Dinard Workshop
Deliberations and Outcomes

(31 May to 4 June 2012)

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Workshop Participants

CHAIRS: CL Van Dover, C Smith

PARTICIPANTS: 31 experts, 14 countries, representing ocean governance, industry, marine scientific research

Workshop Goals

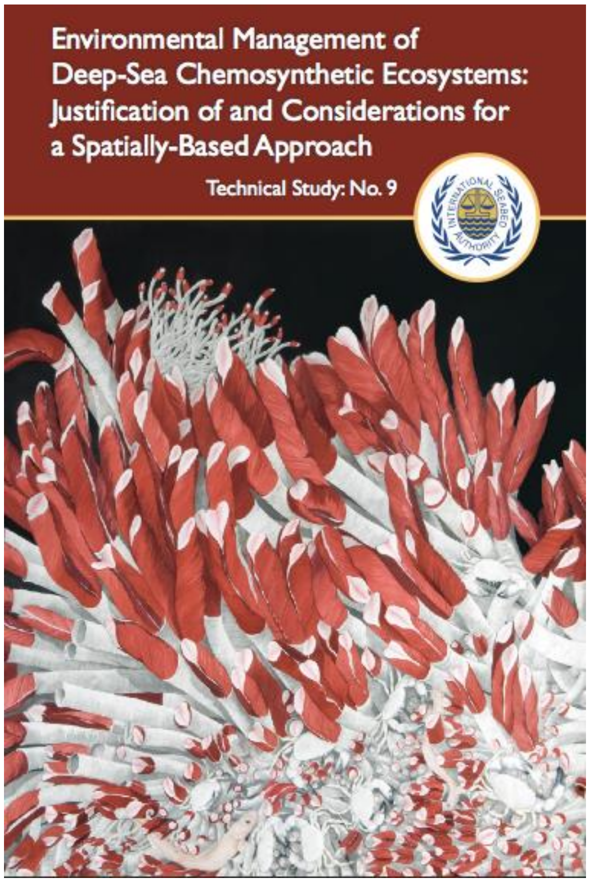
- **Formulate general guidelines for conservation of vent and seep ecosystems at regional and global scales**

- Establish a research agenda aimed at improving existing plans for spatial management of vent and seep ecosystems

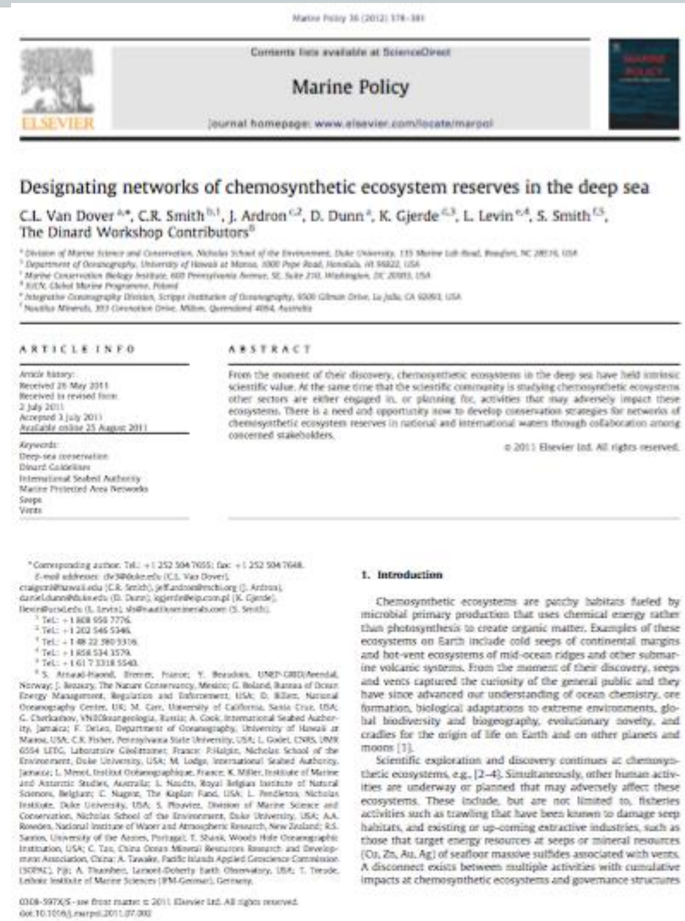
Deliberations

- Current and emerging concerns for management of vent and seep ecosystems
- Basic characteristics of vent and seep ecosystems
- Review of established MPAs at vents and seeps
- Relative impacts of human activities on vents and seeps (extensive table of expert opinion – nature, likelihood, intensity, scale, duration, frequency, persistence of impact, probability of accidental event)
- Relevant policy instruments, jurisdictional boundaries
- Knowledge status and gaps
- **Design principles for spatial management as a conservation tool for chemosynthetic ecosystems**

Deliberations



https://www.isa.org.jm/sites/default/files/files/documents/tstudy9.pdf



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Designating networks of chemosynthetic ecosystem reserves in the deep sea

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A B S T R A C T

From the moment of their discovery, chemosynthetic ecosystems in the deep sea have held intrinsic scientific value. At the same time that the scientific community is studying chemosynthetic ecosystems other sectors are either engaged in, or planning for, activities that may adversely impact these ecosystems. There is a need and opportunity now to develop conservation strategies for networks of chemosynthetic ecosystem reserves in national and international waters through collaboration among concerned stakeholders.

