DESCRIPTION OF AREA MEETING CBD's EBSA CRITERIA IN THE EASTERN TROPICAL AND TEMPERATE PACIFIC REGION

Area: SALAS Y GÓMEZ AND NAZCA RIDGES

Prepared by Mauricio Gálvez, World Wildlife Fund (WWF)

Introduction:

The area proposed covers pelagic through hadal depth zones in the Salas y Gómez and Nazca submarine ridges, which are two sequential chains of submarine mountains of volcanic origin located in the Southeastern Pacific Ocean, jointly extending over 2,900 km. The Salas y Gómez ridge lies in a west-east orientation. Its western end intersects the East Pacific Rise inside the Chilean Exclusive Economic Zone (EEZ) of the Easter Islands and its eastern end adjoins the western end of Nazca ridge. The Nazca ridge spreads in a southwest-northeastern direction. Its southern end includes part of the Chilean EEZ of San Felix Island, while its northern end meets the Peru-Chile subduction zone inside the Peruvian EEZ.

The area beyond national jurisdiction covers about 415,638 km2, which represent approximately 1.68% of the international waters surface in the FAO area No. 87. Further, it contains about 110 seamounts with summits between the sea surface level and 2,000 m depth (fishable depths), which represent some 41% of the seamounts in the Southeastern Pacific Ocean. The area is a biological hotspot with one of the highest levels of marine biological endemism (41.2% in fishes and 46.3% in invertebrates) in the World. It is considered a stepping stone for some marine mammals (e.g., blue whale, Rodrigo Hucke-Gaete personal communication). And it has been identified as part of the forage area for Leatherback turtle. In addition, it has been described as recruitment and nursery area for swordfish and it is part of the breeding zone described for Chilean jack mackerel, overexploited specie. Until now the area has been subject of minor, localized and sporadic activities, like bottom fishing and geological surveys and, therefore, a high degree of naturalness is expected for many seamounts into the area.

Location:

Salas y Gomez ridge is located between 23°42' S and 29°12' S and 111°30' W and 86°30' W. Nazca ridge is located between 15°00' S and 26°09' S and 86°30' W and 76°06' W. Both ridges include a portion of the Chile EEZ: the former spread into the EEZ of Eastern Island and Salas y Gomez Island and Nazca spread into the EEZ of Desventuradas Islands.

Feature description of the proposed area:

The Nazca area is influenced slightly by the eastern boundary currents of the South Pacific anticyclonic gyre. The Chile current carries subantarctic water north, along the coast of Chile towards the equator, along the coast of Chile. At approximately 20° S, influenced by the southeast trade winds and coastal configuration, the current turns westward, away from the coast influencing Nazca area with nutrient-rich waters (Galvez, 2009).

The Salas y Gómez and Nazca ridges are a long chain of tall seamounts and guyots that vary greatly in depth, and are isolated from the nearest continental margin by a deep trench (Parin *et al*., 1997). The ridge area beyond national jurisdiction contains about 110 seamounts with summits at fishable

depths down to 2'000 m, representing 41% of the seamounts in the south-eastern Pacific Ocean. The benthic and benthopelagic invertebrates and fishes of the area are much more closely related to the Indo-West Pacific than to the eastern Pacific fauna.

Currently, 226 species of benthic and benthopelagic invertebrates and 171 fish species of 64 genera are known to inhabit the 22 explored seamounts of the ridges (Parin *et al*., 1997). Considering the overall number of seamounts in the region, many more species can be expected. Further, the bottom areas of Salas y Gómez and Nazca ridges have not been sampled biologically. The area is a biodiversity hotspot with one of the highest levels of marine biological endemism, amounting to 41.2% of fish species and 46.3% of benthic invertebrates (Parin *et al*., 1997; Mironov *et al*., 2006) even surpassing the rates for hydrothermal vent ecosystems (Richer de Forges *et al*., 2000).

The ridges offer habitat to a number of low resilience and long-lived species like deep water sharks (Parin and Kotlyar, 2007), oreos, alfonsino, and reefbuilder corals (e.g., *Madrepora oculata*). They are likely to be speciation centers and provide the only extensive hard substrate available for propagation of benthic suspension feeders like black (Antipatharia) and stony corals (Scleractinia), of which at least 19 genera have been recorded, with many more species (Mironov *et al*., 2006).

