Appendix

Template for Submission of Scientific Information

to Describe Ecologically or Biologically Significant Marine Areas

*Note: Please **DO NOT** embed tables, graphs, figures, photos, or other artwork within the text manuscript, but please send these as separate files. Captions for figures should be included at the end of the text file, however.*

Title/Name of the area: Chile Margin 2012

Presented by (*names, affiliations, title, contact details)*

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Abstract (*in less than 150 words)*

INSPIRE: **IN**ternational **S**outheast**P**acific **I**nvestigation of **R**educing**E**nvironments. During our 22 days aboard the research vessel (R/V) *Melville,* members of the INSPIRE: Chile 2010 expedition set out to explore four largely unknown regions of our planet, in search of missing links in our understanding of biology, geology, and chemistry within the deep ocean. Through untold hours of conductivity, temperature, depth (CTD) work — comprising 33 separate deployments, 26 bouts of multicoring, and 10 trawls — we sampled at depths between 350 and 6100 meters (up to 18,000 feet). Yet due to the nature of what we have collected, we will not know much of what there is to learn for months (or even years) as we process our invaluable samples.

Introduction

(To include: feature type(s) presented, geographic description, depth range, oceanography, general information data reported, availability of models)

Jolted by the planet's biggest earthquakes, sequestering massive reservoirs of methane, while slowly swallowing a mid-ocean ridge, the Chilean margin offers an inspiring natural laboratory for investigating the complex interactions among the solid earth, the deep ocean, and the biosphere. At the Chilean triple junction, where the South Chile rise (a ridge crest) is being forced under the methane-rich South American continent, 10 students — from Scripps Institution of Oceanography (SIO) and University of California – Santa Barbara— and an international team of scientists will explore for tectonically controlled hydrothermal vents, for seep sites of massive methane release, and for novel "hybrid" systems that may yield hot seeps or cool vents.

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With the shared vision of several Census of Marine Life programs, the INSPIRE: Chile Margin 2010 expedition will probe for strange new biological life forms, communities, and ecosystems dependent on as-yet-unknown conditions. As the only location on Earth where all known forms of chemosynthetic ecosystems (hydrothermal vents, cold seeps, oxygen minimum zones, and whale, kelp and wood-falls) can coexist and be studied together, the Chilean margin is a prime target for remarkable discoveries.

Over roughly three weeks, members of the INSPIRE team will use an autonomous underwater vehicle (outfitted with cameras and chemical sensors) called ABE — in combination with instrumentation to measure conductivity, temperature, depth (CTD), a video-guided sediment corer, and a bottom trawl — to locate and characterize heretofore unknown and some barely known ecosystems. Perhaps these will provide a missing link between hot and cold deep-sea communities.

A diverse team of students from SIO (University of California – San Diego) and the University of California – Santa Barbara will be tackling broad-ranging questions about the geology, microbial processing, unicellular life, and multi-cellular animals (and their food and dispersal abilities) at depths far from the sunlit surface. They will be working with an international team of scientists and students from Chile and from other U.S. institutions (Woods Hole Oceanographic Institution and the University of Washington) to blend expertise across geological, chemical, and biological disciplines, and to forge international bonds of collaboration.

Location

(Indicate the geographic location of the area/feature. This should include a location map. It should state if the area is within or outside national jurisdiction, or straddling both. It should also state if the area is wholly or partly in an area that is subject to a submission to the Commission on the Limits of the Continental Shelf)

During this 2,400 kilometer (1,500 mile) voyage, we will visit four sites along the Chile margin, starting in the town of Puerto Montt in Southern Chile and ending in Valparaiso.

The Chile coastline stretches along for more than 4,300 kilometers (2,700 miles). Its geology and biology provide an incredible natural laboratory for the study of how life on our earth functions and has evolved. One particular setting, the Chile triple junction, exemplifies this. The area centers on the intersection of three tectonic plates, two of which are getting pulled apart while both, simultaneously, are being forced under the third plate and the South American continent. During the 24-day INSPIRE cruise, a team of 35 scientists will visit four sites along the Chile margin, starting at this largely unknown — yet completely unique — part of our planet. Through our international, interdisciplinary, and student-led explorations, we hope to reveal the previously undiscovered biodiversity, ecosystem functioning, and distinct geology of the Chile margin.

Feature description of the proposed area

(This should include information about the characteristics of the feature to be proposed, e.g. in terms of physical description (water column feature, benthic feature, or both), biological communities, role in ecosystem function, and then refer to the data/information that is available to support the proposal and whether models are available in the absence of data. This needs to be supported where possible with maps, models, reference to analysis, or the level of research in the area)

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The Chile Triple Junction (CTJ) is a globally unique area where there is a confluence of both geological and biological aspects of processes that control bio-geochemical exchange. An oceanic spreading center subducts beneath the Chilean margin at the triple junction; slope sediments deform and produce methane and some are deposited in the axial zone of the southernmost part of the spreading center. The proximity of magmatically-driven hydrothermal venting and methane seeps on the adjacent slope provides a natural laboratory in which to examine relationships between and interconnectivity of these two types of deep-sea reducing ecosystems. The CTJ is at the confluence of the Pacific, Atlantic and Southern oceans, and so is ideal for investigating evidence for global-scale larval dispersal, potential for cross-basin population connectivity of vent species, and documenting similarities and differences of deep-sea fauna between the basins.

