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)*

The INSPIRE: Chile Margin 2012 expedition is a follow-up to the 2010 expedition. During the 10-day cruise on the R/V *Melville*, we will probe for strange new biological life forms, communities, and ecosystems dependent on as-yet-unknown conditions. Members of the INSPIRE team will use an autonomous underwater vehicle (outfitted with cameras and chemical sensors) called *Sentry* - in combination with instrumentation to measure conductivity, temperature, depth (CTD), a multicorer, and a towed camera system - to locate and characterize heretofore unknown and some barely known ecosystems.

Introduction

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

The goal of the INSPIRE project has been to conduct reconnaissance mapping of the Chile Triple Junction. This is the only place on earth where an actively spreading mid-ocean ridge is being subducted beneath a continent. Mid-ocean ridges support hydrothermal vents, which are areas where super-heated water, enriched in a range of chemicals that are otherwise quite rare in the oceans, is released from the deep seafloor. When certain of these chemicals (notably hydrogen sulfide and methane, but including – to a lesser extent – hydrogen and iron) react with the oxygen present in deep-ocean water, the energy released is harnessed by microbes that use it to grow.

These microbes serve as the deep-sea equivalent of land plants, functioning as primary producers and providing the base of a complex food chain. The microbes involved in these reactions are diverse and can exist both in free-living forms and in *symbiotic* (prolonged but not necessarily beneficial) relationships with many animals, including tube worms, mussels, clams, and shrimp. The chemicals they harness for energy are in a "reduced state" and so hydrothermal vents are a form of "reducing environment," where chemical energy – harnessed by *chemoautotrophic*(deriving energy from inorganic chemical compounds) microbes – fuels a community of strange and unique animals. What will we find at the Chile Triple Junction? In every ocean basin, the fauna inhabiting vent-sites are diverse – from tube worms dominating many Pacific sites to shrimp being the primary "chemosynthetic" animal at many Atlantic vent-sites. In the Southern Ocean, "just around the corner" from the CTJ, abundant "Yeti Crabs" were recently found that are distinct, again, from those on the southern EPR. Whatever we discover is likely to include species completely new to science.

Hydrothermal systems are not the only type of reducing environment. Sites of methane seepage, derived from massive methane deposits on the Chilean continental shelf, are another key and ubiquitous example of reducing environments. Where methane leaks out of vast gas hydrate reservoirs, a group of animals very similar to hydrothermal vent animals exist. They use the same chemical energy sources, yet to date few species found at seeps are also found at vents. The question is: *why?*

The special setting of the Chilean margin provides a unique opportunity since there is a known slope seep site that lies in close proximity to the water column plume signals (hence, the underlying vent-sources) that we identified in 2010. For the first time, therefore, we expect this expedition to allow us to answer the question: *Do vents and seeps host the same endemic, chemosynthetic species when the sites are not separated by huge distances* (by definition, vents on *mid-ocean ridges* typically lie in the **middle** of ocean basins and, hence, long distances from cold seeps at ocean margins)? Another possibility is that these two habitats could be evolutionarily linked by a transition fauna, which is a hybrid fauna which is closely related to both vent fauna and seep fauna but is actually distinct from both.

Our most sophisticated tool for this expedition is an autonomous underwater vehicle (AUV) called *Sentry*. *Sentry* is the latest vehicle to enter the US National Deep Submergence Facility, replacing the *ABE*vehicle that was lost on our prior expedition to this area in Spring 2010. Like *ABE* before it, *Sentry* will be deployed from the ship and programmed to swim in regular patterns over the seafloor measuring properties in the water column and gathering information about the underlying seabed. You can read more about how we will use *Sentry*. In places where the strongest plume signatures are detected, we will re-launch *Sentry* to study the seafloor in ever greater detail up to and including photographing the seabed.

In parallel, we will also use a towed camera system (TowCam) to image the seafloor, both between *Sentry* dives (when *Sentry*'s batteries are being recharged) and even during Sentry dives when both sets of operations will be conducted in the same area. While TowCam is less wieldy at the ocean floor, because of the 3000m of cable that we have to drag through the ocean to operate it, one particular potential advantage in areas of greatest interest is that TowCam can provide live images from the seafloor in real time as we are conducting our survey – i.e. we will know the moment TowCam passes over any new vent or seep animal communities. Further, TowCam also has water samplers and even a new slurp sampling capability which means that we will be able to collect water samples and perhaps even animal samples themselves from any new sites we locate using this device.

Primarily, however, we expect to collect animals using more conventional devices and we have both small trawls with which to collect animals living at and near the seabed as well as a multicorer – a mud sampling device – that will allow us to collect any sediments and the animals that live within them.

