the dynamics of the system (Pinilla *et al.*, 2023). These conditions probably determine a lower availability of the huillín's inter- and subtidal prey and their absence and/or lower abundance.

Due to the above, the NR "Bernardo O'Higgins" is only partially interesting for the conservation of the huillín and chungungo (sector west of the Messier/Escape/Wide channels), where a large part of the distributional area of the huillín corresponds to the NRs "Guaitecas Islands" and "Katalyxar", the NPs "San Rafael", "Kawésqar", "Francisco Coloane" and "Alberto de Agostini", and the NR "Kawésqar". The parks and reserves do not contemplate contiguous sea, except for the NR "Kawésqar", which represents the sea contiguous to the NP "Kawésqar". Controversially, 346 aquaculture concessions (97.4%) of the existing concessions in Aysén are located within the perimeter of the NR "Guaitecas Islands", and 191 concessions (88.4%) of the Magallanes concessions are located within the NR "Kawésqar".

The presence of chungungo is incomplete and fragmentary but appears to be fundamentally restricted to environments with great exposure of the oceanic coast, although it makes incursions into protected sectors of interior channels (Bunster, 2023; Sielfeld *et al.*, *in prep.*) for the Pitipalena sector: Aysén. It must therefore be presumed that both otter species coexist sympatrically along an ecotonal strip that separates the open ocean coastline and the inland coastline of fjords and channels (Sielfeld, 1989). Situations of this style have been studied by Cursach *et al.* (2012) and Bunster (2023), reporting that the huillín avoids ocean wave breaking conditions, while *L. felina* is fully adapted to these conditions throughout its entire distribution area (Sielfeld *et al.*, *op. cit.*), also entering protected environments without waves and even estuarine sectors.

Important areas for the presence of both species, and where they apparently are sympatric, are from north to south Pitipalena Bay, Darwin Bay, Castillo Canal, Ladrillero Gulf, Trinidad Gulf, Concepción Channel, Nelson Strait, Sarmiento de Gamboa Gulf/Contreras Island, Stokes Bay / Cockburn Channel, Stewart Bay, Cook Bay, Año Nuevo Sound/South Bay and Nassau Bay (Fig. 3; Annex: Tables 1 and 2). Other sectors with the probable presence of both species and that require prospecting are Kent Island/Melchor Island, Hoppner Bay, San Quintín Bay, Tarn Bay, Fallos Channel and Beaufort Bay.

Otters and protected areas

The National Parks and National Reserves of Chile are in its origin extensive to terrestrial territories and therefore with an uncertain degree of application in the conservation of the huillín and chungungo, their habitat, and coastal marine fauna and flora in general. Unlike all other protected areas, the creation of the former FR "Alacalufes" represented an important advance in the protection of the huillín and chungungo, their habitat and a series of other species of the marine coast, beyond the hunting prohibitions imposed. by the Hunting Law No. 19,473 and the General Fisheries and Aquaculture Law no. 18,892 and its modifications, by including bays, estuaries, estuaries, and sea inlets in its perimeter. However, with its disaffection and the creation of the NR "Kawésqar" (by Supreme Decree No. 6), which explicitly states that it considers only the land surfaces of the reserve, it loses all significance for the conservation and protection of the huillín, the chungungo and their habitat.

The AMPC-MUs "Pitipalena-Añihue", "Seno Almirantazgo" and "Francisco Coloane" corresponds to maritime territories subject to a "multiple use" regime that includes aquaculture concessions, shipping traffic, and fishing management areas. artisanal, shellfish and algae extraction, port areas, among other anthropogenic activities, so its importance and efficiency for the conservation of huillín and chungungo is limited.

The AMPC-MU "Pitipalena-Añihue", which extends in the northern part of Aysén from Punta Huala to the Guaquel Islands, passing through the Palena River estuary and the Refugio canal, includes huillín and chungungo in sympatry. However, the extent of the area and the populations of huillín and chungungo are very small and insufficient to ensure by itself their conservation in Aysén.

An exception is the MP "Francisco Coloane", which includes maritime territory under strict protection, including the huillín. However, it corresponds to a very limited portion of the Strait of Magellan and is inserted in the AMPC-MU "Francisco Coloane".

Consequently, even though a large part of the region of islands, fjords and channels of Aysén and Magallanes are part of the State Protected Areas System (SNASPE) (Fig. 2), the marine habitat of huillín and chungungo needs more attention.

Despite the Opinion of the National Comptroller of Chile (Dictamen 38429 of Contraloría General de la República), that excludes salmon farming from NPs, it is however not cleared, if within the NPs commercial fishing and temporal fishermen camp instalations are permitted in the 80 m shoreline and the 8 m (zona de servidumbre de pesca) established by the "Política Nacional del Uso del Borde Costero del Litoral de la República" (Decreto Supremo 475, Gobierno de Chile, 14 dic. 1994).

Then, beyond the intentions to protect the huillín that arose under the "Recovery, Conservation and Management Plan of the Huillín", as part of the Species Recovery, Conservation and Management Plans Program (RECOGE) of the Ministry of the Environment (2022- 2023), the huillín and its marine habitat, currently lack the necessary protection of its marine population in the Aysén and Magallanes regions.

Finally, Chile being the Latin American country that has the largest sea area under some category of protection (41.5% of its maritime territory according to data from the United Nations Statistics Division), the protection of coastal ecosystems is still insufficient.

Productive activity within the Huillín distributional area:

The artisanal and industrial fishing activities in Aysén and Magallanes, inside of the distribution area of huillín and chungungo are fisheries in full exploitation regime with management plans, a condition that exempts them from submission to the Environmental Impact Assessment System (SEIA) (Regulation of the Environmental Assessment System; Title I, Art. 10 letter n). These activities, however, entail invasion of pristine sectors in protected areas, human settlement, contamination with garbage and other waste, logging (mainly tepu (*Tepualia stipularis* (Hook. & Arn.) Griseb. for fuel and Guaitecas cypress (*Pilgerodendron uviferum* (D. Don) Florin for fences) with destruction of the coastal forest strip, actions with a unassessed effect on huillín and chungungo populations. Particularly in the Magallanes Region, the installation of temporary camps within protected areas by king crab capture crews stands out.

It is interesting to note that in Magallanes, areas with aquaculture concessions in inland water habitat, periodically visited, show that prior to its installation or at the beginning of its operation, huillines were sighted and/or indirectly recorded. Afterwards they were not observed again. Although the concessions are granted for a water surface, there is an important but not declared intervention on the coastline. Mooring and anchoring ropes, temporary or prolonged deposits of materials, vegetation cut or altered by the transit of people to moor, traffic of small boats very close to the shore, etc., activities that do not kill huillines, but make them emigrate and look for new territories (pers. obs. authors).

In the case of salmon farming, the eutrophication of fjords and canals has been recognized as one of the main environmental risks associated with this activity in Chile (Buschmann & Pizarro, 2002; Buschmann *et al*., 2006; Soto & Norambuena, 2004). Wang *et al*. (2012) has estimated that in Norwegian salmon farming, of the total food input, 70% of the C, 62% of the

N and 70% of the P are released into the environment. In the case of salmon farming by Aysén, Niklitscheck *et al.* (2013) found that 154 centers in 2010 would have unloaded 12,300 tons. of N and 1,600 tons. of P.

The potential impact of the above is difficult to evaluate due to dilution and rapid absorption by microorganisms in the water column (Quiñones *et al.*, 2019). However, the most important effect is the accumulation of organic material on the seabed (Aranda *et al.*, 2010; Findlay *et al.*, 1995; Hargrave, 2010; Kutti *et al.*, 2007), a condition that can produce a reduction of the oxygen dissolved in the water column and the oxy-redox potential of the sediments (Hargrave *et al.*, 1993; Sanz-Lázaro & Marín, 2008). If the flow of organic material is high enough, conditions of hypoxia and anoxia also form in surface sediments, where macrofauna that require oxygen for respiration cannot survive (Haya *et al.*, 2001) and limit the presence of top predators of the system, among them huillín and chungungo. In the Huillín Recovery, Conservation and Management Plan (MMA, 2023), the physical, chemical, and biological contamination of the marine environment of Chiloé, Aysén and Magallanes is considered of high severity, medium scope and high irreversibility.

Salmon farming is also associated with massive harmful algal blooms (HABs), whose relationship with the contribution of nutrients by salmon farming is a matter of controversy (Quiñones *et al.*, 2019), however producing massive mortalities in salmon farming and affecting also human life and wildlife (Guzmán *et al.*, 2002; Iriarte *et al.*, 2005; Lembeye, 1994; Sandoval *et al.*, 2018; Uribe & Ruiz, 2001).

