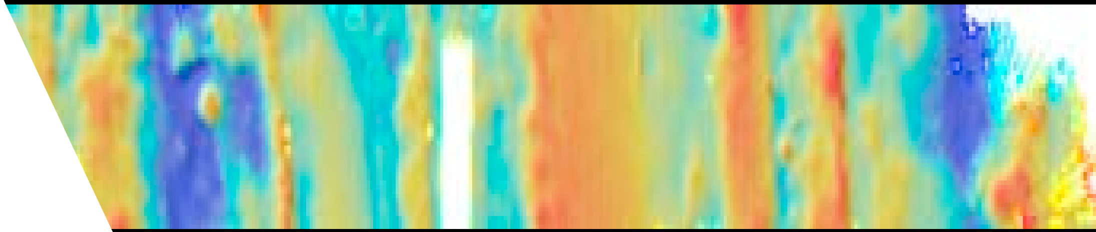
QINGDAO WORKSHOP

Frameworks for

Regional Environmental Management Plans

The CCZ Example

Cindy Lee Van Dover
Distinguished Professor
Duke University USA



APEI 6, CCZ
~300 m color ramp

Leitner et al. 2017

International Seabed Authority ISBA/17/LTC/7

Legal and Technical Commission

13 July 2011

Original: English

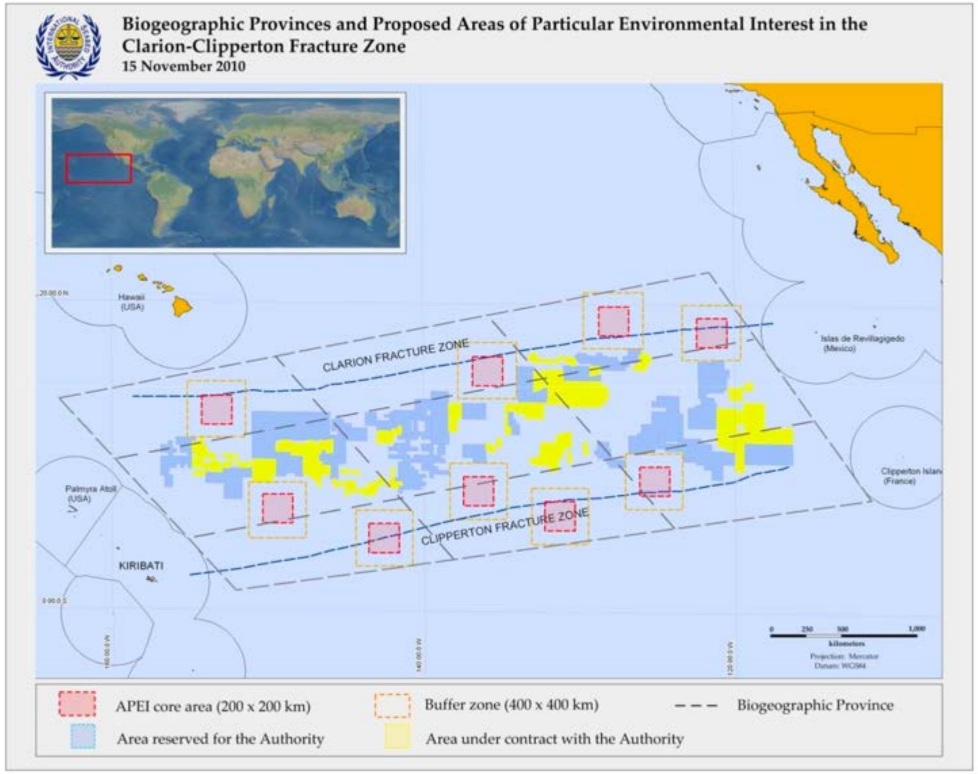
Seventeenth session
Kingston, Jamaica
11-22 July 2011

Environmental Management Plan for the Clarion-Clipperton Zone

I. Introduction

A. Legal framework related to the powers of the International Seabed Authority on the protection of the marine environment

1. Under the 1982 United Nations Convention on the Law of the Sea (the Convention), States parties have a general obligation to protect and preserve the marine environment.[1] This overarching obligation encompasses responsibilities to prevent, reduce and control pollution of the marine environment from any source, to



The CCZ REMP

CCZ EMP
Some Key Management Elements

Evaluate environmental risks	Environmental impact assessment	Taxonomic workshops	Baseline assessments
Training	Intercalibration and standardization	Establish an environmental database	Contractor EMPs including recovery plans
Monitoring	Retention of environmental experts	ABMT to protect 30-50% of area	Use CBD and FAO guidelines

Clarion-Clipperton Zone REMP

design principles codified by ISA/LTC applicable to REMPs in the ABNJ

APEIs

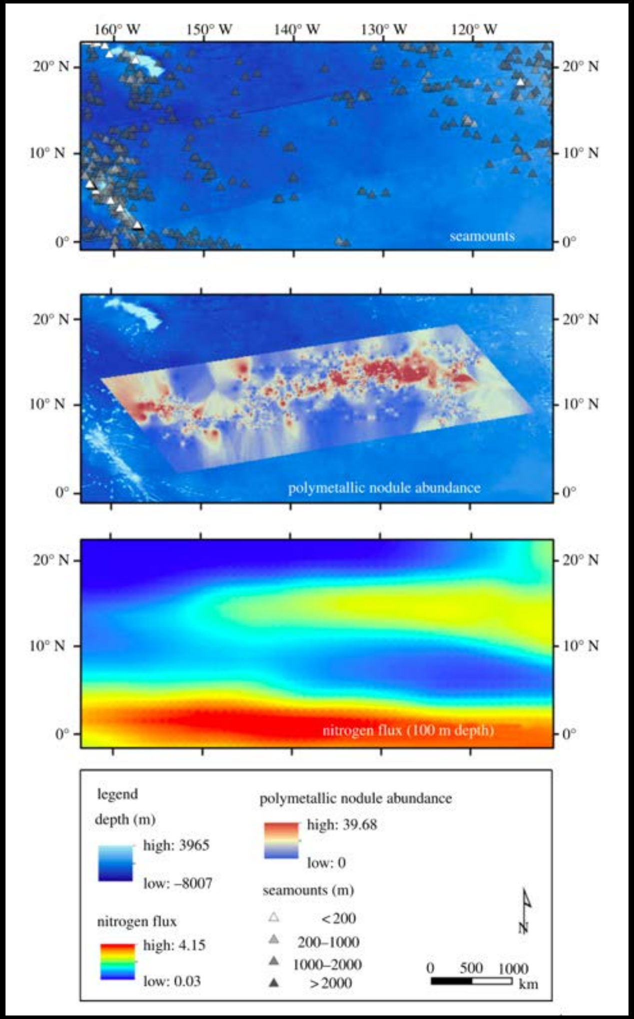
1) protect 30-50% of the management area

2) fit into existing legal frameworks

3) minimize socioeconomic impacts

4) maintain sustainable, intact and healthy marine populations

5) take into account biophysical gradients that affect the biogeography of marine biodiversity



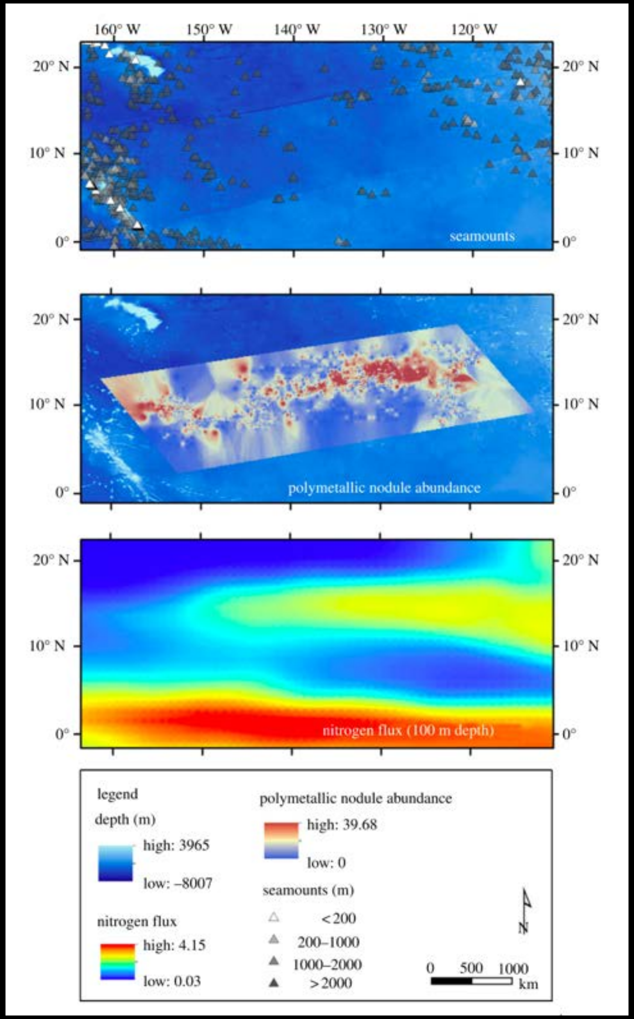
Wedding et al. 2013

Clarion-Clipperton Zone REMP

design principles

6) protect a full range of habitat types found within each subregion

7) ensure maintenance of minimum viable population sizes for species potentially restricted to a sub-region (2 x dispersal distance)



Wedding et al. 2013

Dispersal Distances

new estimates for deep-sea invertebrates

based on slopes of genetic Isolation by Distance measures

MOLECULAR ECOLOGY

Molecular Ecology (2016) **25**, 3276–3298 doi: 10.1111/mec.13689

INVITED REVIEWS AND SYNTHESES

A synthesis of genetic connectivity in deep-sea fauna and implications for marine reserve design

AMY R. BACO,* RON J. ETTER,† PEDRO A. RIBEIRO,‡ § SOPHIE VON DER HEYDEN,¶ PETER BEERLI** and BRIAN P. KINLAN† † ‡ ‡

Table 3 Summary of dispersal estimates from IBD slopes, by data set (All, SigMantel) and taxonomic group (Fishes, CE Inverts and NCE Inverts).