The seamounts of the ridges were found to host aggregations of vertically migrant, seamount-associated mesopelagic fishes and migratory pelagic fishes: Pelagic sharks, in particular schools of large (2 - 3 m TL) adult male blue sharks have been observed to aggregate over Nazca ridge. Also bigeye thresher sharks (*Alopias superciliosus*) were more abundant over seamounts than in the surroundings (Litvinov, 1989). The ridges function as recruitment and nursery areas for swordfish (*Xiphias gladius*) (Yañez et al., 2004, 2006, 2009) and are part of the breeding zone described for Chilean jack mackerel (*Trachurus murphyi*) (Arcos *et al*., 2001; Anon., 2007).

The high pelagic productivity indicated by the formation of Taylor caps and local upwelling processes observed over the Nazca Ridge may support blue whales (*Balaenoptera musculus*), for which it is considered to be a likely reproductive zone and stepping stone during their extensive migrations (Hucke-Gaete and Mate, 2005). Salas y Gómez ridge is located at the center of the foraging area for leatherback sea turtles (*Dermochelys coriacea*) in the South Pacific Gyre (Shillinger, 2008) and, based on that, it has been postulated as ecologically or biologically significant marine area by Duke University and TOPP.

Deepwater commercial species and the occurrence of vulnerable benthic species coincide to a large extent. There are indications of abundant mega- and macrofauna bycatch in trawls, including large branches of gorgonians. Between 1979/80 and 1987 significant changes in the benthic communities such as loss of antipatharian corals were observed in consequence of bottom trawling (Parin et al., 1997).

Feature condition and future outlook of the proposed area

Based on satellite tracking of blue whales, Nazca ridge has been postulated as the likely reproductive zone for blue whale sub-population feeding in Corcovado Gulf (Southern Chile), but *in situ* research must be carried out to test such hypothesis. On Salas y Gómez ridge, most of the fishing activity carried out is pelagic (Vega *et al*., 2009). There has been historical fishing targeting jack mackerel, tunas and swordfish, but information from SPRFMO and IATTC should be available to conduct analyses in that sense. The area is likely to be on the route of cargo ships that transit between Asia Pacific countries and Chilean ports; therefore, strikes with whales may occur.

Assessment of the area against CBD EBSA Criteria

CBD EBSA Criteria (Annex I to decision IX/20)	**Description** (Annex I to decision IX/20)	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	Low	Some	High
Uniqueness or rarity	Area contains either (i) unique ("the only one of its kind"), rare (occurs only in few locations) or endemic species, populations or communities, and/or (ii) unique, rare or distinct, habitats or ecosystems; and/or (iii) unique or unusual geomorphological or oceanographic features		**X**		
Explanation for ranking (references) The seamounts of N&SG are unique in that they constitutes a biogeographical province much more closely related to the Indo-West Pacific than to the eastern Pacific. Findings in the area shown high endemism rates, reached to 41.2% in fishes and 46.3% in invertebrates associated to the bottom (Parin *et al*., 1997; Mironov *et al*., 2006). These endemism rates are the higher found in seamounts, and surpass rates of ecosystems associated with hydrothermal vents, one of the most isolated in the Ocean (Richer de Forges *et al*., 2000). These ridges have 15 out of 94 seamounts in shallow water and has a high proportion of the total number of shallow seamounts in the region and met the criteria for unique habitats (Dunstan *et al*., 2011).					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive				**X**
Explanation for ranking (references) Nazca ridge and the eastern end of Salas y Gomez ridges are considered to be the main recruitment area for Chilean jack mackerel and a nursery zone for swordfish (Yañez *et al*., 2004, 2006). Almost half of all invertebrates recorded live in those seamounts; therefore, the habitat provided by these seamounts is required for invertebrate populations to survive and thrive. It provides the only extensive hard substrate available for propagation of benthic suspension feeders like Antipatharians and Scleractinians.					
Importance for threatened, endangered or declining species and/or habitats	Area containing habitat for the survival and recovery of endangered, threatened, declining species or area with significant assemblages of such species.				**X**
Explanation for ranking (references) Much of the fauna recorded in Nazca and Salas y Gomez ridges is endemic to their seamounts. Therefore, due the scarce information most of benthic or benthopelagic species inhabiting these ridges are not evaluated in their status or are data deficient classified in the IUCN Red List. However, the ridges offer habitat for a number of low resilient and long-living species like deep water sharks (Parin and Kotlyar, 2007), oreos, alfonsino, and reef-builder coral (e.g., *Madrepora oculata*). If					