Salmon farming center also discharge a series of pharmaceutical products (antibiotics) and chemicals (disinfectants, pesticides, antiparasitics, antifouling). The fight against the infection of *Caligus rogecresseyi* Boxshall & Bravo, 2000 has led to the use of treatments with various pesticides and antiparasitics (Bravo *et al.*, 2014; Rain-Franco *et al.*, 2018), however, scientific studies on the potential impact of these products on the Patagonian ecosystem are lacking (Quiñones *et al.*, 2019). The prevention of the dispersion and reduction of pathogenic agents between cultivation centers is based on the use of various disinfectants that are ultimately transferred to the environment. There is currently no information on the total amount used by Chilean salmon farming (Bravo *et al.*, 2005) or on the impact that its use would be producing on the ecosystem.

Regarding the use of antibiotics in salmon farming, Chile has one of the highest rates of antibiotic use (Buschmann *et al.*, 2009 a, b; Millanao *et al.*, 2011) with an estimated 385, 325 and 394 tons. of active product (oxolinic acid, flumequine, tetracycline and florfenicol, mainly) during 2007 and 2008 respectively (Millanao *et al.*, 2011) and 394 tons. in 2017 (Quiñones *et al.*, 2019). These figures correspond to 732-560 grams. ambibiotic/ton. salmon produced, and its use would be 36,500 and 8,000 times greater than that used respectively in the years 2007 and 2008 for the same purposes in Norway (Millanao *et al.*, *op. cit.*).

These practices have the potential to increase the proportion of microbial resistance to antibiotics (Millanao *et al.*, *op. cit.*), with future effects on the health of salmon, wildlife and even human health (Sapkota *et al.*, 2008; Silbergeld *et al.*, 2008) and the biological balance of the aquatic environment (Fortt *et al.*, 2007), in the Chilean case of the protected areas around which salmon farming is developed, and those in which they are inserted.

A special mention deserves the presence of feral salmon in the marine environment of the regions of Los Lagos, Aysén and Magallanes, which can have significant consequences on the southern ecosystems. In this regard, between the seventies and nineties, efforts were concentrated on farming projects to establish wild populations of chinook salmon (*O. tshawytscha*) on the island of Chiloé and the Prat River; coho salmon (*O. kisutch*) on the island of Chiloé; chum salmon (*Oncorhynchus keta*), masou salmon (*Oncorhynchus masou*) and pink salmon (*Oncorhynchus gorbuscha*) in Aysén (Niklitschek *et al*., 2013). None of these breeding efforts were commercially successful, but they did have a great influence on the naturalization of chinook salmon, which invaded the entire Patagonian zone (Ciancio *et al*., 2005; Correa & Gross, 2008; Soto *et al*., 2007).

The presence of wild salmon constitutes trophic competitors of the huillín and chungungo, as well as other top predators in the region (Ortiz-Sandoval *et al*., 2015). The stomach contents of free-living chinook salmon (*Oncorhynchus tschawytscha*) and coho (*O. kisutsch*) in the Aysén Fjord indicated predation on nototheniid fishes, aplochitonid fishes, sardines [*Sprattus fuegensis* (Jenyns, 1842)] and lobsters [*Munida rugosa* (Fabricius, 1775)] (Oyarzún, 2011), species that are part of the diet of the huillín and chungungo in the southern channels (Sielfeld, 1989). Added to the previous ones are around 4 massive escapes per year, with averages of 347,139 individuals/year (over 2,000,000 individuals in the period 2013-2018) (Vivanco & Arancibia, 2019), the importance of this aspect cannot be ignored.

However, there are no studies that account for the impact of these salmon on the native fauna, mainly in the sectors that correspond to national parks and reserves. In the "Huillín Recovery, Conservation and Management Plan" (MMA, 2023), the presence of feral salmonids is classified as low severity, medium range, and high irreversibility. In general, aquaculture is classified as having high scope, high severity, and medium irreversibility. The increase in maritime traffic associated with aquaculture and associated services is also classified by the same source as high severity, low scope, and low irreversibility.

The set of actions derived from extractive activities and cultivation of hydrobiological resources and their effect on the huillín and chungungo, as well as other species that share the same coastal marine ecosystem [caranca (*Chloephaga hybrida* (Molina, 1782), flightless steamer duck (*Tachyeres pteneres* (Forster,1844), among others] have not been evaluated appropriately within the framework of "ecosystem management" as established in Art. 1°B of the General Law of Fisheries and Aquaculture (decree no. 430, Undersecretariat of Fisheries and Aquaculture, September 28, 1991). This principle is maintained in the proposal of the new Fisheries Law (which repeals the previous one) in its Art. 4: Principles, letter e (Paragraph III: Of the guiding principles).

In this regard, it must be considered that 416 concessions (29.7%) of the 1,407 aquaculture concessions assigned to 2021 between the regions of Los Lagos, Aysén and Magallanes, are inserted in marine sectors associated with the perimeter of Protected Areas, or within them, as is the case of the NR "Kawésqar" (Carrere & Romo, 2021; Doppler, 2005; Farías *et al*., 2022). Medina-Vogel *et al*. (2023) has estimated that the salmon farming area presents an overlap of 47.17% (85.77 km^2) with the distribution area of the huillín, and that the area corresponding to the distribution of aquaculture concessions is equivalent to 179.92 km^2. He also points out that 839 of 1,576 aquaculture concessions (53.2%) would be located within the distribution area of huillín in Patagonia. Although the use of the concessions is rotating and not all of them are operational,

the situation shows a scenario of inconsistencies between productive economic interests with species in conservation categories (*e.g.* huillín and chungungo), and with the protection areas for terrestrial biodiversity (parks and reserves) and marine biodiversity (NR "Kawésqar").

Finally, the environmental regulations for aquaculture in Chile (RAMA) do not contemplate regulation of the use of antibiotics in aquaculture (Buschmann *et al.*, 2009 a & b).

The legal framework and its application for the conservation of huillín and chungungo:

The huillín and chungungo are under "absolute ban" that limits the capture of these species, but the main problem of these species is not hunting, but the reduction and destruction of their habitat due to rapid advance of urban, agricultural and fishing borders on wild areas, the intervention of coastal marine environments by fishing, shellfish extraction, intensive aquaculture, watershed management and intervention, among many other aspects associated and related to regulatory permissiveness of the Environmental Bases Law, and the Fisheries and Aquaculture Law that should appropriately mediate the search of solutions for the protection and conservation of these species.

In the case of aquaculture in Chile, environmental regulation is delivered to the regulations of the fishing authority, both in the content and in the specific development of the legal obligations contained in the General Law of Fisheries and Aquaculture (LGBPA) (Bermúdez, 2007).

In summary, despite the wide distribution of huillín in channels and fjords, also used for the installation of salmon farming centers, marine areas for the exploitation of benthic resources and camps of artisanal fishermen dedicated to the extraction of sea urchins, loco abalones, scallops, king crabs, crabs and southern hake, the only measure of the Fisheries and Aquaculture Law, effectively applicable to the protection of the huillín, corresponds to Title II, Paragraph I, Art. 3° which indicates the prohibition of capture of species protected by international conventions, an aspect that fits the huillín. On the other hand, Paragraph 6 of Animal Welfare, Art. 13 f. points out: "Aquaculture must contemplate standards that protect animal welfare and procedures that avoid unnecessary suffering," which is understood to be valid both for animals in culture and those that accidentally enter the system.

The effectiveness of the above for the conservation of marine mammals was part of the objectives of the FIPA 2018-42 project (Acevedo *et al.*, 2019), in which 1,563 projects likely to cause environmental impact in the coastal marine environment and available in the Environmental Impact Assessment System for the period 2000 – 2018 (related to fishing & aquaculture, port infrastructure, urbanization & tourism, mining, energy) were analyzed. According to this study, only 22% (n=345) incorporated the marine mammal matrix, either through a bibliographic review and/or execution of field campaigns (baselines).

Of the projects with a bibliographic review, 24 species of marine mammals were reported, but 39% of them did not confirm presence/absence, even when species were reported in conservation categories of 'Vulnerable', 'Endangered' and 'Critically Endangered'.

Another 289 projects (18.5%) included field campaigns, documenting 16 species of marine mammals, corresponding to two species of pinnipeds, 12 species of cetaceans (mostly small

cetaceans) and two species of otters. Nine of the reported species are classified in one of the categories of high conservation concern in Chile.

Of the projects that incorporated the marine mammal matrix, the huillín was cited in 19 cases (5.4%) and chungungo in 43 cases (12.6%). Of these, the consideration of huillín in most cases was referred to situations associated with rivers and lakes, and in the case of the chungungo it involved projects outside the regions of Aysén and Magallanes.

Only 15 projects (0.94%) (12 EIAs and 3 DIAs) reported on potential adverse effects on marine mammals, but none included the huillín a/o chungungo.

Commitments to carry out follow-up monitoring after the installation of the projects were only included in 42 initiatives (3.5%) and the huillín in only 1 commitment (0.06%).