			PKG dispersal distance estimate (km)*						Maximum–Minimum		90–10th percentile	
Data set	Taxon Group	N	Minimum	10th %ile	Geometric Mean (Upper 95% CI, Lower 95% CI)	Median (25%ile, 75%ile)	90th %ile	Maximum	Range (km)	Range (Orders of Magnitude)	90–100%o Range (km)	90–100%o Range (Ord. of Mag.)
All Dataset	All taxa	95	0.243	4.29	69.7 (45.2, 107)	76.9 (17.2, 347)	1320	4856	4855	4.30	1316	2.49
	Fishes	28	14.956	17.00	234.6 (122.6, 449)	280.5 (75.4, 680)	2269	4856	4841	2.51	2252	2.13
	CE Inverts	38	6.658	8.63	67.6 (38.7, 118)	42.8 (18.7, 242)	1257	2356	2350	2.55	1248	2.16
	NCE Inverts	29	0.243	1.06	22.5 (9.0, 57)	27.8 (2.4, 150)	367	2028	2028	3.92	366	2.54
SigMantel Dataset	All taxa	56	0.243	1.76	33.2 (19.4, 57)	33.9 (8.8, 133)	377	2028	2028	3.92	375	2.33
	Fishes	17	14.956	14.96	134.8 (59.6, 305)	131.8 (31.1, 462)	1512	2028	2013	2.13	1497	2.00
	CE Inverts	8	6.658	8.31	34.6 (19.0, 63)	25.9 (11.5, 103)	225	352	345	1.72	217	1.43
	NCE Inverts	2	0.243	0.47	0.3 (3.8, 28)	8.5 (1.6, 74)	249	367	367	3.18	249	2.72

*All summary statistics were calculated on log_{10}-transformed dispersal estimates and back-transformed to kilometre for reporting only

75th percentile: 74 to 103 km dispersal estimate

”scales of dispersal and connectivity of reserve design in the deep sea might be comparable to or slightly larger than those in shallow water”

Clarion-Clipperton Zone REMP

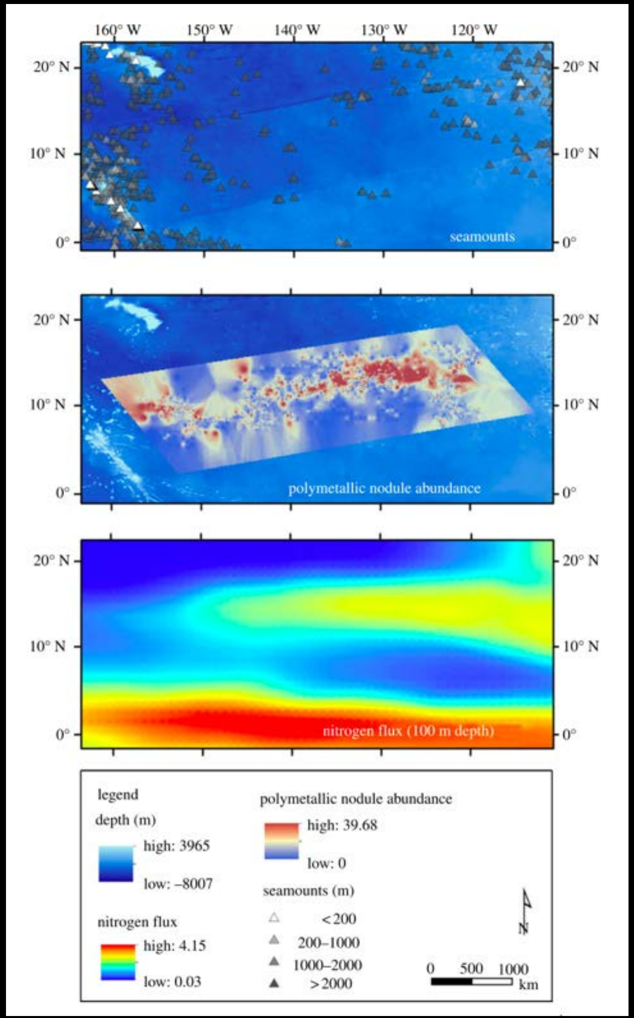
design principles

6) protect a full range of habitat types found within each subregion

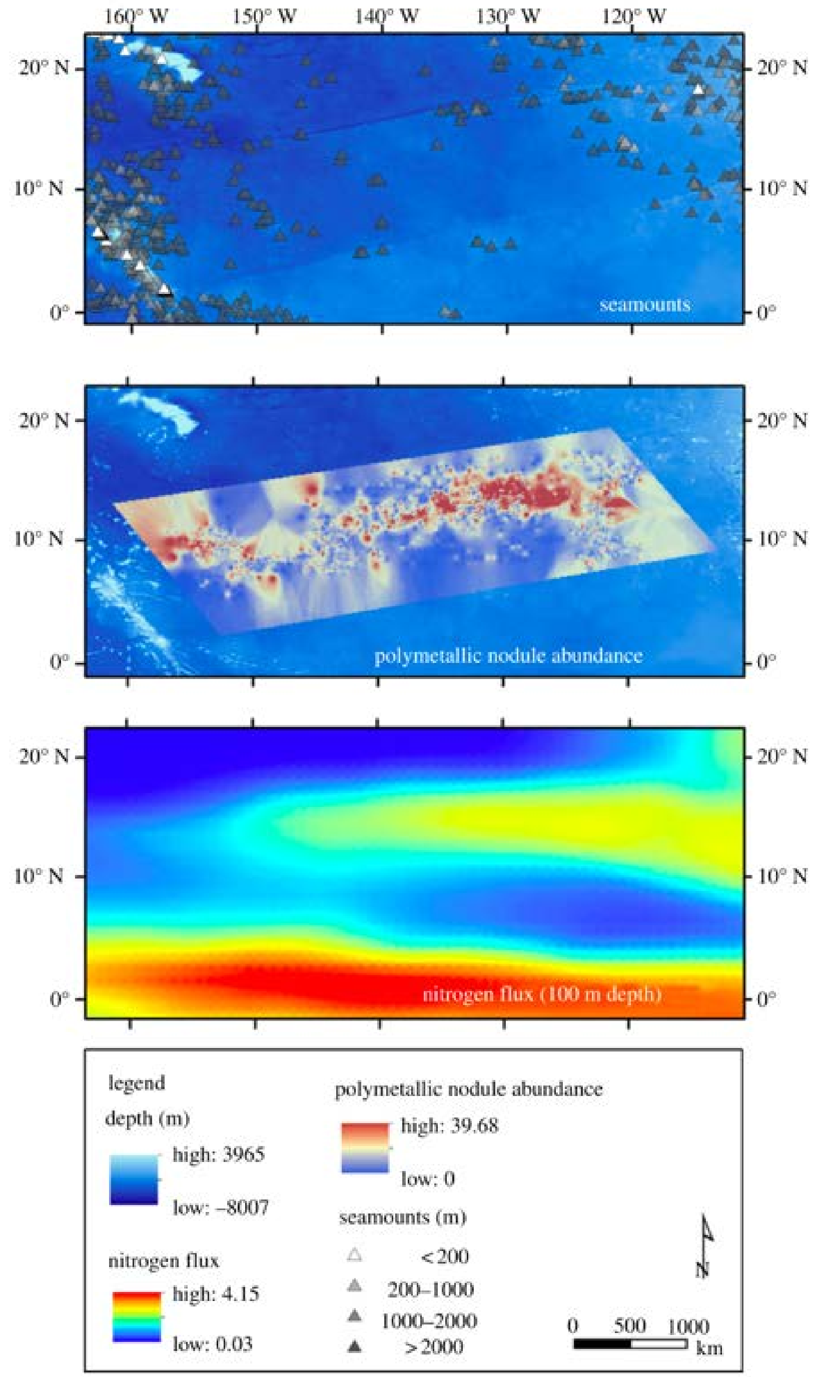
7) ensure maintenance of minimum viable population sizes for species potentially restricted to a sub-region (2 x dispersal distance) = 2 x 100 km (core area)

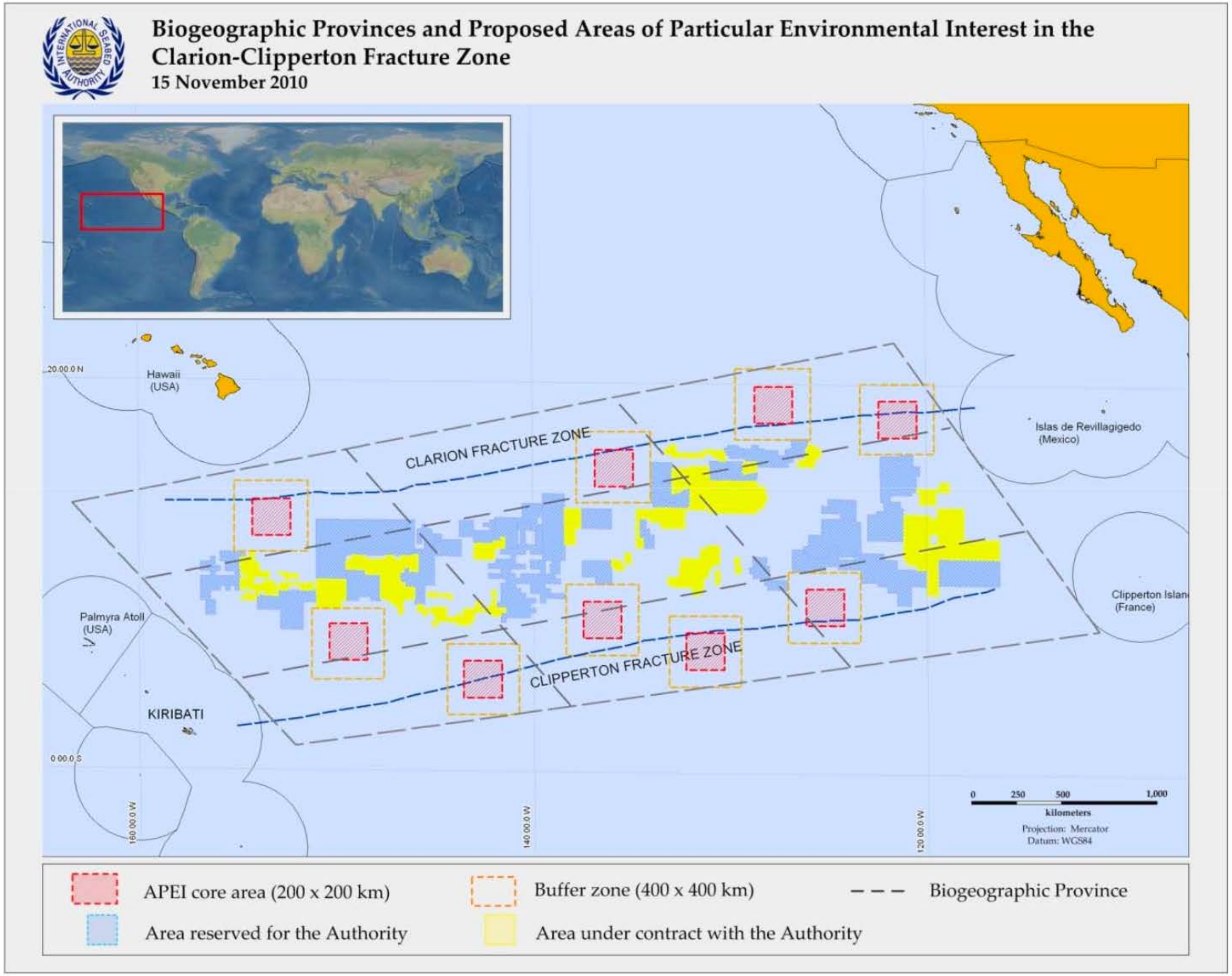
8) use a buffer zone to ensure that biota and habitats in the protected area are not affected by anthropogenic threats occurring outside the MPA = 100 km

9) straight-line boundaries



Wedding et al. 2013


160° W
150° W
140° W
130° W
120° W
20° N
10° N
0°
seamounts
polymetallic nodule abundance
nitrogen flux (100 m depth)
legend
depth (m)
high: 3965
low: −8007
nitrogen flux
high: 4.15
low: 0.03
polymetallic nodule abundance
high: 39.68
low: 0
seamounts (m)
< 200
200–1000
1000–2000
> 2000
0
500
1000
km
N