these species are adversely affected they may easily become threatened.
Satellite tracking has recorded the presence and persistence of blue whales and leatherback turtles, both threatened species

Vulnerability, fragility, sensitivity, or slow recovery	Areas that contain a relatively high proportion of sensitive habitats, biotopes or species that are functionally fragile (highly susceptible to degradation or depletion by human activity or by natural events) or with slow recovery.				**X**

Explanation for ranking (references)
In particular deep water species and biogenic habitats such as formed by cold water corals and sponges are considered vulnerable (Koslow, 2007), as often fragile, and slow (if at all) to recover due to slow growth, retarded maturity and high generation length, as well as population characteristics of high diversity at low biomass.
Please see below for illustration:
"Significant changes were noted between 1979-1980 and 1987 in the structure of bottom communities. Antipatharians were destroyed by the bottom otter-trawl [...], and [cirripedes] were lost with their substratum animals, [while] populations of sea urchin [, who feed over cirripedes,] declined following the destruction" (Parin *et al*., 1997: 178)

Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.			**X**	

Explanation for ranking (references)
Daneri *et al* (2000) have shown strong evidence that may support the formation of Taylor columns over the seamounts of Nazca ridge, and the occurrence of local upwelling process in Nazca area, making this area particularly more productive than the surrounding South-eastern Pacific Ocean.
The Nazca area is slightly influenced by the eastern boundary currents of the South Pacific anticyclonic gyre. The Chile Current arises in the Subantarctic region. Thus, it carries "equatorward", along the coast of Chile, Subantarctic Water. When it reaches approximately 20° S, influenced by the southeast trade winds and coastal configuration, turns westward, away from the coast influencing Nazca area with rich nutrients waters (Galvez, 2009).

Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				**X**

Explanation for ranking (references)
Few comprehensive studies have been conducted on the N&SG ridges. Taking into account only the Russian research, we know that 192 species of benthopelagic and benthic invertebrates and 171 species of fishes inhabit the 22 explored seamounts of the Nazca and Salas y Gomez ridges (Parin *et al*., 1997). If we consider that the area comprise at least 110 seamounts, then we can expect to discover a much higher biodiversity. It is important to note that the bottom of Nazca and Salas y Gomez ridges has not been biologically sampled. Elevations and depths ranging from abyssal soft sediment plains and trenches to the hard bottom peaks of seamounts and hills on the ridges may provide for an extensive range of ecological niches. Preliminary information on research done in 2011 shows that new species and high biological diversity were found in Salas y Gomez ridge close to Salas y Gomez island (National Geographic and Oceana, 2011)

Naturalness	Area with a comparatively higher degree of naturalness as a result of the lack of or low level of human-induced disturbance or degradation.				**X**
Explanation for ranking (references) Only the former URSS scientific expeditions and Chilean bottom trawling fleet were known to bottom fish in this area (Galvez, 2009) There are indications that big branches of gorgonias were destroyed by trawlers (Parin *et al*., 1997). However, from beyond fishing depth, no significant human impacts are known. In sum, the area has been lightly fished with only 12 seamounts with reported fishing activity, so naturalness is reasonably high (Dunstan *et al*., 2011). In the case of Salas y Gomez ridge, most of the fishing activity carried out is on pelagic layer on tuna and swordfish (Vega *et al*., 2009).					