In summary, it highlights an inefficient application of the environmental regulatory legal framework with respect to the two otter species in marine habitats in the southern zone of Chile.

CONCLUSIONS

1.- The huillín is widely distributed in the system of channels and fjords of Aysén and Magallanes as far south as the Cape Horn archipelago, while the chungungo is distributed along the oceanic coastline of both regions. Its eventual presence on the Diego Ramírez Islands (56°30'40''S; 68°43'39''W) constitutes an important point for future research.

2.- The huillín avoids the ocean coast, while the chungungo ventures into protected sectors of gulfs and large bays, where both species can cohabit sympatrically.

3.- An important part of the channels and fjords of Aysén and Magallanes are part of the protected areas of Chile, of which the MPs "Francisco Coloane", "Alberto de Agostini", "Bernardo O'Higgins", NR "Kawésqar" and the AMPC-MU "Pitipalena-Añihue", AMPC-MU "Francisco Coloane" and AMPC-MU "Seno Almirantazgo" are extensive to the marine coast.

4.- Of the previous areas, only the MP "Francisco Coloane" offers rigorous protection to the huillín and its habitat. The NR "Kawésqar" and the Multiple Use Marine Areas (AMPC-MU) include aquaculture concessions and other productive activities that affect the littoral ecosystem and do not ensure the protection of the huillín/chungungo and their habitat.

5.- The effectiveness of the current environmental evaluation system is inefficient with respect to the protection of huillín/chungungo and its habitat, an aspect reflected in the low consideration of huillín (5.4%) and chungungo (12.6%) in studies/ environmental impact statements. Furthermore, only 0.94% referred to adverse effects on marine mammals, without mention of huillín/chunungo.

6.- In conclusion, there are no specific protection measures for huillín/chungungo in the Patagonian channels and fjords, situation that requires a profound review of specific protection efforts and strategies for both species, including an action plan focused on the establishment of protected areas throughout their distributional ranges, and considering biological corridors between these sectors and with the continental population of rivers and lakes.

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APPENDIX

N°	SECTORS	Latitude (S)	Longitude (W)
1	Piti Palena: Ensenada de las Islas	43°45.55′	72°54.55′
2	Rio Rodríguez: sector Barra	43°46.71′	72°49.71′
3	Las Hermanas It. Mayor lado N.	43°46.81′	73°01.81′
4	Añihue: Islas Velasco	43°52.10′	73°03.10′
5	I. Agnus: Pto. Bonito	43°53.66′	73°03.66′
6	I. Melinka	43°53.85′	73°44.78′
7	Estero sur Ba. Mala	43°55.52′	73°03.52′
8	I. Larga: Santo Domingo	43°58.85′	73°06.85′
9	Is. Guaquel	44°01.60′	73°07.60′
10	Canal Jacaf: Gala/Toto	44°15.85′	73°13.14′
11	Puyuhuapi	44°22.96′	72°36.20′
12	I. James: C. Ninualac	44°59.05′	73°57.08′
13	C. Pichirupa/I. Kent/I. Purén	45°06.13′	74°15.06′
14	C. Chivato, I. Melchor	45°15.83′	73°47.48′
15	Pto. Italiano, isla Palumbo	45°22.10′	74°05.53′
16	Seno Duble: Caleta Aurora	45°33,78′	74°13.43′
17	I. Salas: Canal Chacabuco	45°42.70′	74°14.58′
18	Estero Goñi, canal Wickham	45°52.30′	74°33.87′
19	Seno Cornish: Pnsla. Taitao	46°00.99′	74°41.48′
20	Estero Odger: I. Nalcayec	46°08.97′	73°46.83′
21	Istmo Ofqui: Rio San Tadeo	46°42.88′	74°06.63′
22	Estuario Rio Baker	47°57.88′	73°37.77′
23	Estuario Rio Pascua: canal Baker	48°06.28′	73°27.76′
24	Canal Erhardt: I. Wellington	48°41.59′	74°49.50′
25	F. Iceberg, al fondo	48°42.41′	73°59.79′
26	Seno Triple: I. Wellington	48°55.22′	74°45.81′
27	F. Eyre - Glaciar Pío XI	49°27.00′	74°04.00′
28	Pto. Nuevo: I. Mornington	49°03.12′	75°23.64′
29	F. Backout: I. Wellington	49°37.26′	74°28.44′
30	C. Picton: Est. Neesham	49°52.09′	75°05.81′
31	I. Luxor	49°52.12′	75°05.80′
32	Pto. Alert: I. Mornington	49°52.79′	75°14.68′
33	Estero Wide: I. Wellington	49°59.21′	74°30.73′
34	F. Peel - Glaciar Amalia	50°06.00′	73°07.00′
35	I. Madre de Dios	50°18.49′	75°18.92′

Table 1: Sectors with huillín and chungungo records in fjords and channels of Aysén and Magallanes Regions.

36	I. Chatham	50°37.85′	74°15.54′
37	I. Farrell: extremo norte	50°44.33′	74°47.60′
38	Between I. Chatham e I. Peel	50°50.19′	74°08.77′
39	I. Farrell: south sector	50°52.15′	74°55.00′
40	I. Gabriel Gonzalez	51°11.49′	74°28.45′
41	I. Jorge Montt, Ba. Bell	51°28.00′	74°48.83′
42	I. Contreras	51°37.62′	74°51.25′
43	East of Paso Kirke	52°00.67′	72°58.28′
44	Seno Taraba	52°01.10′	73°22.27′
45	E Ba. Ladrillero, Alm. Montt	52°04.37′	72°54.35′
46	I. Vidal Gormáz: C. Nogueira	52°06.32′	74°48.63′
47	Seno Brazo Hojeda, Poca Esperanza	52°09.00′	73°04.30′
48	Between I. Pérez & I. Philippi	52°11.68′	74°18.42′
49	Estero Poca Esperanza	52°11.84′	73°06.13′
50	I. Riesco, S. Skyring, Pta. Rocallosa	52°38.80′	71°59.25′
51	I. Manuel Rodriguez: C. Smyth	52°40.26′	74°44.93′
52	S. Skyring, I. Latorre	52°40.27′	72°18.71′
53	S. Skyring, E. Ponsonby	52°40.80′	71°56.33′
54	Otway, I. Grande, Canal Bertrand	52°47.21′	72°27.55′
55	I. Riesco, Estero Riquelme	52°50.77′	72°27.48′
56	I. Desolación: S. Damian	53°01.14′	73°56.73′
57	C. Gajardo, Pto. Guzmán	53°03.50′	73°01.82′
58	I. Riesco: Seno Fanny	53°04.34′	72°16.11′
59	I. Beauclerk: C. Tapia	53°08.47′	73°58.83′
60	G. Xaultegua: Est. Retroceso	53°12.32′	72°43.34′
61	G. Xaultegua: Cta. Cascada	53°13.74′	72°47.25′
62	G. Xaultegua, Est. Pérez de Arce	53°16.65′	72°44.00′
63	I. Riesco: Brazo Núñez	53°17.82′	72°30.38′
64	C. Jerónimo, Estr. Condor	53°21.32′	72°38.07′
65	Desaguadero L. Parrillar	53°26.38′	71°17.28′
66	S. de las Nieves, I.Sta.Inés	53°31.10′	72°43.24′
67	I. Carlos III	53°39.24′	72°15.30′
68	E Seno Ballena, SW Carlos III	53°40.26′	72°30.54′
69	I. Sta. Inés, S. Ballena	53°43.08′	72°37.23′
70	San Isidro, Magallan Straits	53°46.59′	70°58.20′
71	I. Santa Inés: S. Smyth	53°49.85′	72°11.87′
72	I. Sta. Inés, glaciar Helado	53°49.90′	72°27.30′

73	I. Cayetano, Pta. Elvira	53°50.08′	72°02.51′
74	Cabo Froward	53°53.10′	71°17.77′
75	I. Santa Inés: C. Barbara	54°02.12′	72°24.47′
76	I. Cap. Aracena: Cta. Beaubasin	54°04.54′	71°01.68′
77	I. Cap. Aracena: Bahía Stokes	54°11.50′	71°00.52′
78	I. Cap. Aracena: C. Agwalisnan	54°13.52′	71°37.99′
79	I. Guardian Brito: S. Vaccaro	54°14.35′	72°24.27′
80	I. Capt. Aracena, S. Mercurio	54°14.73′	71°13.74′
81	C. Gabriel, Magellan Straits	54°16.10′	70°20.40′
82	T.F., Seno Keats: B. Queta	54°21.17′	70°39.66′
83	T. F., Ba. Filton	54°22.78′	70°12.27′
84	T.F., Seno Agostini: Pta. Baja	54°28.20′	70°20.13′
85	Brecknock: Pta.Chasco	54°28.48′	71°58.89′
86	Pla. Brecknock: Seno Mama	54°36.87′	71°33.85′
87	T.F., Seno Ventisquero	54°45.63′	70°15.69′
88	Cta. 2 de Mayo: Yendegaia	54°51.72′	68°42.03′
89	C. Beagle: Lapataia	54°52.03′	68°31.15′
90	C. Beagle: Yendegaia	54°53.31′	68°43.88′
91	C. Beagle: I.Gordon/Cta. Olla	54°58.64′	69°08.70′
92	I. Hoste: Cta. Awaiakirrh	55°00.13′	69°00.34′
93	I. Hoste Seno Ponsonby	55°06.49′	68°58.13′
94	I.Hoste: Seno Ponsonby	55°08.23′	68°52.67′
95	I. Hoste: Est. Moneraye	55°12.33′	69°15.50′
96	I. Hoste: Seno Carfort	55°12.98′	68°49.44′
97	Seno Año Nuevo: I. Mason	55°17.47′	69°02.,81′