Biogeographic Provinces and Proposed Areas of Particular Environmental Interest in the Clarion-Clipperton Fracture Zone
15 November 2010
Hawaii (USA)
Islas de Revillagigedo (Mexico)
Clipperton Island (France)
Palmyra Atoll (USA)
KIRIBATI
CLARION FRACTURE ZONE
CLIPPERTON FRACTURE ZONE
0
250
500
1,000
kilometers
Projection: Mercator
Datum: WGS84
APEI core area (200 x 200 km)
Buffer zone (400 x 400 km)
Biogeographic Province
Area reserved for the Authority
Area under contract with the Authority

Based on CBD Decision IX/20 Annex III:

Four initial steps to be considered in the development of representative networks of marine protected areas

Network Design

Convention on Biological Diversity

1. use a biogeographical approach

2. identify important areas

3. iterative site selection to build a network

4. consider ecological coherence
(e.g., ecological connectivity and viability)

IMPORTANT AREAS

Vulnerable Marine Ecosystems (FAO)

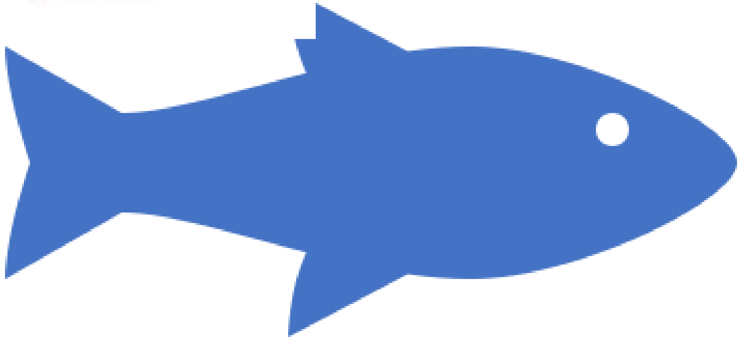
- Uniqueness or rarity
- Functional significance of the habitat
- Fragility
- Life-history traits that make recovery difficult
- Structural complexity

Ecologically and Biologically Significant Areas (CBD)

plus

- Biological diversity
- Biological productivity
- Naturalness

+ Scientifically & Culturally Important Areas



Convention on Biological Diversity

Evaluation of Network Design

1) Important Areas

2) Representativity

3) Connectivity

4) Replication

5) Adequacy & Viability **including under ocean climate change**

Convention on Biological Diversity

Network criteria based on CBD Decision IX/20 Annex II:

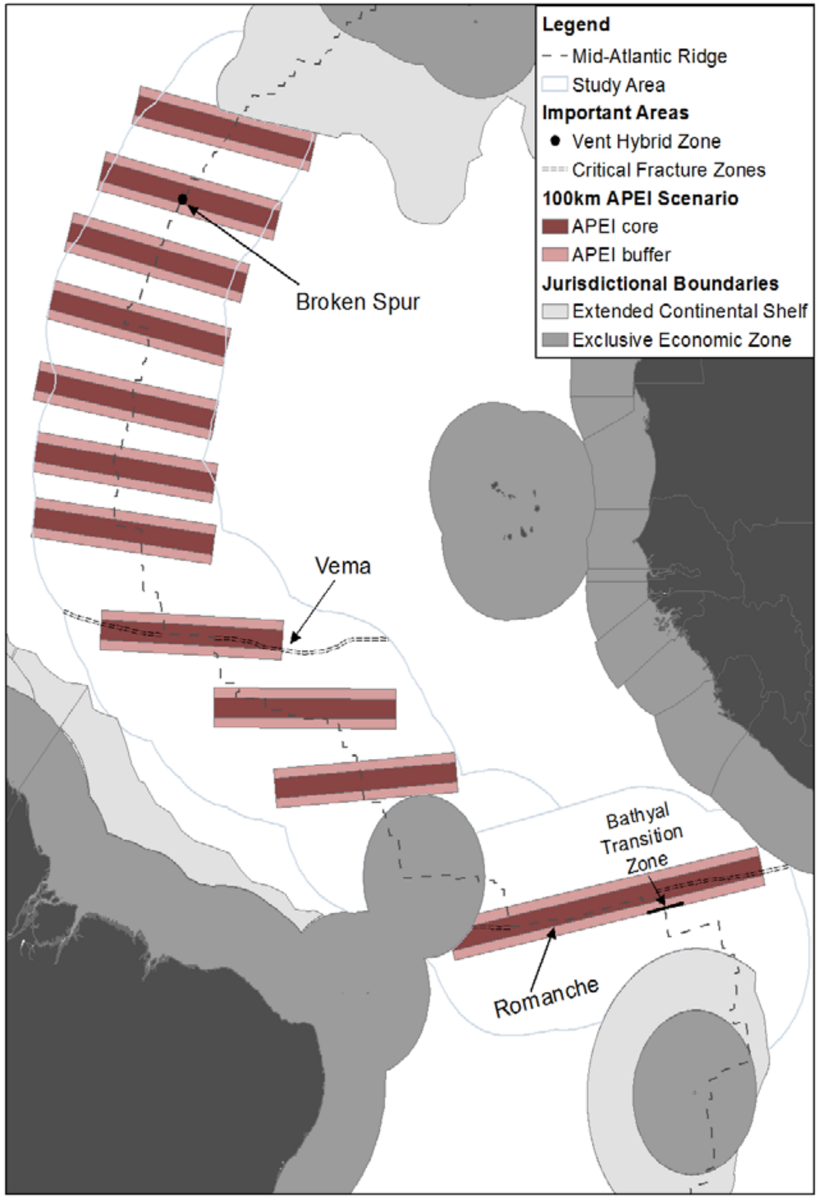
Scientific guidance for selecting areas to establish a representative network of marine protected areas, including in open ocean waters and deep-sea habitats

See Dunn et al. in press, *Science Advances* (due out in July) for an implementation of such an evaluation scheme

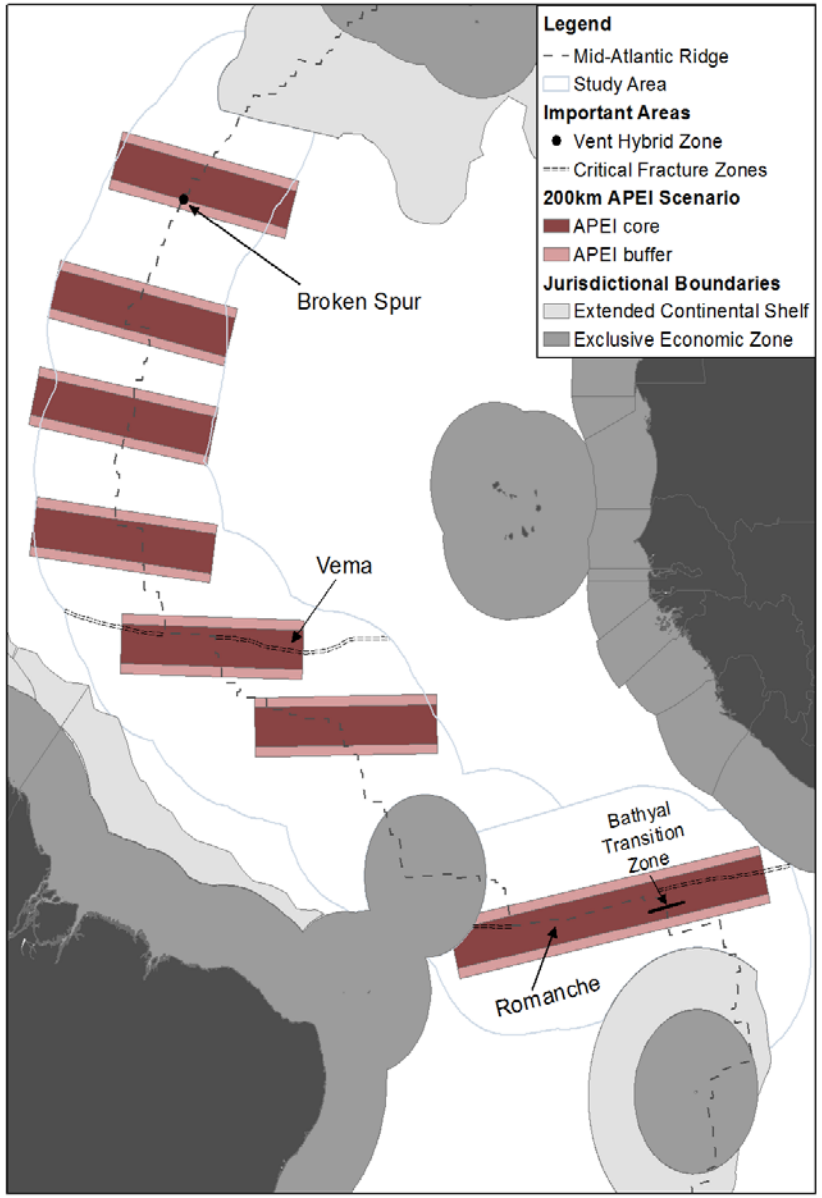
END

Scenarios (Core Length)