References

Anon., 2007. Report from Chile on jack mackerel research and stock assessment. Paper SPRFMO-III-SWG-18 presented at Third Scientific Working Group of South pacific Regional Fisheries Organisation, 25-27 April 2007 in Reñaca, Chile. http://www.southpacificrfmo.org/third-swg-meeting/

Arcos, D., L. Cubillos & S. Nuñez. 2001. The jack mackerel fishery and El Niño 1997-1998 effects off Chile. *Progress in Ocenography*, **49**(1), 597-617.

Clark, J.G. & J. Dymond. 1977. Geochronology and petrochemistry of Easter and Sala y Gómez islands; implications for the origin of the Sala y Gómez Ridge. *J. Volcanol. Geoth. Res*., **2**(1), 29-48.

Daneri, G., V. Dellarossa, R. Quiñones, B. Jacob, P. Montero & O. Ulloa. 2000. Primary production and community respiration in the Humboldt current system off Chile and associated oceanic areas. *Mar. Ecol. Prog. Ser*., **197**, 41-49.

Dunstan, P.K., M.R. Clark, J. Guinotte, T. O'Hara, E. Niklitschek, A.A. Rowden, T. Schlacher, S. Tsuchida, L. Watling, & A. Williams. 2011. Identifying Ecologically and Biologically Significant Areas on Seamounts. Gland, Switzerland: IUCN. 14 pp. http://data.iucn.org/dbtw-wpd/edocs/2011-056.pdf

Gálvez, M. 2009. Seamounts of Nazca and Salas y Gómez: a review for management and conservation purposes. *Lat. Am. J. Aquat. Res*., **37**(3), 479-500. http://www.scielo.cl/pdf/lajar/v37n3/art16.pdf

Hucke-Gaete, R. & B. Mate. 2005. Feeding season movements and fall migration to wintering areas for Chilean blue whales. Abstracts of the 16th Biennial Conference on the Biology of Marine Mammals, 12-16 December 2005, San Diego, CA, USA.

Koslow, T. 2007. The silent deep: the discovery, ecology and conservation of the deep sea. Chicago. The University of Chicago Press, Chicago, 270 pp.

Litvinov, F.F. 1989. Struktura epipelagicheskogo taksocena Elasmobranchii v Atlanticheskom i Tikhom okeanakh i ee izmeneniya v noveyshee geologicheskoe vremya. *Voprosy Ikhtyologii*, **29**, 973–984.

Mironov, A.N., T.N. Molodtsova & N.V. Parin. 2006. Soviet and Russian studies on seamount biology. Presentation at the International Seabed Authority workshop on Cobalt-Rich Crusts and the Diversity and Distribution Patterns of Seamount Fauna. http://www.isa.org.jm/en/scientific/workshops/2006/Mar06.

National Geographic & Oceana. 2011. Expedición a Isla de Pascua y Salas y Gómez, Febrero – Marzo 2011. Informe Científico. http://oceana.org/sites/default/files/reports/Informe_IPySG_final.pdf

Parin, N.V., A.N. Mironov & K.N. Nesis. 1997. Biology of the Nazca and Sala y Gómez submarine ridges, an outpost of the Indo-West Pacific fauna in the Eastern Pacific Ocean: composition and distribution of the fauna, its communities and history. In: A.V. Gebruk et al. (ed.). The biogeography of the oceans. *Adv. Mar. Biol*., **32**, 145-242.

Parin, N.V. and A. N. Kotlyar. 2007. On Finding of Shark of the Genus Somniosus (Squalidae) at the Submarine Ridge of Nazca (Southeastern Pacific). *Journal of Ichthyology*, **47**(8), 669–672.

Richer de Forges, B.; J.A. Koslow & G.C.B. Poore. 2000. Diversity and endemism of the benthic seamount fauna in the southwest Pacific. *Nature*, **405**, 944–947.