N°	SECTORS	Latitude (S)	Longitude (W)
1	Pta Huala	43°43.75′	73°02.85′
2	.Los Patos	43°44.34′	73°00.90′
3	Raúl Marin Balmaceda	43°46.19′	72°56.63′
4	I. Las Hermanas	43°46.13′	73°01.81′
5	Isl. Alleupa	43°49.43′	73°01.63′
6	Isl. Los Payos	43°50.81′	73°04.02′
7	Isl. Añihue	43°52.44′	73°03.09′
8	I. Refugio	43°52.81′	73°08.23′
9	I.Garrido, C. Darwin	45°25.39′	74°23.79′
10	I. Carlos	49°05.36′	75°36.98′
11	I. Mornington, Pto. Alert	49°52.65′	75°14.86′
12	I. Contreras, C. Charlton	51°37.92′	74°52.92′
13	I. Beauclerck, costa weste	53°11.50′	74°03.01′
14	C. Agwalisnan, I. Seebrock	54°19.17′	71°43.82′
15	I. Skyring, Pto. Tom	54°27.93′	72°03.98′
16	I. Basket, Pta. Liliana	54°44.67′	71°32.80′
17	I. Stewart, Pto. Artillero	54°57,48′	71°00.51′
18	I. Hoste, Ba. Indios	55°30.85′	69°04.77′
19	I. Hoste, Pta. Negra	55°34.38′	69°16.33′
20	I. Grevy	55°34.50′	67°42.27′
21	I. Deceit	55°52.08′	67°05.19′
22	Cta. Lientur: I. Wollaston	55°43,55′	67°18.10′

Table 2: Sectors with chungungo records in fjords and channels of Aysén and Magallanes Regions.

Site	Date	Latitude (S)	Longitude (W)	Responsible for data	I	F	H	M
Piti Palena: Ensenada de las Islas	26-03-2022	43°45.55′	72°54.55′	R. Parra	3			
Raúl Marín: C. Garrao	09-02-2022	43°49.07′	72°57.07′	C. Bunster	1		X	
Rio Rodriguez: sector Barra	01-11-2021	43°46.71′	72°49.71′	W. Sielfeld			X	
Las Hermanas Ist. Mayor lado N.	04-02-2022	43°46.81′	73°01.81′	P. Merino	1			
Las Hermanas Ist. Mayor lado S	04-02-2022	43°46.79′	73°01.79′	W. Sielfeld	1			
Rio Añihue sector bajo	05-02-2022	43°50.96′	72°59.96′	W. Sielfeld			X	
Estero sur Ba. Mala	06-02-2022	43°55.52′	73°03.52′	W. Sielfeld			X	
Añihue: Is. Velasco	Summer 2015/16	43°52.10′	73°03.10′	G. Sanino/M. Meza	1	X		
Añihue: Is. Velasco	Summer 2015/16	43°52.29′	73°03.29′	G. Sanino/M. Meza	1	X		
Bahía Añihue interior	Summer 2015/16	43°52.94′	73°00.94′	G. Sanino/M. Meza	1	X		
Bahía Añihue interior	Summer 2015/16	43°52.73′	73°01.73′	G. Sanino/M. Meza	1	X		
I. Agnus: Pto. Bonito	05-02-2022	43°53.66′	73°03.66′	J.C Cubillos	1			
I. Refugio, Pta. Melipichún	28-03-2022	43°57.42′	73°07.42′	J.C Cubillos	1			
I. Larga: Santo Domingo	06-05-2022	43°58.85′	73°06.85′	J.C Cubillos	1			
Rio Refugio	06-02-2022	43°56.91′	73°04,91′	W. Sielfeld			X	
Estero Santo Domingo	06-02-2022	43°58.89′	73°05.89′	J.C Cubillos	1			
Is. Guaquel 1	05-02-2022	44°01.60′	73°07.60′	W. Sielfeld	1	X	X	X
Is. Guaquel 2	06-02-2022	44°01.34′	73°07.34′	W. Sielfeld	1	X	X	
C. Chivato, I. Melchor	20-02-2014	45°15.83′	73°47.48′	W. Sielfeld	1			
C. Pichirupa, Is. sector S	20-02-2014	45°09.50′	74°13.44′	W. Sielfeld	1			

Table 3: Detailed list of huillín records in fjords and channels of the Aysén and Magallanes Regions (I = specimens; F= feces; H=footprints; M= dens).

C. Pichirupa, Isl. Purén	20-02-2014	45°06.13′	74°15.06′	W. Sielfeld	1			
I. Kent, Pto. María Isabel	20-02-2014	45°05.85′	74°17.57′	W. Sielfeld	1			
I. James: C. Ninualac	23-02-2014	44°59.05′	73°57.08′	W. Sielfeld	1			
Isla James: C. Ninualac	16-07-2002	44°53.30′	74°05.13′	J. Acevedo	3			
Seno Puyuhuapi	21-05-2014	44°27.23′	72°38.39′	W. Sielfeld	1	X		
Seno Puyuhuapi	21-05-2014	44°22.96′	72°36.20′	W. Sielfeld	1	X		X
C. Jacaf: I.Gala/I. Toto	06-02-2012	44°15.85′	73°13.14′	W. Sielfeld	1			
E. Odger: I. Nalcayec, E. Elefante	26.03.2014	46°08.97′	73°46.83′	W. Sielfeld	1			
Seno Cornish: Pla. Taitao	05-09-2014	46°00.99′	74°41.48′	W. Sielfeld	1	X		
Seno Cornish: Pla. Taitao	05-09-2014	46°00.37′	74°43.25′	W. Sielfeld	1	X		X
I. Rivera, Seno Duble: Cta. Aurora	25-07-2014	45°33.78′	74°13.43′	W. Sielfeld	1			
Istmo Ofqui: Rio San Tadeo	15-03-2014	46°42.88′	74°06.63′	W.Sielfeld	1	X	X	X
I. Salas: C. Chacabuco	03-09-2014	45°42.70′	74°14.58′	W. Sielfeld		X		
Estuary Rio Baker	Summer 2006	47°55.95′	73°17.09′		1			
Estuary Rio Baker	Summer 2006	47°04.88′	73°37.41′		1			
Estuary Rio Baker	Summer 2006	47°57.88′	73°37.77′		1			
Estuary Rio Pascua	Summer 2006	48°04.26′	73°33.76′		1		X	
Estuary Rio Pascua	Summer 2006	48°06.28′	73°27.76′		1			
Pto. Italiano, I. Palumbo	15-07-2002	45°22.10′	74°05.53′	J. Acevedo	1			
I. Hoste Seno Ponsonby	25-01-1977	55°06.49′	68°58.13′	W. Sielfeld	1	X	X	
East of Paso Kirke	05-01-1978	52°00.67′	72°58.28′	W. Sielfeld	1			
C. Beagle: Lapataia	15-03-1981	54°52.03′	68°31.15′	W. Sielfeld	1	X		
C. Beagle: Yendegaia	19-12-1981	54°53.31′	68°43.88′	W. Sielfeld	1			
I. Diablo: C. Beagle	10-12-1981	54°57.32′	69°07.46′	W. Sielfeld	1	X		X
I. Diablo: C. Beagle	10-12-1981	54°57.48′	69°07.93′	W. Sielfeld		X		X
I. Diablo: C. Beagle	10-12-1981	54°57.60′	69°06.97′	W. Sielfeld		X		X