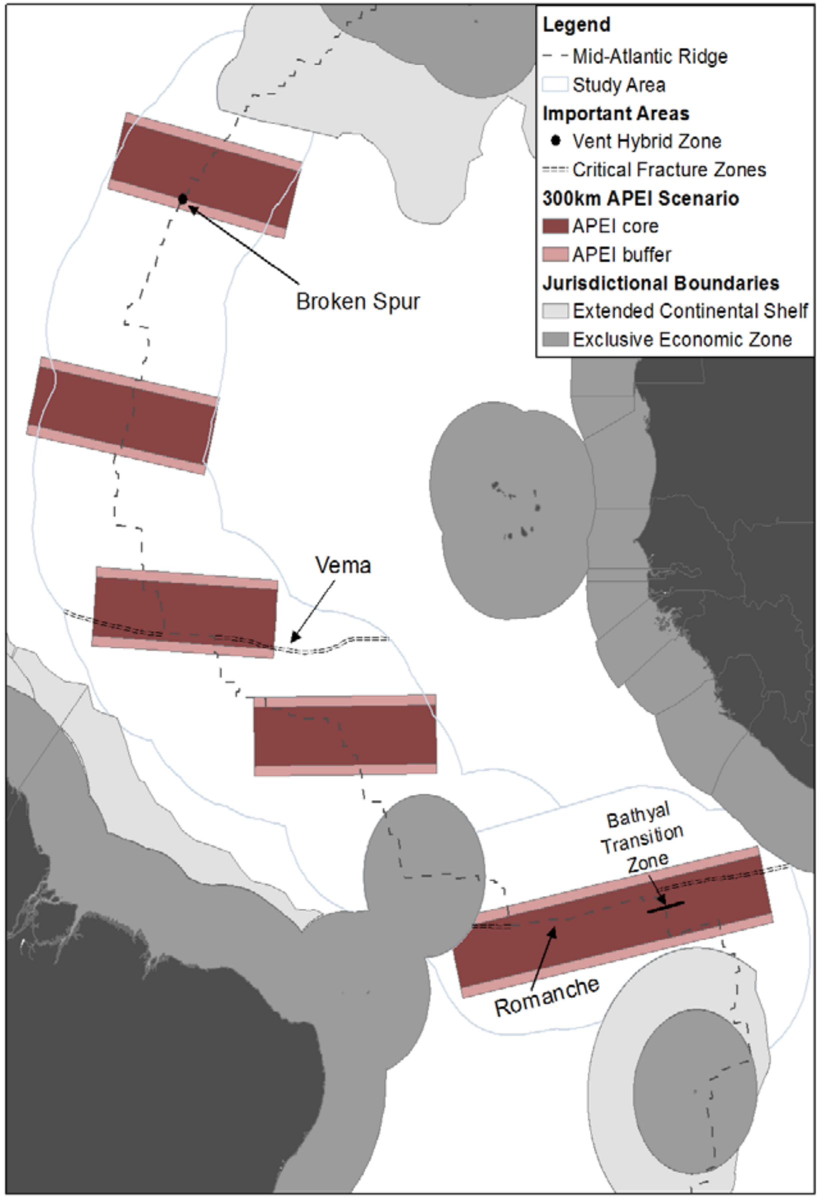
100 km

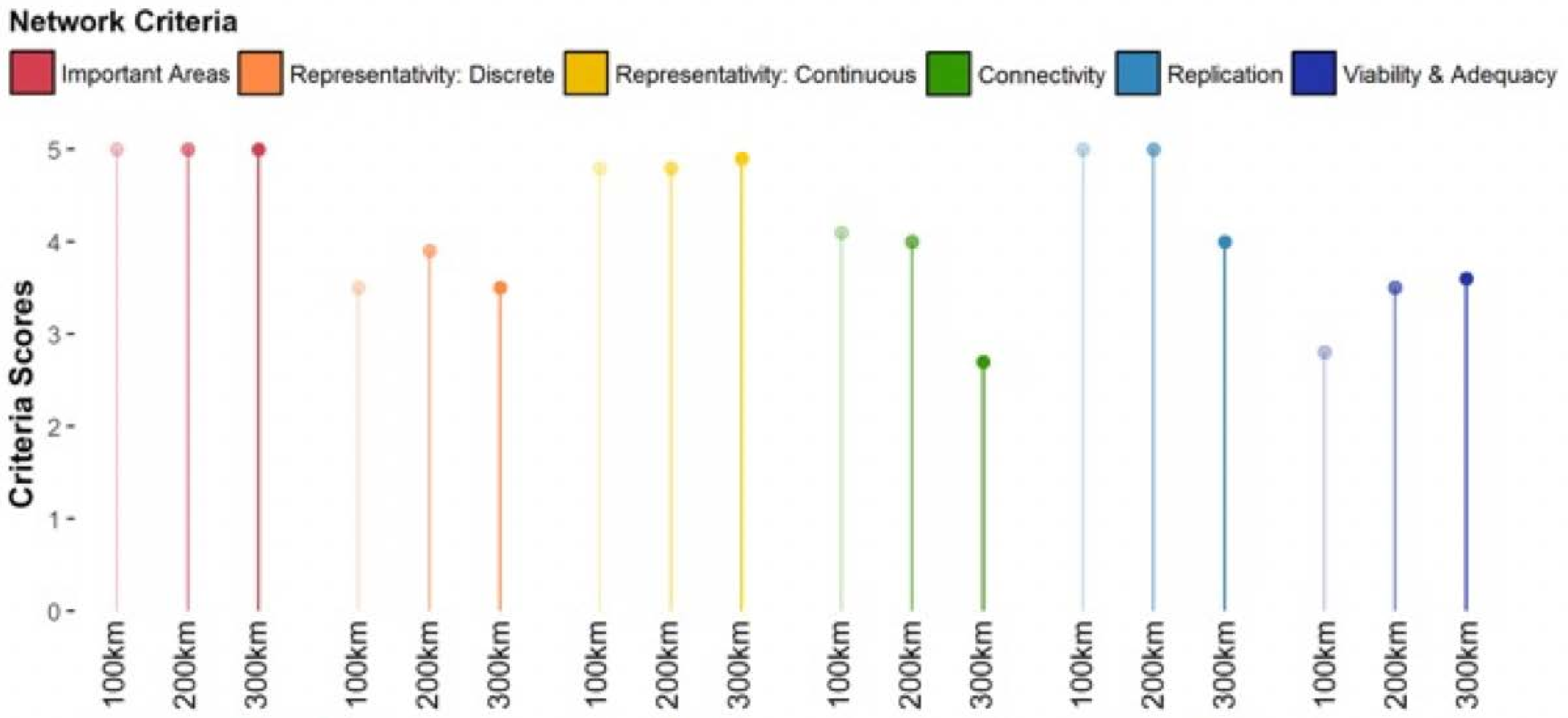


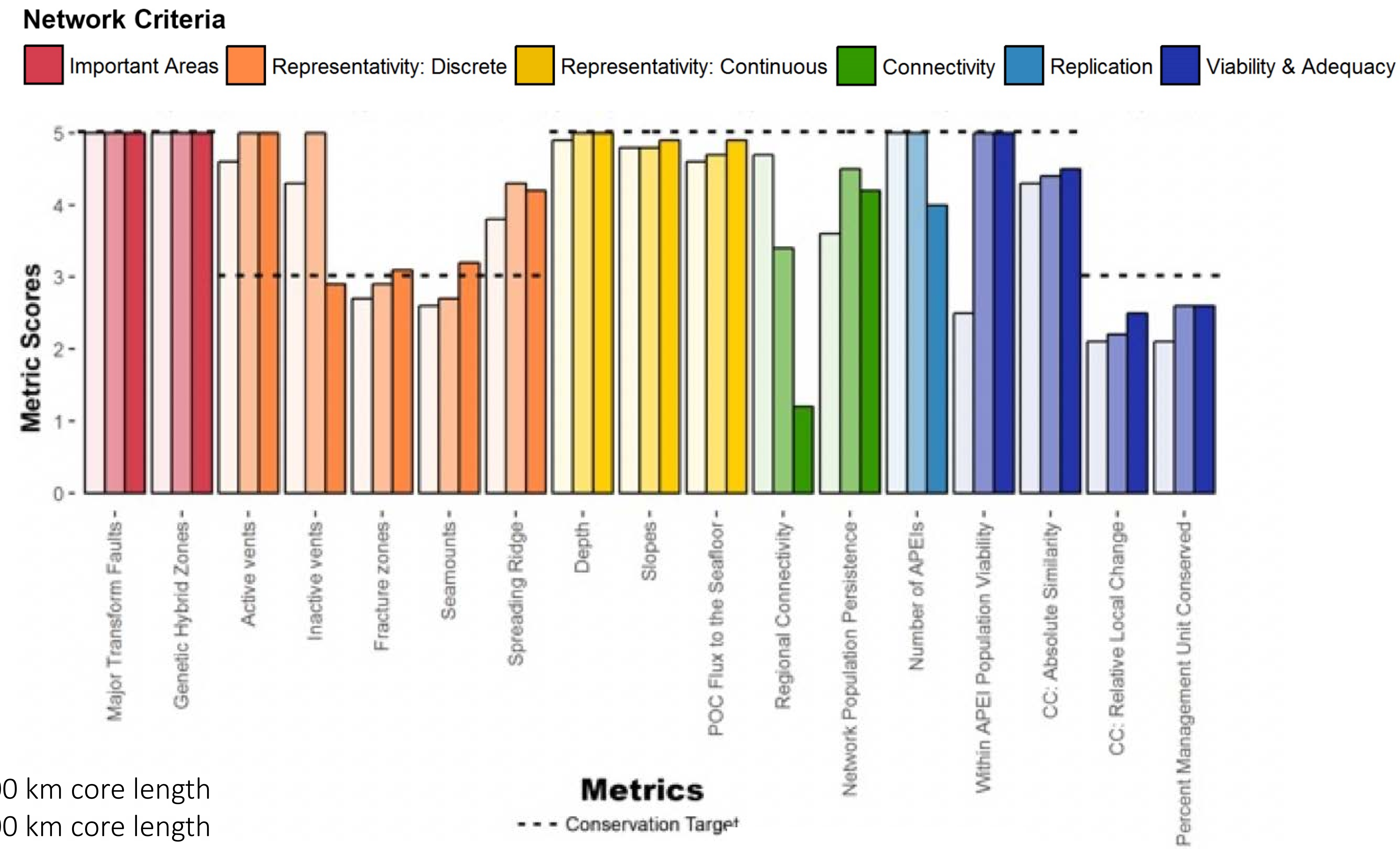
200 km



300 km




Network Criteria
Important Areas
Representativity: Discrete
Representativity: Continuous
Connectivity
Replication
Viability & Adequacy
Criteria Scores
0
1
2
3
4
5
100km
200km
300km