Vega, R., R. Licandeo, G. Rosson & E. Yáñez. 2009. Species catch composition, length structure and reproductive indices of swordfish (*Xiphias gladius*) at Easter Island zone. *Lat. Am. J. Aquat. Res.*, **37**(1), 83-95. http://www.scielo.cl/pdf/lajar/v37n1/art07.pdf

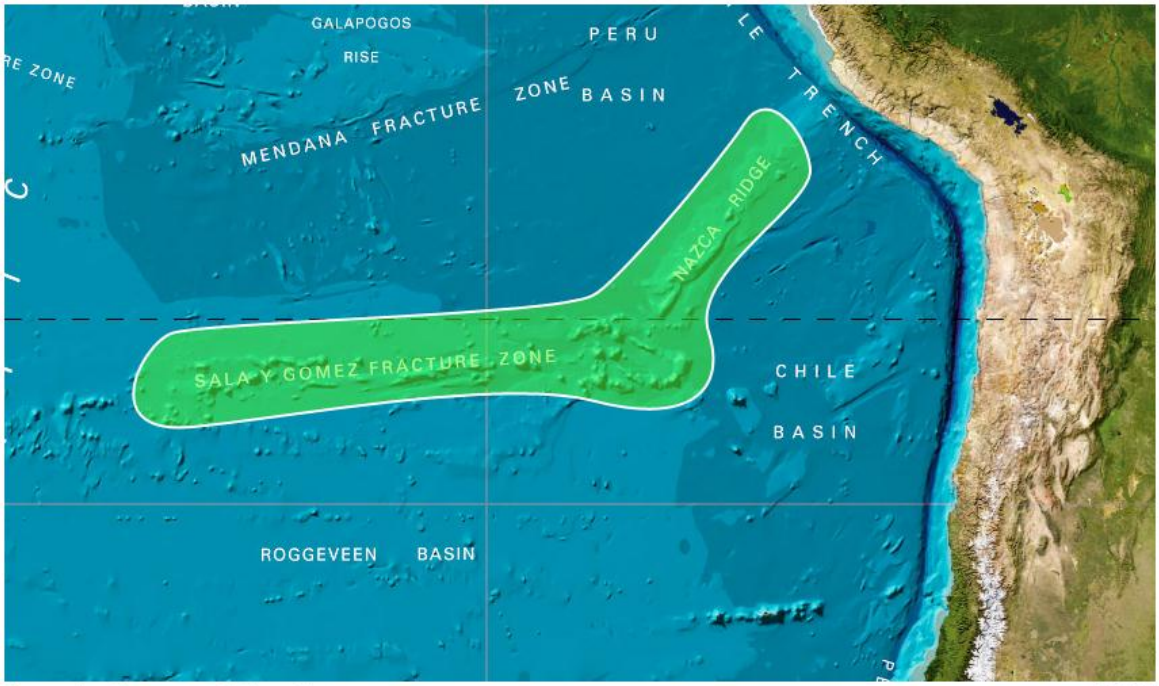
Yáñez, E., C. Silva, J. Marabolí, F. Gómez, N. Silva, E. Morales, A. Bertrand, J. Campalans, A. Gamonal, J. Chong, P. Rojas, B. Menares & J.I. Sepúlveda. 2004. Caracterización ecológica y pesquera de la Cordillera de Nazca como área de crianza del pez espada. Informe Final Proyecto FIP N° 2002-04: 388 pp.

Yáñez, E., C. Silva, N. Silva, A. Ordenes, F. Leiva, P. Rojas, J. Chong, J. Campalans, S. Palma, G. Claramunt, C. Oyarzún, R. Meléndez & R. Vega. 2006. Caracterización ecológica y pesquera de Cordillera de Nazca como área de crianza del pez espada. Fase II. Informe Final Proyecto FIP 2004-34: 236 pp.

Yáñez, E., C. Silva, M. Barbieri1, A. Órdenes & R. Vega. 2009. Environmental conditions associated with swordfish size compositions and catches off the Chilean coast. *Lat. Am. J. Aquat. Res.*, **37**(1), 71-81. http://www.lajar.cl/pdf/imar/v37n1/Articulo_37_1_6.pdf

Maps and Figures

Figure 1: Area meeting EBSA criteria



The green shows the area covered by the project.

Disclaimer: Maritime limits depicted on WWF maps are shown for general orientation and reference only and they are not to be considered as an authority on the delimitation of international maritime limits. Data or information provided by WWF does not prejudice or affect any future submission on extended continental shelf to the Commission on the Limits of the Continental Shelf.