I. Diablo: C. Beagle	11-12-1981	54°57.73′	69°07.10′	W. Sielfeld	1	X		X
I. Diablo: C. Beagle	11-12-1981	54°58.21′	69°07.77′	W. Sielfeld		X		X
I. Gordon: C. Beagle	13-12-1981	54°58.64′	69°08.70′	W. Sielfeld		X	X	X
I. Gordon: C. Beagle	13-12-1981	54°58.22′	69°08.25′	W. Sielfeld		X	X	X
I. Gordon: C. Beagle	13-12-1981	54°58.03′	69°08.57′	W. Sielfeld		X		X
I. Gordon: C. Beagle	13-12-1981	54°57.85′	69°09.06′	W. Sielfeld		X		X
I. Gordon: C. Beagle	13-12-1981	54°57.33′	69°09.82′	W. Sielfeld		X		
T.F., Cta. Olla	16-12-1981	54°56.43′	69°09.31′	W. Sielfeld	1	X	X	X
T.F., Cta. Olla	17-12-1981	54°57.21′	69°06.94′	W. Sielfeld		X	X	X
F. Eberhardt: I. Wellington	15-04-1982	48°41.59′	74°49.50′	W. Sielfeld		X		
F. Eberhardt: I. Wellington	15-04-1982	48°41.30′	74°49.32′	W. Sielfeld		X		
F. Eberhardt: I. Wellington	15-04-1982	48°41.41′	74°47.12′	W. Sielfeld		X		X
F. Eberhardt: I. Wellington	15-04-1982	48°41.65′	74°46.57′	W. Sielfeld		X		
F. Eberhardt: I. Wellington	15-04-1982	48°41.89′	74°46.85′	W. Sielfeld	1	X		
Seno Triple: I. Wellington	18-04-1982	48°55.22′	74°45.81′	W. Sielfeld		X		X
Seno Triple: I. Wellington	18-04-1982	48°55.94′	74°45.66′	W. Sielfeld		X		
Seno Triple: I. Wellington	18-04-1982	48°55.56′	74°46.14′	W. Sielfeld		X		
Pto. Nuevo: I. Mornington	17-04-1982	49°36.12′	75°23.64′	W. Sielfeld		X	X	X
Pto. Nuevo: I. Mornington	17-04-1982	49°36.61′	75°23.44′	W. Sielfeld	1	X		
Pto. Nuevo: I. Mornington	17-04-1982	49°36.35′	75°23.61′	W. Sielfeld		X	X	X
Pto. Nuevo: I. Mornington	17-04-1982	49°35.74′	75°23.37′	W. Sielfeld		X	X	
F. Backout: I. Wellington	14-04-1982	49°37.26′	74°28.44′	W. Sielfeld		X		
F. Backout: I. Wellington	14-04-1982	49°37.19′	74°27.97′	W. Sielfeld		X	X	
F. Backout: I. Wellington	14-04-1982	49°03.65′	74°27.76′	W. Sielfeld		X	X	
F. Backout: I. Wellington	14-04-1982	49°38.10′	74°27.92′	W. Sielfeld	1	X		X
F. Backout: I. Wellington	14-04-1982	49°37.67′	74°29.43′	W. Sielfeld		X		

F. Backout: I. Wellington	14-04-1982	49°38.08′	74°29.15′	W. Sielfeld		X	X	
F. Backout: I. Wellington	14-04-1982	49°37.52′	74°30.34′	W. Sielfeld		X		X
Pto. Alert: I. Mornington	16-04-1982	49°52.79′	75°14.68′	W. Sielfeld		X	X	X
Pto. Alert: I. Mornington	16-04-1982	49°51.57′	75°14.49′	W. Sielfeld		X	X	
Pto. Alert: I. Mornington	16-04-1982	49°50.81′	75°13.69′	W. Sielfeld	1	X		X
Pto. Alert: I. Mornington	16-04-1982	49°50.38′	75°13.80′	W. Sielfeld		X		
Pto. Alert: I. Mornington	16-04-1982	49°49.58′	75°15.99′	W. Sielfeld		X		X
F. White: I. Wellington	13-04-1982	49°59.21′	74°30.73′	W. Sielfeld		X	X	
F. White: I. Wellington	13-04-1982	49°59.90′	74°31.87′	W. Sielfeld		X		
F. White: I. Wellington	13-04-1982	49°59.49′	74°31.18′	W. Sielfeld		X		X
I. Madre de Dios	11-04-1982	50°18.49′	75°18.92′	W. Sielfeld		X		
I. Madre de Dios	11-04-1982	50°18.90′	75°18.53′	W. Sielfeld	1	X	X	
I. Madre de Dios	11-04-1982	50°19.11′	75°17.80′	W. Sielfeld		X		
I. Madre de Dios	10-04-1982	50°18.88′	75°17.29′	W. Sielfeld		X	X	X
I. Madre de Dios	10-04-1982	50°18.28′	75°17.24′	W. Sielfeld		X		
I. Madre de Dios	10-04-1982	50°18.43′	75°16.79′	W. Sielfeld		X	X	
I. Farrell: north part	08-04-1982	50°44.33′	74°47.60′	W. Sielfeld		X		
I. Farrell: north part	08-04-1982	50°44.60′	74°46.56′	W. Sielfeld		X		
I. Farrell: north part	08-04-1982	50°44.77′	74°45.33′	W. Sielfeld		X		
Between I. Chatham & I. Peel	08-04-1982	50°50.19′	74°08.77′	W. Sielfeld		X		
I. Farrell: south part	07-04-1982	50°52.15′	74°55.00′	W. Sielfeld		X		
I. Farrell: south part	07-04-1982	50°52.25′	74°54.21′	W. Sielfeld	1	X		
I. Farrell: south part	07-04-1982	50°51.99′	74°52.42′	W. Sielfeld		X		
I. Farrell: south part	07-04-1982	50°51.28′	74°51.70′	W. Sielfeld		X		
I. Gabriel Gonzalez	06-04-1982	51°11.49′	74°28.45′	W. Sielfeld		X		

I. Gabriel Gonzalez	06-04-1982	51°11.27′	74°28.47′	W. Sielfeld		X		
I. Gabriel Gonzalez	06-04-1982	51°11.27′	74°27.95′	W. Sielfeld		X		
I. Gabriel Gonzalez	06-04-1982	51°11.14′	74°27.50′	W. Sielfeld		X		
I. Gabriel Gonzalez	06-04-1982	51°11.06′	74°29.41′	W. Sielfeld		X		
I. Contreras	05-04-1982	51°37.62′	74°51.25′	W. Sielfeld		X		
I. Contreras	05-04-1982	51°37.77′	74°50.66′	W. Sielfeld	1	X		X
I. Contreras	05-04-1982	51°38.08′	74°50.36′	W. Sielfeld		X		
I. Contreras	04-04-1982	51°37.97′	74°49.17′	W. Sielfeld		X		
I. Contreras	04-04-1982	51°38.54′	74°50.06′	W. Sielfeld		X		X
I. Vidal Gormáz	03-04-1982	52°06.32′	74°48.63′	W. Sielfeld		X		
I. Vidal Gormáz	03-04-1982	52°06.59′	74°48.50′	W. Sielfeld		X		
I. Vidal Gormáz	03-04-1982	52°06.97′	74°47.42′	W. Sielfeld		X		
I. Vidal Gormáz	03-04-1982	52°07.13′	74°47.95′	W. Sielfeld		X		
I. Vidal Gormáz	03-04-1982	52°06.18′	74°47.04′	W. Sielfeld		X		
Between I. Pérez e I. Philippi	21-04-1982	52°11.68′	74°18.42′	W. Sielfeld		X	X	
Between I. Pérez e I. Philippi	21-04-1982	52°11.77′	74°19.00′	W. Sielfeld	1	X		
Between I. Pérez e I. Philippi	21-04-1982	52°12.38′	74°19.40′	W. Sielfeld		X	X	
Between I. Pérez e I. Philippi	21-04-1982	52°12.60′	74°20.41′	W. Sielfeld		X		
Between I. Pérez e I. Philippi	21-04-1982	52°12.71′	74°20.90′	W. Sielfeld		X		X
I. Manuel Rodriguez	22-04-1982	52°40.26′	74°44.93′	W. Sielfeld		X		
I. Riesco: G. Xaultegua	23-04-1982	53°03.22′	72°53.97′	W. Sielfeld		X		
I. Riesco: G. Xaultegua	23-04-1982	53°02.60′	72°53.01′	W. Sielfeld		X		
I. Riesco: G. Xaultegua	23-04-1982	53°02.16′	72°52.09′	W. Sielfeld		X		