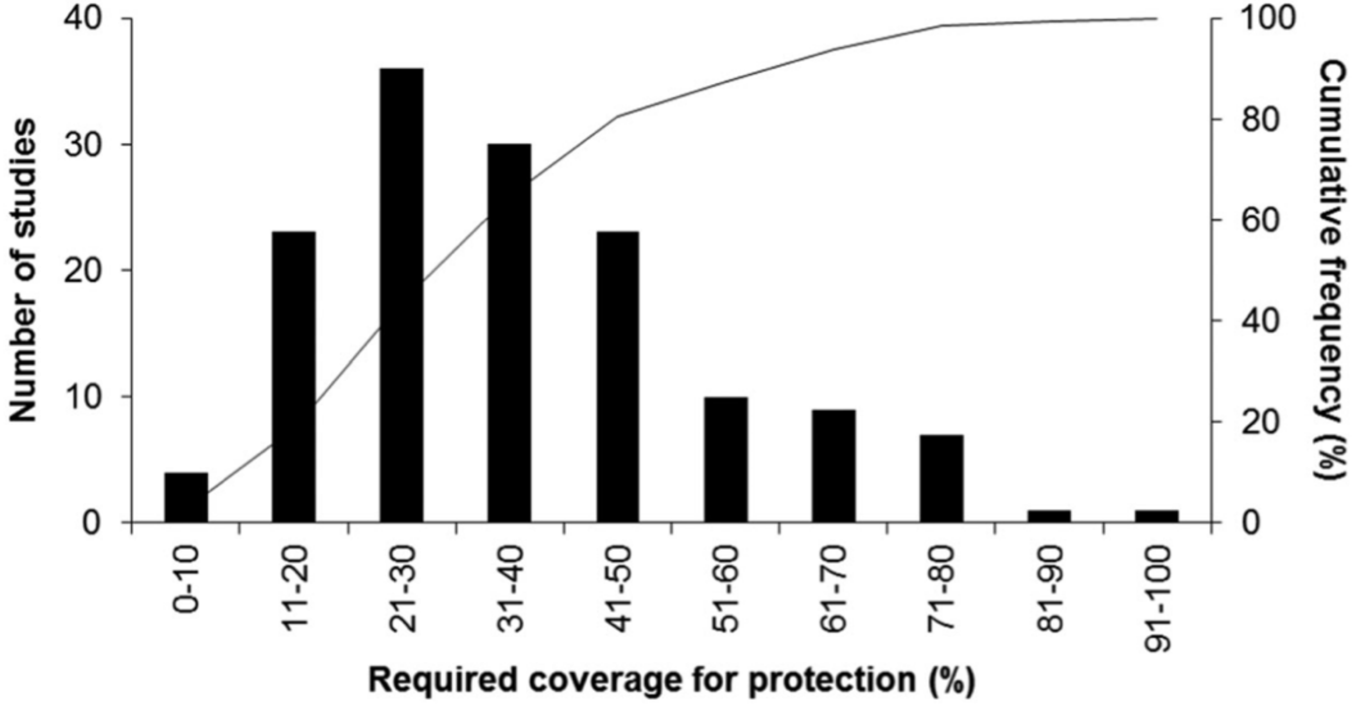


SHADING

Light: 100 km core length

Medium: 200 km core length

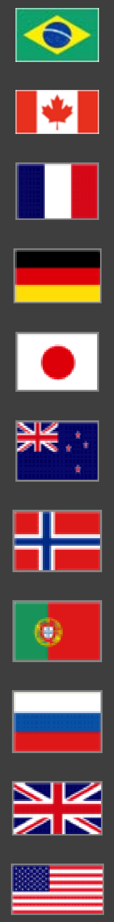
Dark: 300 km core length



O’Leary et al. 2016

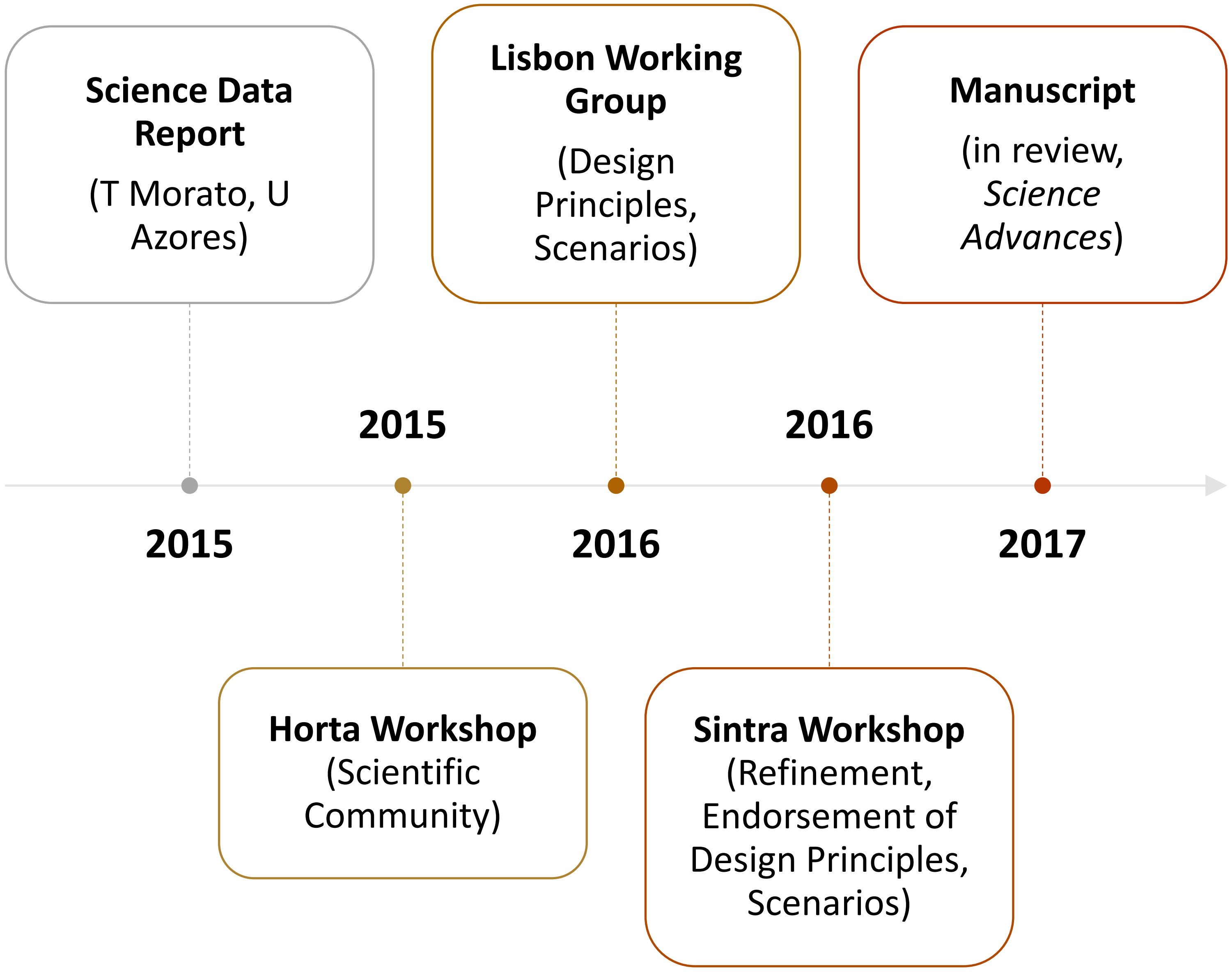
MPA Networks
Target Effective Area

30-50%



Mid-Atlantic Ridge Scientific Case Study

Area-Based Management Tool Framework for REMPs on Mid-Ocean Ridges



International Guidelines for the Management of Deep-sea Fisheries in the High Seas (FAO 2009)

- Uniqueness or rarity
- Functional significance of the habitat
- Fragility
- Life history traits of component species that make recovery difficult
- Structural complexity

Biogeographic transitions

Genetic hybrid zones

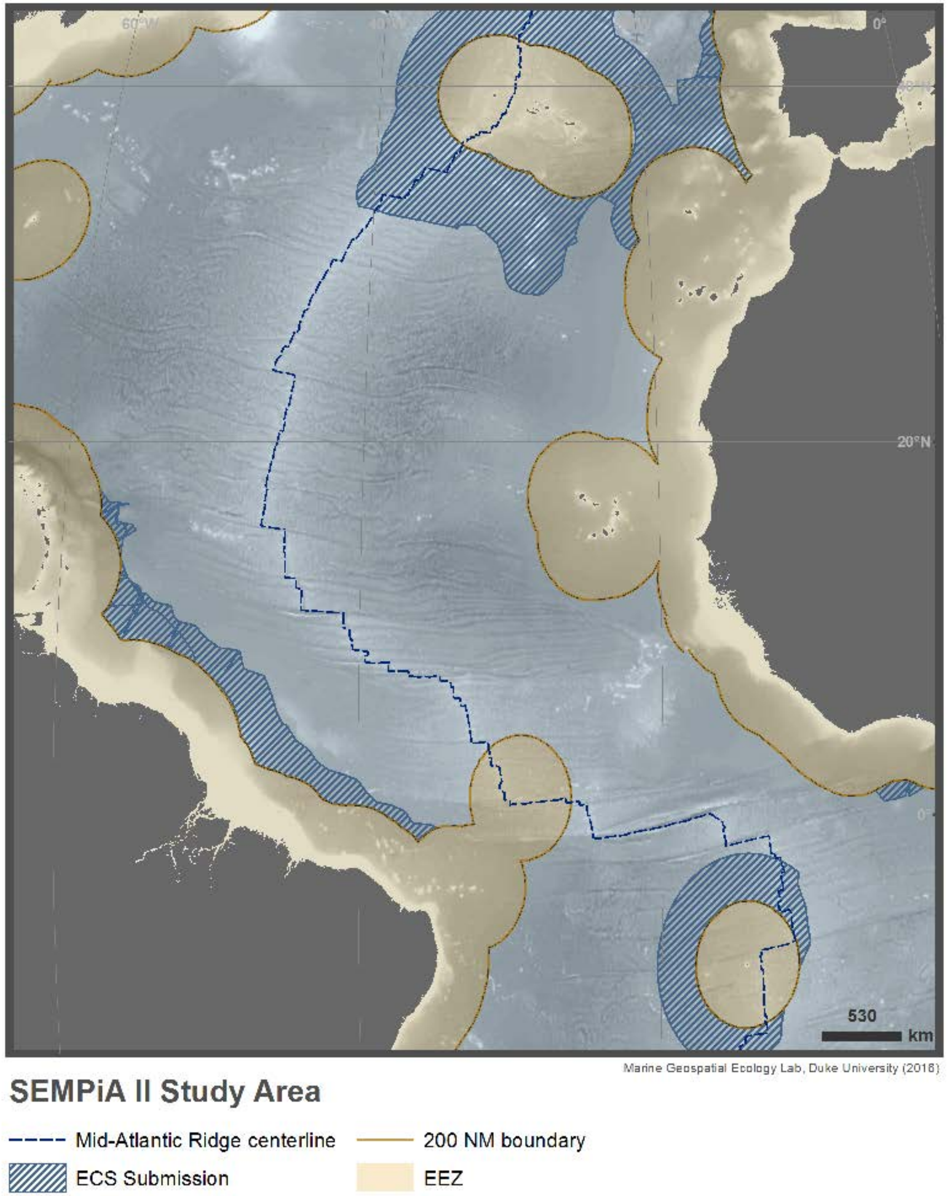
Major transform faults

Conservation Goal

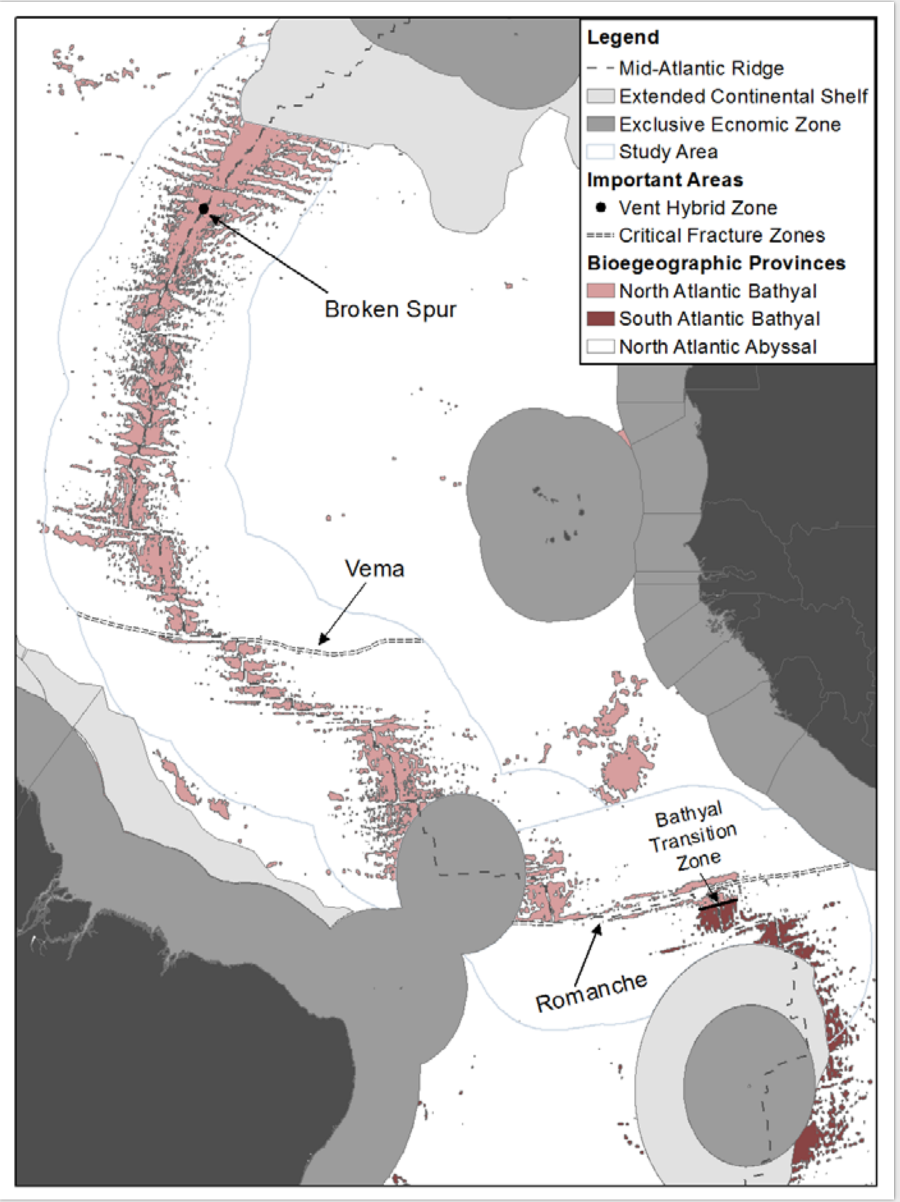
to contribute to:

“the protection of the natural diversity, ecosystem structure, function, connectivity, and resilience of deep-sea communities in the context of seabed mining in the region.”