Location

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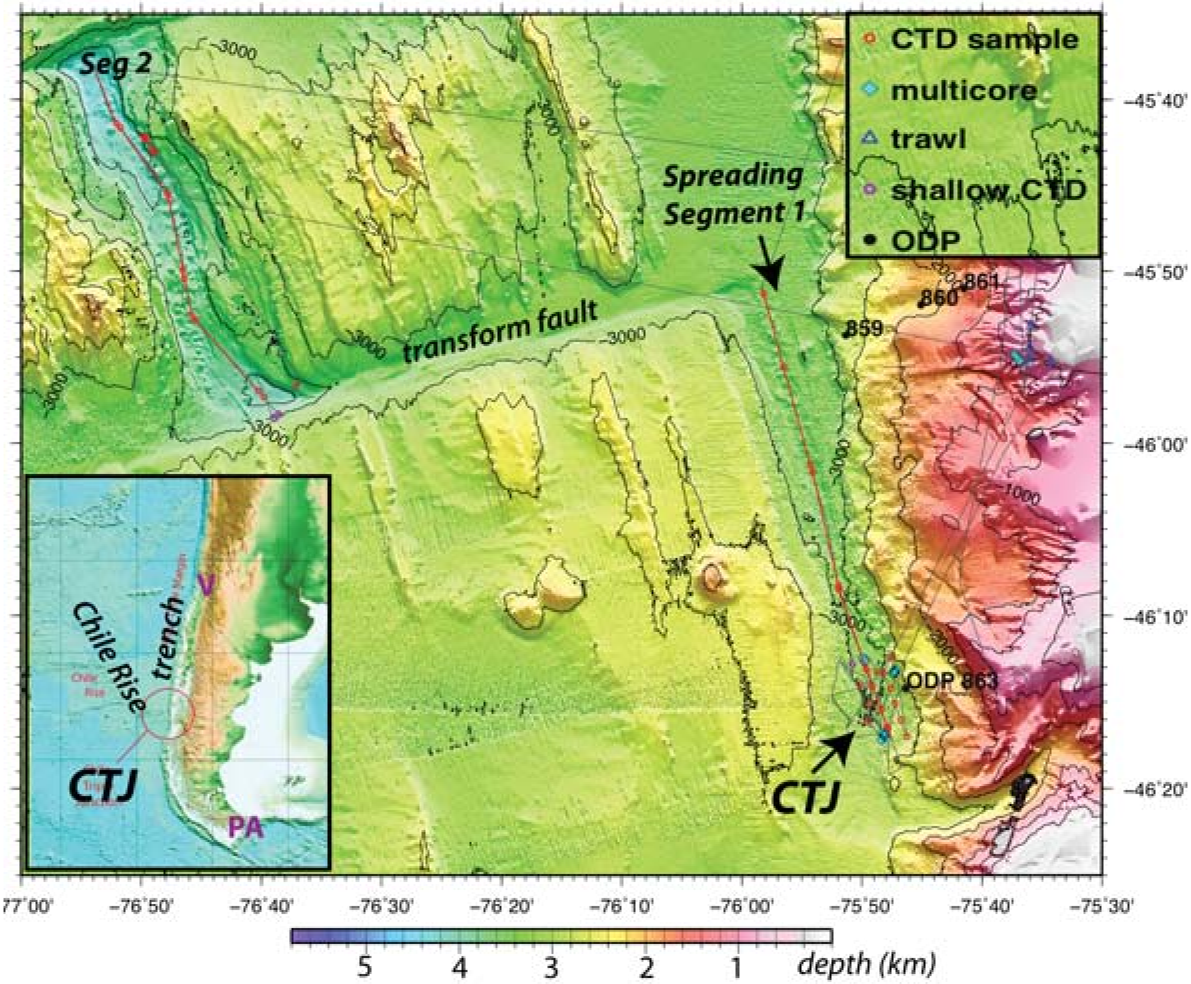
(Indicate the geographic location of the area/feature. This should include a location map. It should state if the area is within or outside national jurisdiction, or straddling both. It should also state if the area is wholly or partly in an area that is subject to a submission to the Commission on the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



Study area, tracks and symbols show INSPIRE 2010 work. The cruise will start in Punta Arenas (PA) and spend several days at Chile Triple Junction (CTJ) and a nearby slope seep site (~45°55'S). We will finish the cruise with single-track mapping along the continental slope along the way to Valparaiso (V). Failure along parts of this slope may have contributed to tsunami caused by the February 2010 great earthquake, centered south of Valparaiso. *Image courtesy of Scripps Institution of Oceanography.*

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

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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)

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?)

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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/12chile/welcome.html

Maps and Figures

Rights and permissions

(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)