I. Riesco: G. Xaultegua	24-04-1982	53°02.00′	72°51.24′	W. Sielfeld	1	X
I. Riesco: G. Xaultegua	24-04-1982	53°01.99′	72°51.32′	W. Sielfeld		X
I. Riesco: G. Xaultegua	24-04-1982	53°02.08′	72°52.08′	W. Sielfeld		X
I. Riesco: G. Xaultegua	24-04-1982	53°02.36′	72°52.23′	W. Sielfeld		X
I. Riesco: G. Xaultegua	25-04-1982	53°02.60′	72°52.46′	W. Sielfeld		X
I. Riesco: G. Xaultegua	25-04-1982	53°02.59′	72°52.98′	W. Sielfeld		X
I. Riesco: G. Xaultegua	25-04-1982	53°02.92′	72°53.57′	W. Sielfeld		X
I. Riesco: G. Xaultegua	25-04-1982	53°03.26′	72°53.91′	W. Sielfeld		X
I. Riesco: Brazo Núñez	25-04-1982	53°17.82′	72°30.38′	W. Sielfeld		X
I. Riesco: Brazo Nuñez	25-04-1982	53°16.46′	72°33.04′	W. Sielfeld		X
I. Riesco: Brazo Nuñez	25-04-1982	53°17.10′	72°32.17′	W. Sielfeld		X
I. Riesco: Brazo Nuñez	25-04-1982	53°17.76′	72°30.92′	W. Sielfeld		X
I. Riesco: Seno Fanny	25-04-1982	53°04.34′	72°16.11′	W. Sielfeld		X
I. Riesco: Seno Fanny	25-04-1982	53°03.65′	72°17.05′	W. Sielfeld		X
I. Riesco: Seno Fanny	25-04-1982	53°03.73′	72°16.11′	W. Sielfeld		X
I. Riesco: Seno Fanny	25-04-1982	53°03.58′	72°17.56′	W. Sielfeld		X
I. Santa Inés: S. Smyth	29-10-1982	53°49.85′	72°11.87′	W. Sielfeld	1	X
I. Santa Inés: S. Smyth	29-10-1982	53°49.17′	72°13.55′	W. Sielfeld	1	X
I. Santa Inés: S. Smyth	29-10-1982	53°48.80′	72°15.34′	W. Sielfeld		X
I. Santa Inés: S. Smyth	29-10-1982	53°48.42′	72°17.28′	W. Sielfeld		X
I. Santa Inés: S. Smyth	29-10-1982	53°48.12′	73°15.60′	W. Sielfeld		X
I. Beauclerk: C. Tapia	28-04-1982	53°08.47′	73°58.83′	W. Sielfeld		X
I. Beauclerk: C. Tapia	28-04-1982	53°09.95′	73°57.10′	W. Sielfeld	1	X

I. Beauclerk: C. Tapia	28-04-1982	53°09.44′	73°57.96′	W. Sielfeld		X		
I. Beauclerk: C. Tapia	28-04-1982	53°11.06′	73°55.72′	W. Sielfeld		X		
I. Beauclerk: C. Tapia	28-04-1982	53°11.40′	73°56.15′	W. Sielfeld		X		
I. Beauclerk: C. Tapia	28-04-1982	53°11.99′	73°55.85′	W. Sielfeld		X		
I. Desolación: S. Damian	26-04-1982	53°01.14′	73°56.73′	W. Sielfeld		X		
I. Desolación: S. Damian	26-04-1982	53°00.70′	73°58.06′	W. Sielfeld		X		
I. Santa Inés: C. Barbara	27-04-1982	54°02.12′	72°24.47′	W. Sielfeld		X		
I. Santa Inés: C. Barbara	27-04-1982	54°02.54′	72°24.80′	W. Sielfeld		X		X
I. Santa Inés: C. Barbara	27-04-1982	54°02.83′	72°24.71′	W. Sielfeld		X	X	
I. Guardian Brito: S. Vaccaro	09-10-1982	54°14.35′	72°24.27′	W. Sielfeld		X		
I. Guardian Brito: S. Vaccaro	09-10-1982	54°14.97′	72°24.23′	W. Sielfeld		X		
I. Guardian Brito: S. Vaccaro	09-10-1982	54°14.99′	72°25.13′	W. Sielfeld	1	X		
I. Guardian Brito: S. Vaccaro	09-10-1982	54°15.27′	72°24.65′	W. Sielfeld		X		
I. Guardian Brito: S. Vaccaro	09-10-1982	54°15.55′	72°23.77′	W. Sielfeld		X		
I. Guardian Brito: S. Vaccaro	09-10-1982	54°16.10′	72°21.54′	W. Sielfeld	1	X		
I. Guardian Brito: S. Vaccaro	09-10-1982	54°16.41′	72°21.27′	W. Sielfeld		X		
I. Cap. Aracena: C. Agwalisnan	07-10-1982	54°13.52′	71°37.99′	W. Sielfeld		X		
I. Cap. Aracena: C. Agwalisnan	07-10-1982	54°13.83′	71°37.74′	W. Sielfeld		X		X
I. Cap. Aracena: C. Agwalisnan	07-10-1982	54°14.34′	71°36.08′	W. Sielfeld		X		
I. Cap. Aracena: C. Agwalisnan	07-10-1982	54°14.66′	71°36.28′	W. Sielfeld	1	X		X
I. Cap. Aracena: C. Agwalisnan	07-10-1982	54°14.70′	71°37.17′	W. Sielfeld		X		
I. Cap. Aracena: Ba. Stokes	08-10-1982	54°11.50′	71°00.52′	W. Sielfeld		X		
I. Cap. Aracena: Ba. Stokes	08-10-1982	54°12.43′	71°01.54′	W. Sielfeld		X		

I. Cap. Aracena: Ba. Stokes	08-10-1982	54°12.82′	71°02.22′	W. Sielfeld		X	
I. Cap. Aracena: Ba. Stokes	08-10-1982	54°13.21′	71°03.38′	W. Sielfeld		X	
I. Cap. Aracena: Ba. Stokes	08-10-1982	54°12.54′	71°03.54′	W. Sielfeld		X	
I. Cap. Aracena: Cta. Beaubasin	07-10-1982	54°04.54′	71°01.68′	W. Sielfeld		X	
I. Cap. Aracena: Cta. Beaubasin	07-10-1982	54°04.03′	71°03.14′	W. Sielfeld		X	
I. Cap. Aracena: Cta. Beaubasin	07-10-1982	54°03.90′	71°03.42′	W. Sielfeld		X	X
I. Cap. Aracena: Cta. Beaubasin	07-10-1982	54°04.79′	71°02.74′	W. Sielfeld		X	
I. Cap. Aracena: Cta. Beaubasin	07-10-1982	54°05.01′	71°03.36′	W. Sielfeld	1	X	
T.F., Seno Agostini: Pta. Baja	04-10-1982	54°28.20′	70°20.13′	W. Sielfeld		X	
T.F., Seno Agostini: Pta. Baja	04-10-1982	54°28.07′	70°21.48′	W. Sielfeld		X	
T.F., Seno Agostini: Pta. Baja	04-10-1982	54°27.44′	70°23.19′	W. Sielfeld		X	
T.F., Seno Agostini: Pta. Baja	04-10-1982	54°26.42′	70°25.01′	W. Sielfeld		X	
T.F., Ba. Filton	05-10-1982	54°22.78′	70°12.27′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°21.17′	70°39.66′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°21.70′	70°39.80′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°21.34′	70°41.60′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°21.61′	70°40.42′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°22.70′	70°13.03′	W. Sielfeld	1	X	
T.F., Seno Keats: B. Queta	05-10-1982	54°21.90′	70°14.78′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°22.31′	70°12.90′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°21.40′	70°16.28′	W. Sielfeld		X	
T.F., Seno Keats: B. Queta	05-10-1982	54°20.39′	70°17.58′	W. Sielfeld		X	
Pla. Brecknock	12-10-1982	54°36.87′	71°33.85′	W. Sielfeld		X	
Pla. Brecknock	12-10-1982	54°37.25′	71°34.07′	W. Sielfeld		X	

Pla. Brecknock	12-10-1982	54°37.53′	71°34.49′	W. Sielfeld	1	X		
Pla. Brecknock	12-10-1982	54°38.05′	71°35.04′	W. Sielfeld		X		
Pla. Brecknock	12-10-1982	54°38.54′	71°35.45′	W. Sielfeld		X		
Pla. Brecknock	12-10-1982	54°38.94′	71°35.28′	W. Sielfeld		X		
Pla. Brecknock	12-10-1982	54°38.70′	71°33.25′	W. Sielfeld		X		
T. F., Seno Ventisquero	14-10-1982	54°45.63′	70°15.69′	W. Sielfeld		X		
I.Hoste: Seno Ponsonby	25-01-1977	55°08.23′	68°52.67′	W. Sielfeld	1			
I. Hoste: Est. Moneraye	22-10-1982	55°12.33′	69°15.50′	W. Sielfeld	1	X	X	X
I. Hoste: Est. Moneraye	22-10-1982	55°11.87′	69°15.21′	W. Sielfeld		X		
I. Hoste: Est. Moneraye	22-10-1982	55°11.89′	69°15.40′	W. Sielfeld		X		
I. Hoste: Est. Moneraye	22-10-1982	55°11.96′	69°15.61′	W. Sielfeld		X	X	
I. Hoste: Est. Moneraye	22-10-1982	55°11.94′	69°16.75′	W. Sielfeld	1	X		
I. Hoste: Est. Moneraye	22-10-1982	55°11.66′	69°16.53′	W. Sielfeld		X	X	
I. Hoste: Est. Moneraye	22-10-1982	55°11.52′	69°16.82′	W. Sielfeld		X		
Seno Año Nuevo: I. Mason	20-10-1982	55°17.47′	69°02.81′	W. Sielfeld		X		
Seno Año Nuevo: I. Mason	20-10-1982	55°17.40′	69°01.96′	W. Sielfeld		X		X
Seno Año Nuevo: I. Mason	20-10-1982	55°17.56′	69°01.80′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°12.98′	68°49.44′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°13.08′	68°49.92′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°12.25′	68°48.34′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°12.04′	68°47.81′	W. Sielfeld	1	X		
I. Hoste: Seno Carfort	17-10-1982	55°11.57′	68°47.26′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°11.38′	68°46.87′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°11.74′	68°46.44′	W. Sielfeld		X		
I. Hoste: Seno Carfort	17-10-1982	55°11.44′	68°46.28′	W. Sielfeld		X		