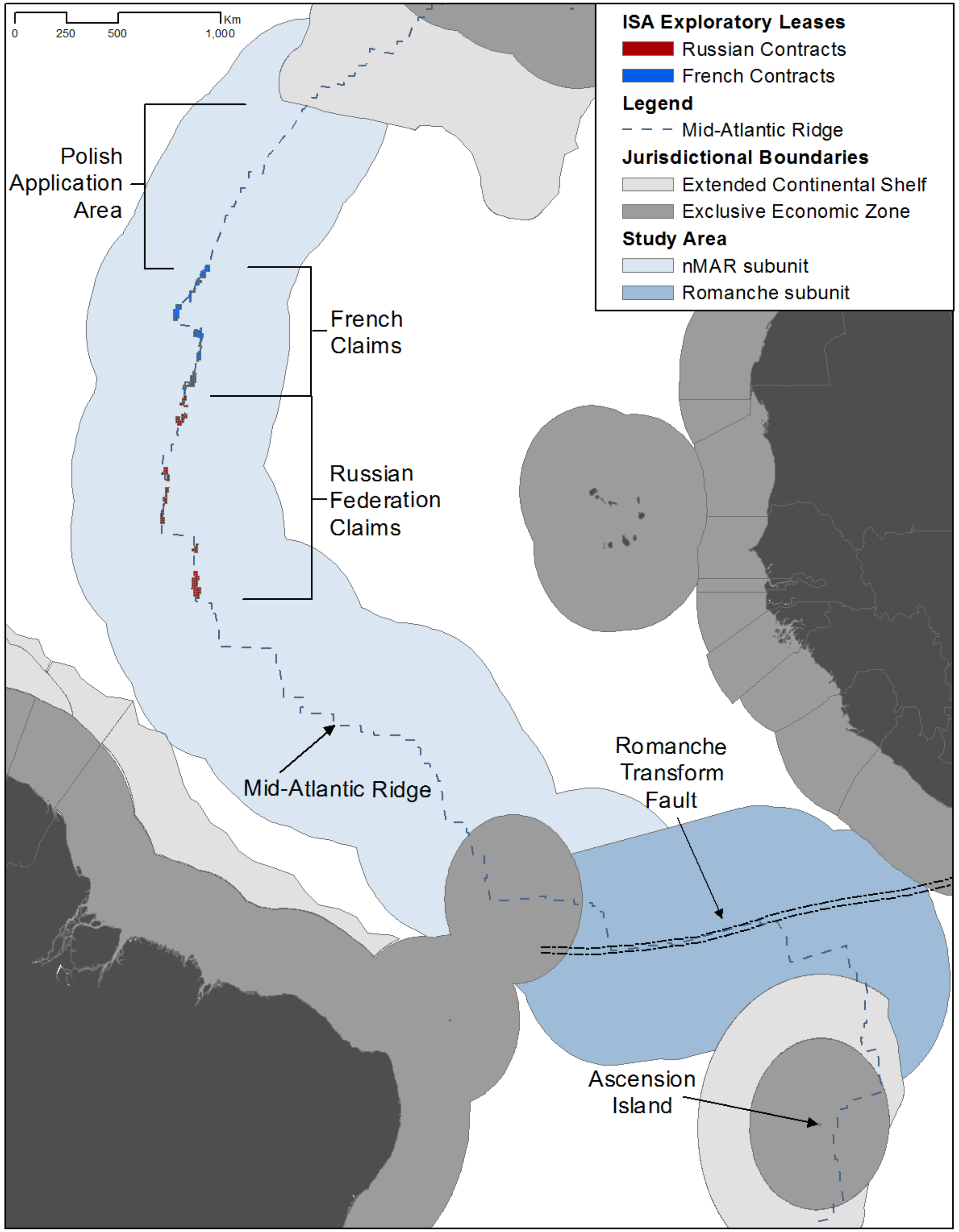
SEMPiA Study Area



Biogeographic Context & Important Areas



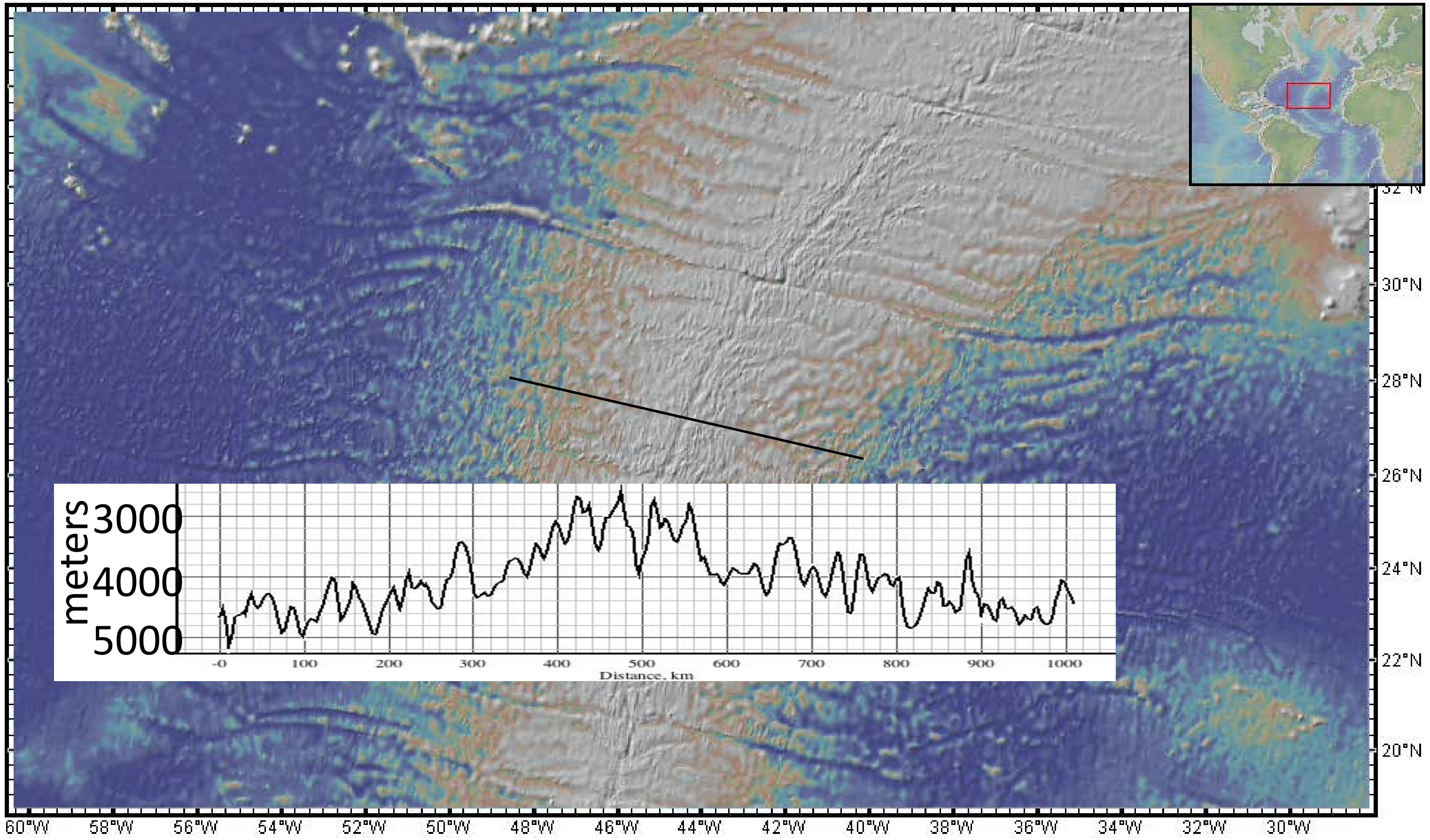
Exploration contracts awarded by the ISA



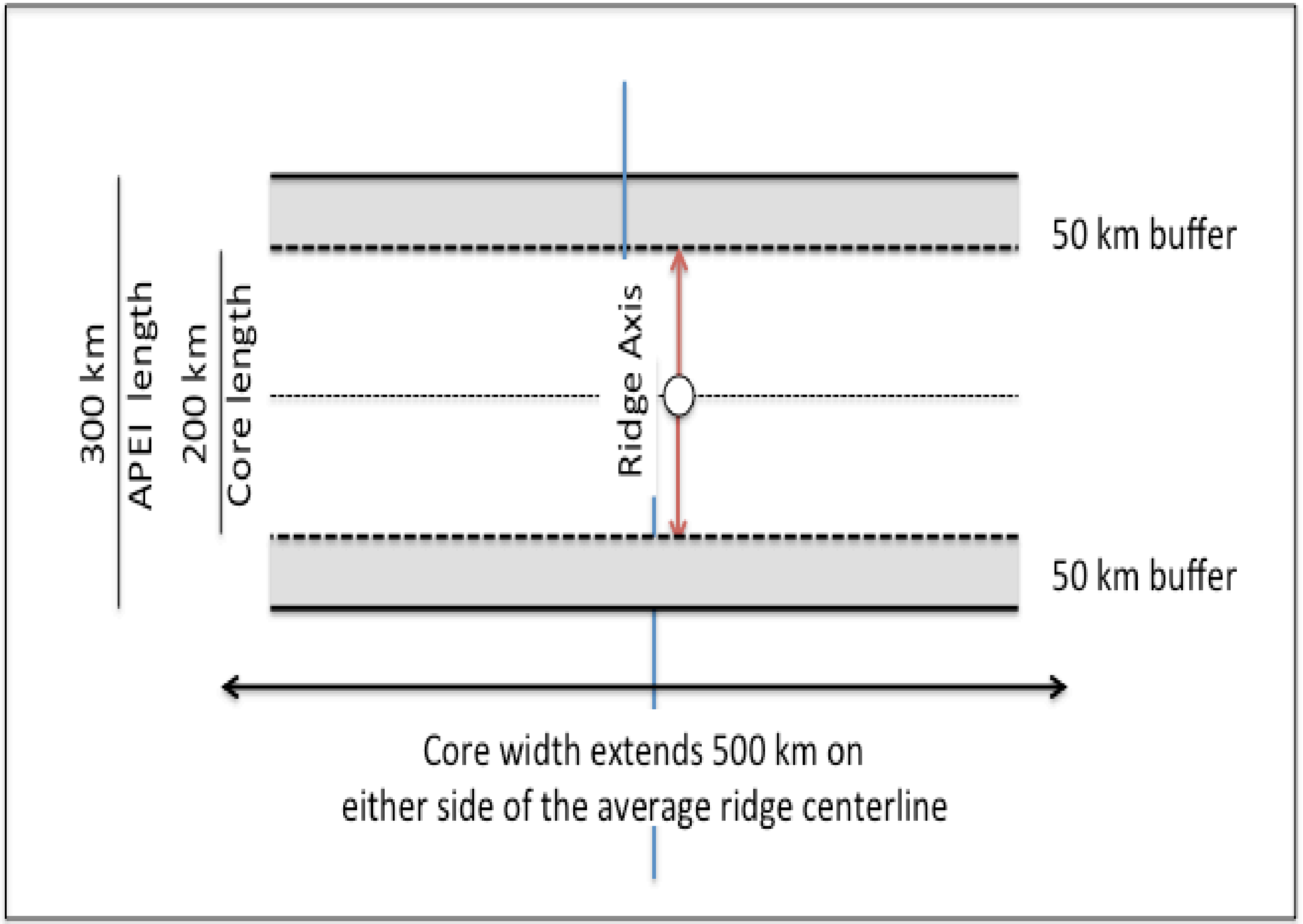
APEI Dimensions: Length

2X median larval dispersal distance
(best estimate: 100 km)