Feature condition and future outlook of the proposed area

(Description of the current condition of the area – is this static, declining, improving, what are the particular vulnerabilities? Any planned research/programmes/investigations?)

The Chilean Triple Junction presented many challenges during this initial exploration. We found *chemosynthetic*(able to form organic compounds using energy released from chemical reactions) fauna and many areas with methane. While methane can indicate hydrothermal activity, it is also present at methane seeps. We currently do not know where, along the continuum of hydrothermal vents to methane seeps, many of our newly discovered sites lie. As we analyze the water we collected from within the potential hydrothermal plumes, the story will become clear. At that point, we will know if we have discovered our sought-after “hybrid” habitat.

In any case, we collected a bounty of biodiverse fauna throughout the 400 to 3,300 m (1,443 to 10,826 ft) deep water we sampled. One of the great advantages to exploring regions such as this is that *all* of these samples provide much needed information about this under-sampled area, including many new species of *invertebrate* (lacking a backbone) which to this day remain undescribed. Most surprisingly, we avoided the storms which make this region so difficult to study; we rarely had more than a rolling swell and a puff of wind.

The Chilean methane seep area was strangely the most challenging area we visited. We knew the most about it before we showed up; yet consistent swells and the previous loss of the autonomous benthic explorer (ABE) meant our knowledge of where we were going was limited. In addition, the area we identified as having active seepage was difficult to core due to hard sediment. We also spent our time towing around in the dark — similar to towing a magnet through a haystack looking for a needle — taking pictures as we went and mapping out what we found. In the face of this adversity, we obtained a much better idea of the distribution of species in that region and the area of active seeping.

Perhaps our greatest find was a carbonate rock that was rich with species similar to those we have collected from areas of active seepage around the Pacific. As always, our water-column sampling was successful throughout. We found many small and large bursts of methane covering this very active margin.

At El Quisco methane seep we earned the distinct honor of collecting the first live chemosynthetic species ever from this region. By following the methane, our trawl collected multiple species of*vesicomyid* (seep)

clams. In addition, we continued to map areas of methane release and seepage in this region, and, at the risk of sounding like a broken record, there was methane everywhere we looked.

The trench came and went in a sleepless fury of samples. This area lies a few six hours away from one of the greatest ports in the world, Valparaiso, yet has almost never had its 6100m depth sampled. We wrangled both mud and water from the bottom of the ocean yielding cool worms and enough microbes to study for years.

Support Yields Success

Separate from the specific science goals of this cruise, we had many other successes. An incredible hands-on class was taught to those students who were fortunate enough to join in this venture. We were also able to deploy the "budget" video-guided multicorer on its maiden voyage. This modification of a piece of robust, deep-sea sampling equipment was able to be guided into small areas on the seafloor and to map as we went. This system was all the more necessary after our AUV went missing. The system was designed and fabricated at the last hour by Carl Matson and Scott Hiller, both of whom work at Shipboard Technical Support at the Scripps Institution of Oceanography, on an unworkably small budget which they made work. Their willingness to support our science made this cruise a success for many of us.

During this cruise, we collected the first direct evidence of methane seep fauna from 46º south and the first live symbionts-bearing clams from an area which was known to be seeping; and we now know more than we have ever known about methane seeps and hydrothermal activity in the Chilean margin. In the end, this cruise was a success due to the incredible support we had from a fine ship, a hard-working crew, and the support of all on board and at home to make this work.

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Assessment of the area against CBD EBSA Criteria

(Discuss the area in relation to each of the CBD criteria and relate the best available science. Note that a candidate EBSA may qualify on the basis of one or more of the criteria, and that the boundaries of the EBSA need not be defined with exact precision. And modeling may be used to estimate the presence of EBSA attributes. Please note where there are significant information gaps)

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.				
Explanation for ranking					
Special importance for life-history stages of species	Areas that are required for a population to survive and thrive.				
Explanation for ranking					
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.				
Explanation for ranking					
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.				
Explanation for ranking					

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Biological productivity	Area containing species, populations or communities with comparatively higher natural biological productivity.				
Explanation for ranking					
Biological diversity	Area contains comparatively higher diversity of ecosystems, habitats, communities, or species, or has higher genetic diversity.				
Explanation for ranking					
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.				
Explanation for ranking					

Sharing experiences and information applying other criteria (Optional)

Other Criteria	**Description**	**Ranking of criterion relevance** (please mark one column with an X)			
		Don't Know	**Low**	**Some**	**High**
Add relevant criteria					
Explanation for ranking					

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References

(e.g. relevant documents and publications, including URL where available; relevant data sets, including where these are located; information pertaining to relevant audio/visual material, video, models, etc.)

http://oceanexplorer.noaa.gov/explorations/10chile/welcome.html

Maps and Figures

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(Indicate if there are any known issues with giving permission to share or publish these data and what any conditions of publication might be; provide contact details for a contact person for this issue)