I. Hoste: Cta. Awaiakirrh	16-10-1982	55°00.13′	69°00.34′	W. Sielfeld		X		
I. Hoste: Cta. Awaiakirrh	16-10-1982	55°00.11′	69°02.54′	W. Sielfeld		X		
I. Hoste: Cta. Awaiakirrh	16-10-1982	55°00.49′	69°11.73′	W. Sielfeld	1	X		
I. Hoste: Cta. Awaiakirrh	16-10-1982	55°00.66′	69°11.64′	W. Sielfeld		X		
I. Hoste: Cta. Awaiakirrh	16-10-1982	55°00.87′	69°12.22′	W. Sielfeld		X		
I. Hoste: Cta. Awaiakirrh	16-10-1982	55°01.87′	69°10.99′	W. Sielfeld		X		
I. Hoste: Cta. Awaiakirrh	16-10-1982	55°59.53′	69°07.64′	W. Sielfeld		X		
I. Chatham	27-01-2001	50°37.85′	74°15.54′	W. Sielfeld	1	X		X
C. Picton: Est. Neesham	02-02-2001	49°52.09′	75°05.81′	W. Sielfeld	2	X		X
I. Luxor	06-02-2001	49°52.12′	75°05.80′	W. Sielfeld	2	X		X
G. Xaultegua: Est. Retroceso	03-03-2013	53°12.32′	72°43.34′	W. Sielfeld			X	
G. Xaultegua: Cta. Cascada	02-03-2013	53°13.74′	72°47.25′	W. Sielfeld		X	X	
G. Xaultegua: Cta. Cascada	02-03-2013	53°13.74′	72°47.26′	W. Sielfeld		X	X	
G. Xaultegua: Cta. Cascada	02-03-2013	53°13.76′	72°47.28′	W. Sielfeld		X	X	
G. Xaultegua: Cta. Cascada	02-03-2013	53°13.78′	72°47.28′	W. Sielfeld		X	X	
G. Xaultegua: Cta. Cascada	02-03-2013	53°13.87′	72°47.31′	W. Sielfeld		X	X	
G. Xaultegua: Cta. Cascada	02-03-2013	53°14.53′	72°45.21′	W. Sielfeld			X	
G. Xaultegua, Est. Pérez de Arce	s/d 2013	53°16.65′	72°44.00′	A. Silva	1			
Canal Gajardo, Pto. Guzmán	s/d 2012	53°03.50′	73°01.82′	A. Silva			X	
Canal Gajardo, Pto. Guzmán	s/d 2012	53°03.35′	73°02.30′	A. Silva			X	
I. Riesco, S. Skyring, Pta. Rocallosa	s/d 2012	52°38.80′	71°59.25′	A. Silva	1			
I. Riesco, Estero Riquelme	s/d 2013	52°50.77′	72°27.48′	A. Silva	1			
Otway, I. Grande, Canal Bertrand	s/d 2013	52°47.21′	72°27.55′	A. Silva			X	

F. Eyre - Glacier Pío XI	s/d 2012	49°27.00′	74°04.00′	J. Acevedo	1
F. Peel - Glacier Amalia	s/d 2012	50°86.00′	73°87.00′	J. Acevedo	1
F. Iceberg, inner part	s/d 2004	48°42.41′	73°59.79′	A. Silva	1
F. Iceberg, inner part	s/d 2005	48°42.48′	73°59.78′	A. Silva	1
Desaguadero L. Parrillar	s/d 2005	53°26.38′	71°17.28′	A. Silva	1
Pla. Brecknock: Pta. Chasco	s/d 2005	54°28.48′	71°58.89′	A. Silva	1
Cta. 2 de Mayo: Yendegaia	s/d 2018	54°51.72′	68°42.03′	A. Silva	1
I. Carlos III, Whalesound	15-01-2002	53°39.24′	72°15.30′	J. Capella	1
I. Carlos III, Whalesound	28.01.03	53°39.24′	72°15.30′	J. Capella	3
I. Carlos III, Whalesound	15.03.04	53°39.24′	72°15.30′	J. Capella	1
I. Carlos III, Whalesound	07.01.05	53°39.24′	72°15.30′	J. Capella	3
I. Carlos III, Whalesound	10.02.06	53°39.24′	72°15.30′	J. Capella	4
I. Carlos III, Whalesound	01.03.07	53°39.24′	72°15.30′	J. Capella	4
I. Carlos III, Whalesound	09.03.08	53°39.24′	72°15.30′	J. Capella	1
I. Carlos III, Whalesound	23.03.09	53°39.24′	72°15.30′	J. Capella	3
I. Carlos III, Whalesound	30.03.10	53°39.24′	72°15.30′	J. Capella	3
I. Carlos III, Whalesound	28.02.11	53°39.24′	72°15.30′	J. Capella	4
I. Carlos III, Whalesound	13.03.12	53°39.24′	72°15.30′	J. Capella	4
I. Carlos III, Whalesound	12.03.13	53°39.24′	72°15.30′	J. Capella	3
I. Carlos III, Whalesound	20.02.14	53°39.24′	72°15.30′	J. Capella	1
I. Carlos III, Whalesound	18.03.15	53°39.24′	72°15.30′	J. Capella	1
I. Carlos III, Whalesound	07.03.16	53°39.24′	72°15.30′	J. Capella	2
I. Carlos III, Whalesound	21.03.17	53°39.24′	72°15.30′	J. Capella	3

I. Carlos III, Whalesound	28.01.18	53°39.24′	72°15.30′	J. Capella	1		
I. Carlos III, paso Tortuoso	26.03.17	53°51.11′	72°11.88′	J. Capella	1		
I. Carlos III, paso Inglés	03.02.18	53°39.06′	72°15.18′	J. Capella	3		
I. Sta. Inés, glaciar Helado	14.02.12	53°49.90′	72°27.30′	J. Capella	1		
S. Skyring, E. Ponsonby	26.04.12	52°40.80′	71°56.33′	J. Capella	1		
S. Skyring, E. Ponsonby	26.04.12	52°40.90′	71°55.70′	J. Capella	1		
S. Skyring, E. Ponsonby	16.12.12	52°41.38′	71°54.20′	J. Capella	1		
S. Skyring, E. Ponsonby	18.01.13	52°41.11′	71°55.31′	J. Capella	1		
S. Skyring, E. Ponsonby	27.02.13	52°40.85′	71°55.88′	J. Capella	1		
Sn. Isidro, Magallan Straits	01.07.12	53°46.59′	70°58.20′	J. Capella	2		
Sn. Isidro, Magallan Straits	02.07.12	53°47.06′	70°28.24′	J. Capella	1		
G. Xaultegua, Est. Perez de Arce	02.03.13	53°13.73′	72°47.25′	J. Capella			X
G. Xaultegua, Est. Perez de Arce	02.03.13	53°13.74′	72°47.20′	J. Capella		X	X
G. Xaultegua, Est. Perez de Arce	02.03.13	53°13.76′	72°47.28′	J. Capella		X	X
G. Xaultegua, Est. Perez de Arce	02.03.13	53°13.78′	72°47.28′	J. Capella		X	X
G. Xaultegua, Est. Perez de Arce	02.03.13	53°13.87′	72°47.31′	J. Capella		X	X
G. Xaultegua, Est. Perez de Arce	02.03.13	53°14.53′	72°45.21′	J. Capella			X
G. Xaultegua, Est. Retroceso	03.03.13	53°11.76′	72°45.14′	J. Capella			X
G. Xaultegua, Est. Retroceso	03.03.13	53°11.79′	72°45.15′	J. Capella			X
G. Xaultegua, Est. Retroceso	03.03.13	53°11.98′	72°44.89′	J. Capella		X	X
G. Xaultegua, Est. Retroceso	03.03.13	53°11.98′	72°44.50′	J. Capella		X	X
G. Xaultegua, Est. Retroceso	03.03.13	53°11.99′	72°44.35′	J. Capella			X
G. Xaultegua, Est. Retroceso	03.03.13	53°12.04′	72°44.11′	J. Capella		X	X