APEI Dimensions: Width



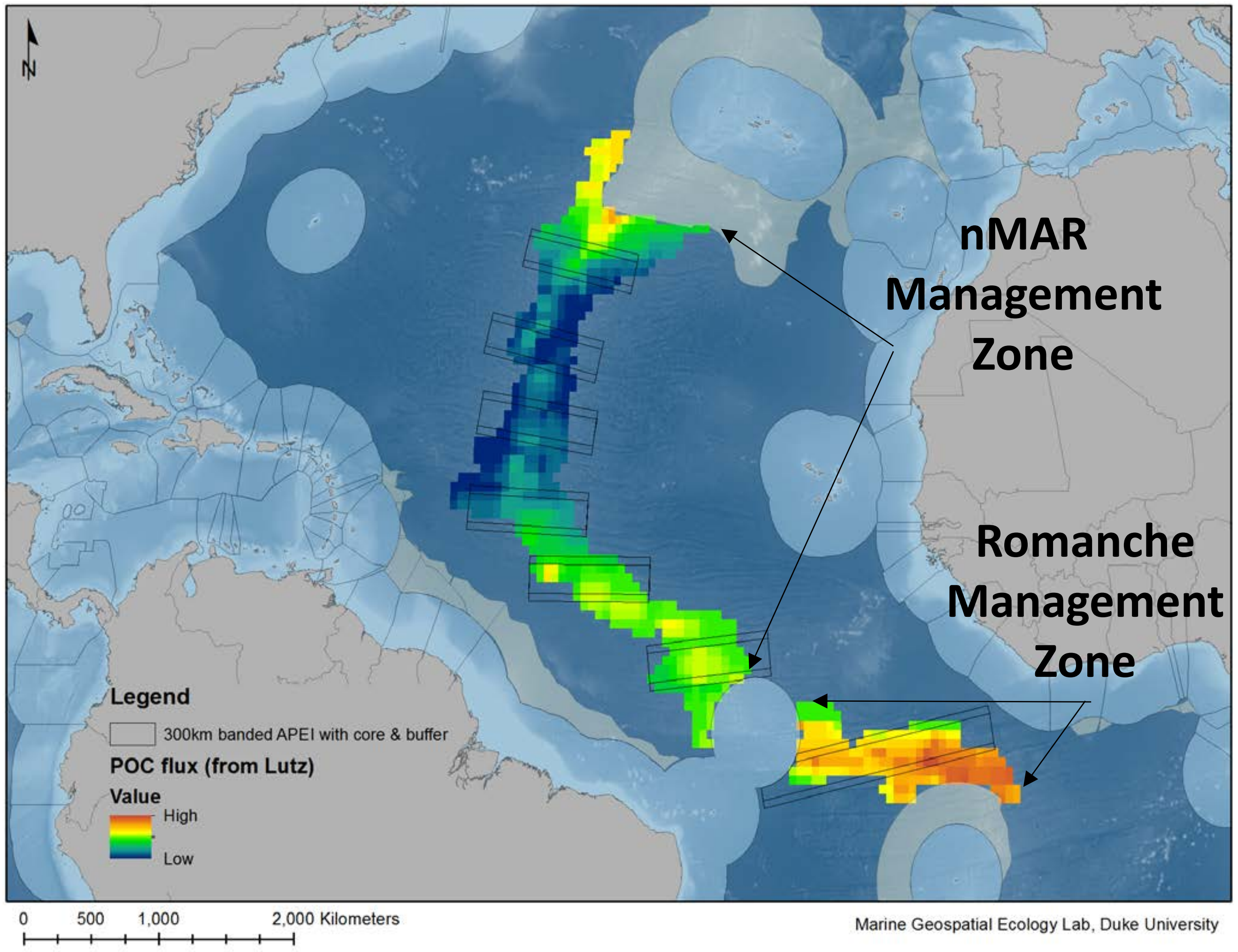
Proposal for APEI Size



POC Flux

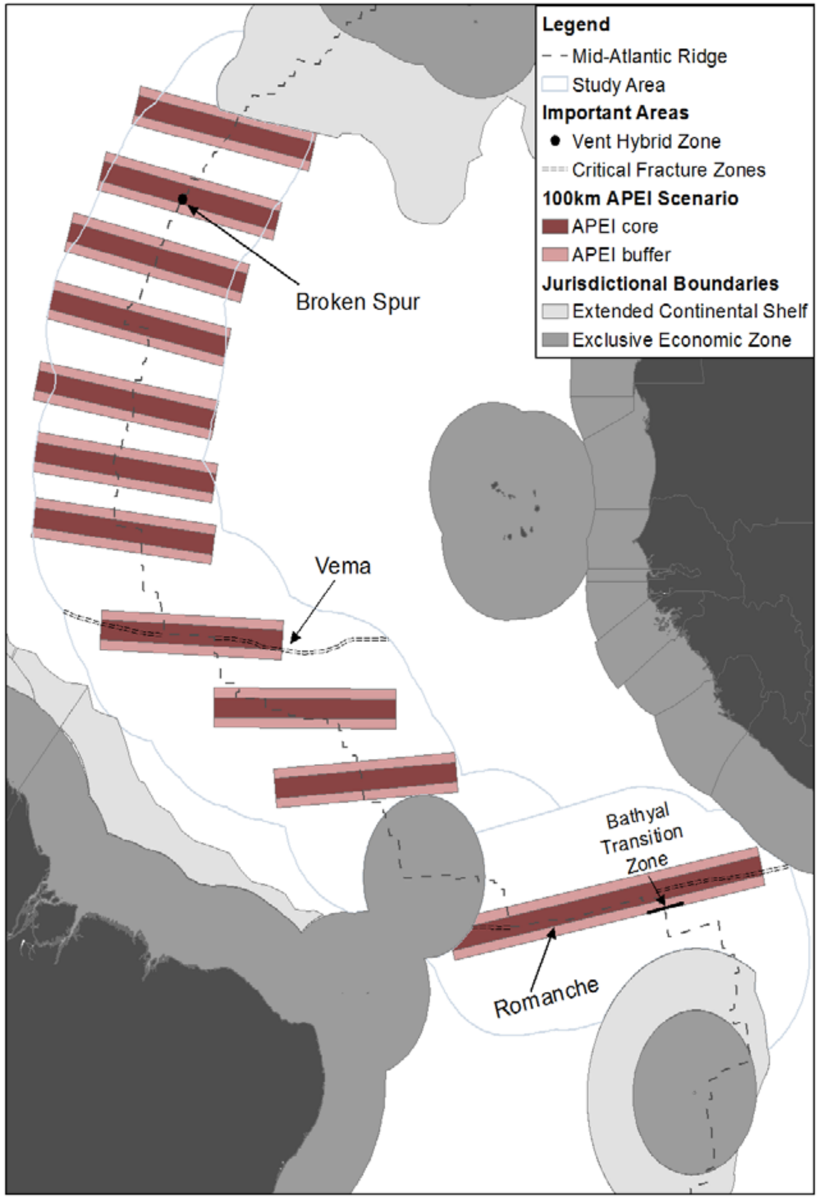
Management Units

200 km core APEIs

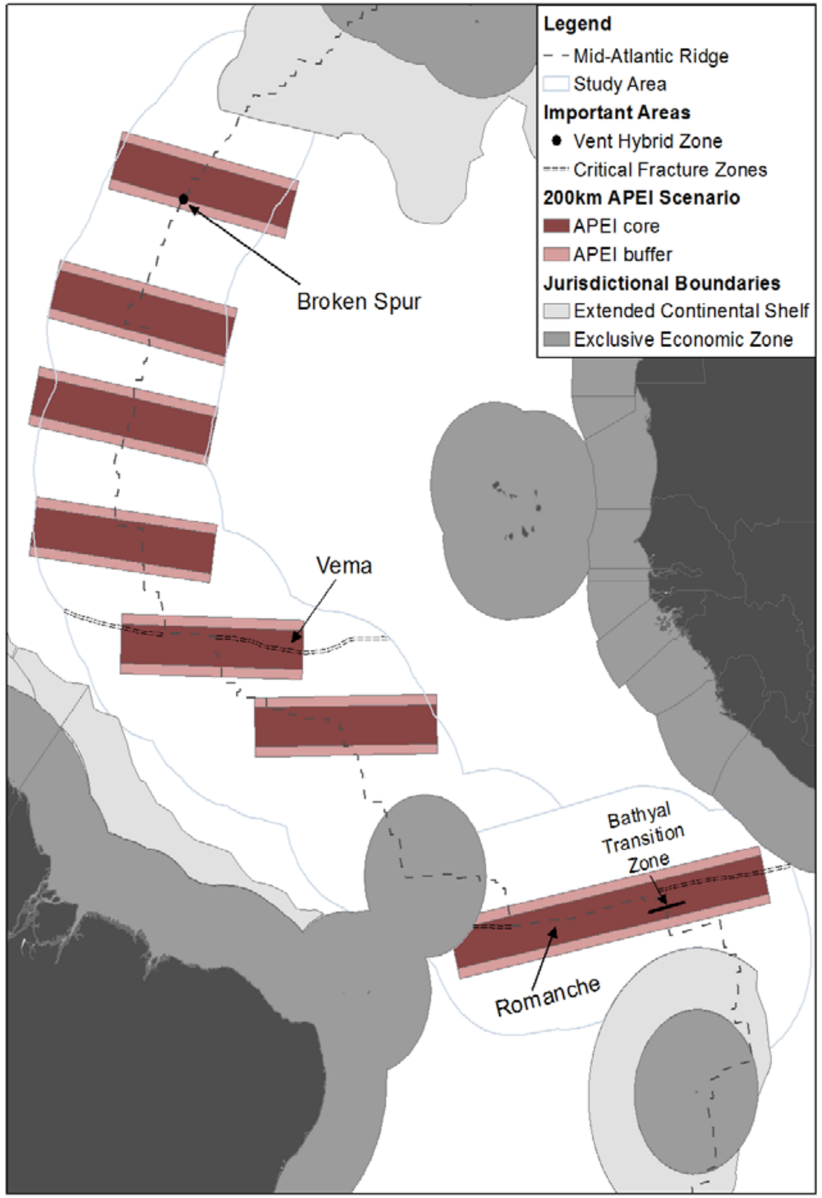


Scenarios (Core Length)

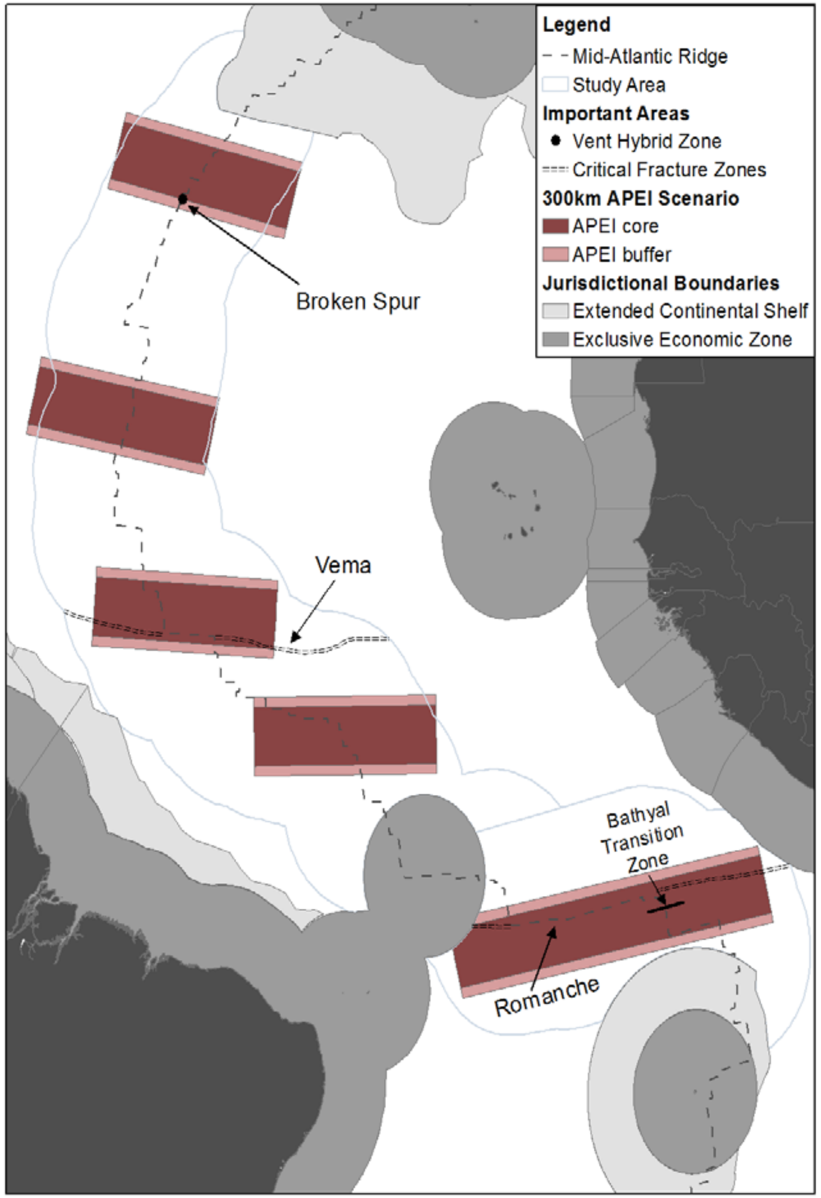
100 km

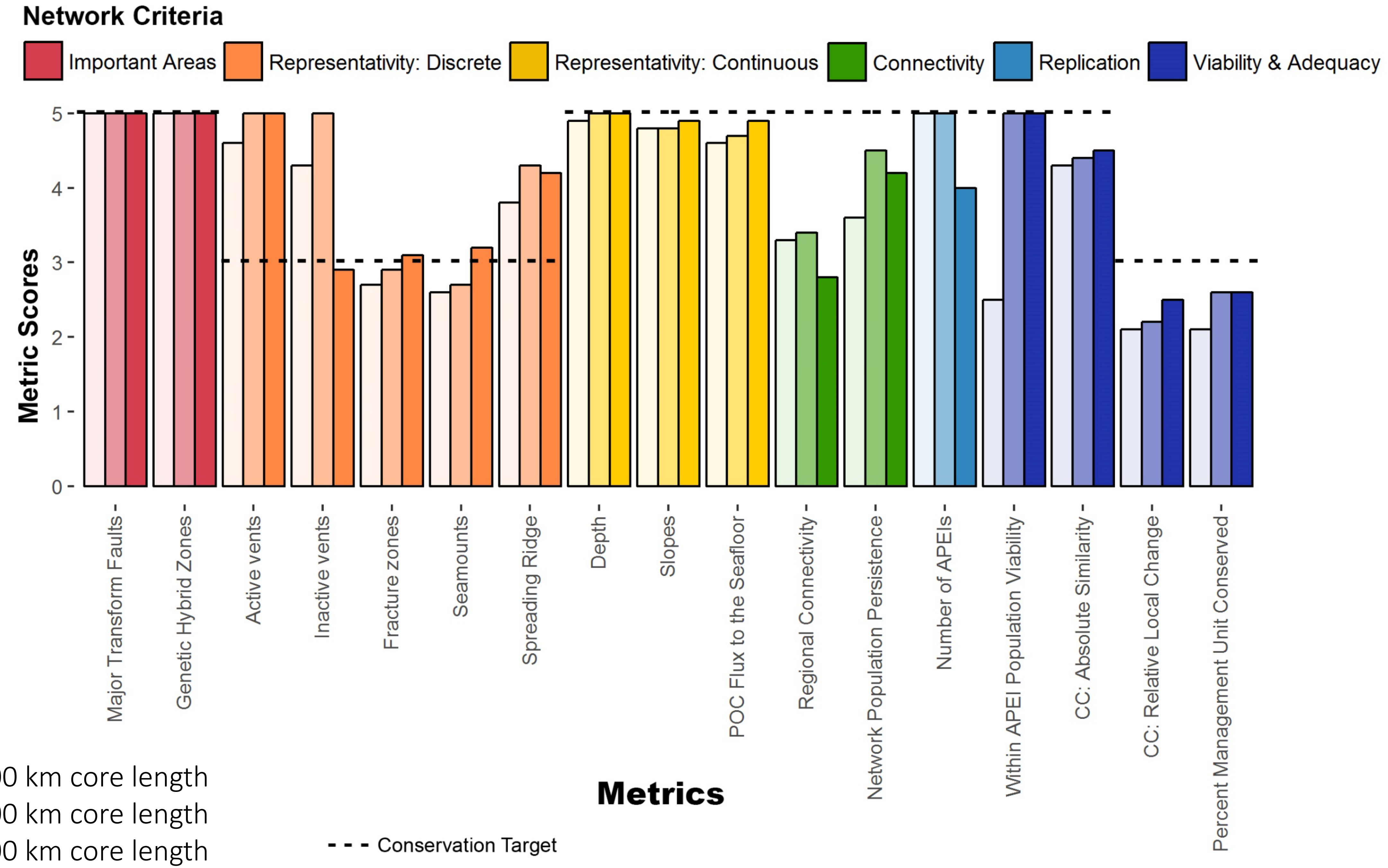


200 km



300 km





SHADING
Light: 100 km core length
Medium: 200 km core length
Dark: 300 km core length

Key Points

- Final design and placement of APEIs is the purview of member States of the ISA
- Design principles allow for a robust framework based on inter-governmentally agreed criteria
- Quantitative metrics allow for network design options to be evaluated against conservation goals
- Design principles may be applied to other mid-ocean ridges
- APEIs (no-mine areas) are only one part of a Regional Environmental Management Plan
  - Regional conservation targets may be met by multiple management measures (.e.g., protection of active vents, temporal planning, mitigation efforts, etc)

Thank You!

Preliminary strategy for the development of regional environmental management plans for the Area   ISBA/24/C/3 (16 January 2018)

ISA OBJECTIVES

- Proactive, area-based management tool to support informed decision-making that **balances resource development with conservation**

- Clear and consistent mechanism to identify particular areas thought to be **representative of the full range of habitats, biodiversity and ecosystem structures and functions** within the relevant management area, and provide those areas with appropriate levels of protection

APEI Key Points

- Final design and placement of APEIs is the purview of member States of the ISA
- Design principles allow for a robust framework based on inter-governmentally agreed criteria
- Quantitative metrics allow for network design options to be evaluated against conservation goals
- Design principles may be applied to other mid-ocean ridges
- APEIs (no-mine areas) are only one part of a Regional Environmental Management Plan
  - Regional conservation targets may be met by multiple management measures (.e.g., protection of active vents, temporal planning)

Thank You!

1. Assess environmental impact of the activity and determine which are significant

2. Identify all legal obligations and other requirements

3. Assess stakeholder views

4. Prepare an environmental policy

5. Define key roles and responsibilities

6. Establish environmental management objectives and targets

7. Develop environmental management programs, identify operational controls, monitoring, and measurement needs

10. Establish corrective action, document control, and records management processes

etc

https://www.epa.gov/ems/guide-developing-environmental-management-system-do

CCZ EMP Outline

I. INTRODUCTION

A. Legal Framework

B. Other international organizations and processes related to the protection of the marine environment

C. Guiding principles

D. Definition of the Clarion-Clipperton Zone area and other relevant terms

E. Description of mining operations, vulnerability and potential impacts

CCZ EMP OUTLINE

II. Environmental Management*

A. Spatial Variation
B. Size of areas of particular environmental interest
C. Scientific design
D. Flexibility

III. Vision

IV. Goals

V. Strategic Aims

* Is spatial management sufficient?

CCZ EMP OUTLINE

VI. Operational objectives
   A. Entire Clarion-Clipperton Zone
   B. Contract Areas
   C. Areas of Particular Environmental Interest

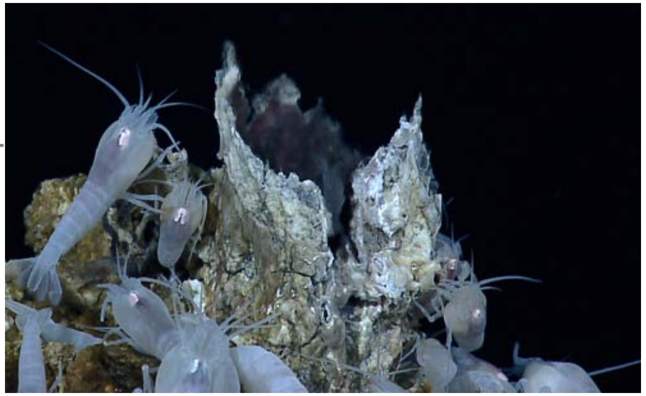
VII. Management Objectives
   A. Entire Clarion-Clipperton Zone
   B. Contract Areas
   C. Areas of Particular Environmental Interest

VIII. Implementation

IX. Review

X. Recommended priority action

important areas e.g., **active** hydrothermal vents



NOAA Ocean Exploration

- Active hydrothermal vent ecosystems are extremely rare.
- Mineral resources at active vents would not contribute significantly to the global metal supply.
- Effective networks that protect representative active vents cannot be ensured.
- Avoiding impacts to active hydrothermal vents would be consistent with their recognition as vulnerable by international organizations.

see Van Dover et al. 2018, *Marine Policy*