G. Xaultegua, Est. Retroceso	03.03.13	53°12.10′	72°43.97′	J. Capella			X	
G. Xaultegua, Est. Retroceso	03.03.13	53°12.30′	72°43.43′	J. Capella	1			
G. Xaultegua, Est. Retroceso	03.03.13	53°12.27′	72°43.28′	J. Capella			X	
G. Xaultegua, Est. Retroceso	03.03.13	53°12.25′	72°43.31′	J. Capella				
S. Skyring, I. Latorre	07.03.13	52°40.27′	72°18.71′	J. Capella	1			
Est. Poca Esperanza, Hojeda	26.04.13	52°09.19′	73°03.86′	J. Capella	1			
Est. Poca Esperanza, Juarez	26.04.13	52°11.84′	73°06.13′	J. Capella				
Est. Poca Esperanza, Juarez	26.04.13	52°11.89′	73°06.09′	J. Capella		X		X
Est. Poca Esperanza, SW	26.04.13	52°14.37′	73°05.52′	J. Capella	1			
Est. Poca Esperanza, SW	26.04.13	52°14.41′	73°05.51′	J. Capella			X	
Est. Poca Esperanza, SE	27.04.13	52°15.37′	72°52.33′	J. Capella	1			
Est. Poca Esperanza, SE	27.04.13	52°15.38′	72°52.33′	J. Capella			X	
Est. Poca Esperanza, E	27.04.13	52°14.74′	72°52.89′	J. Capella			X	
Est. Poca Esperanza	28.04.13	52°11.11′	72°57.55′	J. Capella	1			
S. Skyring, I. Grande	01.12.13	52°45.03′	72°22.66′	J. Capella			X	
S. Skyring, I. Grande	01.12.13	52°45.68′	72°22.89′	J. Capella			X	
S. Skyring, I. Grande	01.12.13	52°45.83′	72°23.06′	J. Capella			X	
S. Skyring, I. Grande	01.12.13	52°46.91′	72°26.83′	J. Capella			X	
S. Skyring, I. Grande	01.12.13	52°47.04′	72°27.36′	J. Capella			X	
S. Skyring, NE	02.12.13	52°34.02′	72°20.67′	J. Capella			X	
S. Skyring, Est. Oberreuter	01.02.14	52°50.62′	71°33.36′	J. Capella	1			
I. Sta.Inés, S. Ballena	18.02.15	53°40.24′	72°17.29′	J. Capella	1			
I. Sta. Inés, S. Ballena, G. Capella	25.03.15	53°43.08′	72°37.23′	J. Capella	2			
E Ba. Ladrillero, Almte. Montt	29.08.15	52°04.37′	72°54.35′	J. Capella	1			
SW Ba. Ladrilleros, Almte. Montt	29.08.15	52°04.25′	72°55.82′	J. Capella	1			
S of Brazo Hojeda, Poca Esperanza	24.09.15	52°09.00′	73°04.30′	J. Capella	1			
I. Cayetano, Pta. Elvira	28.05.17	53°50.08′	72°02.51′	J. Capella	1			

E Seno Ballena, SW I. Carlos III	29.05.17	53°40.26′	72°30.54′	J. Capella	1			
S. de las Nieves, Magallan Straits	05.06.17	53°31.10′	72°43.24′	J. Capella	1			
S. Skyring, S of I. Grande	02.06.17	52°46.90′	72°30.40′	J. Capella	3			
S. Skyring, W sector	02.06.17	52°37.40′	72°47.10′	J. Capella	2			
S. Skyring, W sector	02.06.17	52°35.80′	72°49.70′	J. Capella	1			
C. Jerónimo, Estr. Condor	18.07.17	53°21.32′	72°38.07′	J. Capella	1			
I. Capt. Aracena, S. Mercurio	22.07.17	54°14.73′	71°13.74′	J. Capella	1			
I. Capt. Aracena, S. Mercurio	22.07.17	54°16.34′	71°14.62′	J. Capella	1			
C. Gabriel, Estr. Magallanes	28.09.2002	54°16.10′	70°20.40′	A. Aguayo	1			
Estero Goñi, canal Wickham	21.11.2002	45°52.30′	74°33.87′	J. Acevedo	3			
Cap Froward	29.12.2005	53°53.10′	71°17.77′	A. Aguayo	1			
Ba. Esmeralda	28.02.2008	51°02.00′	73°42.15′	J. Acevedo		X	X	
I. Jorge Montt, Ba. Bell	29.02.2008	51°28.00′	74°48.83′	J. Acevedo		X		
Cord. S. de Gamboa, S. Taraba	19.01.2013	52°01.10′	73°22.27′	J. Acevedo	1			X
Cord. S. de Gamboa, S. Taraba	28.01.2013	51°01.10′	73°31.43′	J. Acevedo	1			
Cord. S. de Gamboa, S. Taraba	29.01.2013	51°01.10′	73°29.87′	J. Acevedo	1			

Site	Date	Latitude (S)	Longitude (W)	Responsible for data	I	F	H	M
Pta. Huala	09-11-2019	43°43.75′	73°02.85′	V. Rainilla	1			
Pta. Piti, Los Patos	07-11-2019	43°44.34′	73°00.90′	W. Sielfeld	1			
Raúl Marin	10-11-2019	43°46.19′	72°56.63′	V. Rainilla	1			
Las Hermanas Its. Mayor	04-02-2022	43°46.13′	73°01.81′	P. Merino	2			
Las Hermanas: Its. Oeste	04-02-2022	43°46.37′	73°02.88′	W. Sielfeld	3			
Its. Alleupa	09-11-2019	43°49.30′	73°01.63′	V. Rainilla	1			
Añihue: I. Velasco 05	01-2015 to 04-2016	43°52.44′	73°03.09′	G. Sanino/M. Meza	1			
Añihue: I. Velasco 06	01-2015 to 04-2016	43°52.40′	73°03.04′	G. Sanino/M. Meza	1			
Añihue: I. Velasco 07	01-2015 to 04-2016	43°51.93′	73°03.22′	G. Sanino/M. Meza	1			
Añihue: I. Velasco 08	01-2015 to 04-2016	43°52.22′	73°03.28′	G. Sanino/M. Meza	1			
Ba. Añihue interior 01	01-2015 to 04-2016	43°52.40′	73°00.94′	G. Sanino/M. Meza	1			
Ba. Añihue interior 03	01-2015 to 04-2016	43°52.44′	73°00.99′	G. Sanino/M. Meza	1			
Ba. Añihue interior 10	01-2015 to 04-2016	43°52.47′	73°01.73′	G. Sanino/M. Meza	1			
Its. Los Payos	05-02-2022	43°50.81′	73°04.02′	W. Sielfeld	1			
I. Refugio: Its. Crujul	29-03-2022	43°52.81′	73°08.23′	W. Sielfeld	1			
I. Garrido, C. Darwin	23-02-2014	45°25.39′	74°23.79′	W. Sielfeld	2			
I. Carlos	15-04-1982	49°05.36′	75°36.98′	W. Sielfeld	1	X	X	
I.	17-04-1982	49°52.65′	75°14.86′	W. Sielfeld	1	X		
I. Contreras, C. Charlton	04-04-1982	51°37.92′	74°52.92′	W. Sielfeld	1	X		
I. Beauclerck, costa weste	28-04-1982	53°11.50′	74°03.01′	W. Sielfeld	1			

I. Skyring, Pto. Tom	12-10-1982	54°27.93′	72°03.98′	W. Sielfeld	1	X		
C.	14-10-1982	54°19.17′	71°43.82′	W. Sielfeld	1	X	X	
I. Basket, Pta. Liliana	10-10-1982	54°44.67′	71°32.80′	W. Sielfeld	1			
I. Stewart, Pto. Artillero	13-10-1982	54°57.48′	71°00.51′	W. Sielfeld	1	X	X	
I. Hoste, Pta. Negra	19-10-1982	55°34.38′	69°16.33′	W. Sielfeld	1	X	X	
I. Hoste, Ba. Indios	19-10-1982	55°30.85′	69°04.77′	W. Sielfeld	1			
I. Grevy	15-01-1982	55°34.50′	67°42.27′	W. Sielfeld	1	X		
I. Deceit	20-01-1982	55°52.08′	67°05.19′	W. Sielfeld	1	X	X	
I. Bayly	10-03-1980	55°37.30′	67°33.31′	W. Sielfeld	1	X		X
Cta. Lientur: I. Wollaston	14-02-1980	55°44.12′	67°18.02′	W. Sielfeld	1	X	X	

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