1. Introduction

Chemosynthetic ecosystems are patchy habitats fueled by microbial primary production that uses chemical energy rather than photosynthesis to create organic matter. Examples of these ecosystems on Earth include cold seeps of continental margins and hot-vent ecosystems of mid-ocean ridges and other submarine volcanic systems. From the moment of their discovery, seeps and vents captured the curiosity of the general public and they have since advanced our understanding of ocean chemistry, ore formation, biological adaptations to extreme environments, global biodiversity and biogeography, evolutionary novelty, and cradles for the origin of life on Earth and on other planets and moons [1].

Scientific exploration and discovery continues at chemosynthetic ecosystems, e.g., [2–4]. Simultaneously, other human activities are underway or planned that may adversely affect these ecosystems. These include, but are not limited to, fisheries activities such as trawling that have been known to damage seep habitats, and existing or up-coming extractive industries, such as those that target energy resources at seeps or mineral resources (Cu, Zn, Au, Ag) of seafloor massive sulfides associated with vents. A disconnect exists between multiple activities with cumulative impacts at chemosynthetic ecosystems and governance structures

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Chemosynthetic Ecosystem Reserves (CERs)
Conservation Goal

GOAL

To protect the natural diversity, ecosystem structure, function, and resilience of chemosynthetic communities while enabling extraction of natural resources.

Conservation Objectives

builds on CBD IX/20 Annex 2 and EBSA criteria

- Maintenance of biodiversity, ecological connectivity, functional linkages
- Conserve multiple ecosystems within management units to address uncertainty, natural variation, catastrophic events, limited scientific understanding, and adaptive management
- Adequate size and spacing to allow for sustained ecosystems; multiple sites to include representative communities/processes
- Measures for well-managed human uses consistent with conservation goals
- Scientific reference sites with long-term monitoring to differentiate effects of human activities from natural variability
- Maintain the potential of vent ecosystems to provide future services (e.g., industrial, medical, energy) as well as evolutionary potential for biota to cope with change

Chemosynthetic Ecosystem Reserves (CERs) Dinard Guidelines

SPATIAL DESIGN

A. Identify sites that meet CBD criteria for Ecologically and Biologically Significant Areas (EBSAs) AND that are otherwise of particular scientific, historical, or other cultural importance (EBSCAs).

B. Define regional framework for ecosystem-based management (i.e., ***natural management units***[1] within biogeographic regions or provinces).

[1]*natural management unit*: may be defined by genetic connectivity of key taxa

Chemosynthetic Ecosystem Reserves (CERs) Dinard Guidelines

C. *Within management unit:* Determine distribution of chemosynthetic habitats to provide a spatial framework for capturing representativity.

D. *Within management unit:* Design and establish replicated networks of CERs to include EBSCAs, using guidelines for size and spacing that ensure connectivity and that take into account the pattern of distribution of chemosynthetic habitats, which may vary from semi-continuous to widely dispersed.

E. Define human uses and the levels of protection for each CER to achieve the conservation goal.

CER Design Principles

- Buffer zones are essential
- Spacing of CERs
  - For semi-continuously distributed habitats, spacing should mimic the natural distribution of distances between habitat patches. If natural distribution is unknown, a variety of distances should be incorporated
  - Where habitats are only known to be widely distributed (precluding a rigorously replicated network design within a unit), conservation status of a given site needs to be negotiated between the contractor and an environmental advisory panel of the regulatory authority
- Number of Networks
  - One or more within a management unit, taking into account potential for directional dispersal and optimization of potential for each site to serve as a source and a sink

CER Design Principles

- Conservation targets
  - Well studied areas (where > 90% of sites are known in a region): at least 30% should be placed in a network of CERs
  - Poorly studied areas (little or know knowledge of site locations): >50% of management area be placed in a network of CERs
- Maximize number of distributed CERs
  - Spreads risk
  - Ensures capture of natural variation
  - Increases connections
  - Greater uncertainty requires greater replication of CERs
- Tests of CER efficacy
  - Performance through monitoring metrics

Policy Conditions

- Management unit must be large enough to achieve conservation goal
- Identify CERs to promote integration of interests of multiple governance bodies, multiple oceanic regions
- Tradeoffs negotiated among stakeholders can contribute to decision process, but final network must be consistent with conservation goals
- Initial networks should be implemented in areas where ecological and human values are high and risk is imminent

Additional Considerations

- Consultation – among stakeholders
- Transparency – open and timely access to non-proprietary environmental data and cross-sectoral information exchange
- Governance – integrated across multiple frameworks
- Multi-use CERs
  - require EIAs for activities likely to cause adverse environmental impacts
  - Monitoring to assess cumulative impacts
  - Prescriptive criteria for ‘triggers’ for closer monitoring or cessation of activities that threaten conservation goals

Tromsø-Bergen Concept

Potential 2-step model, protection of vent ecosystems, ABNJ

1. Establish reserves <u>at all active and inactive vents</u> ≤100,000 T[1], <u>and</u> areas of ecological, biological, or scientific interest, with buffer zones.

   Rationale:

   - 50% of known sites are <0.1 Mt (S Petersen, pers.comm.) – make up a natural network
   - not economically viable (too small)
     - not technologically viable (too hot, acid) at active sites
     - provide valued supporting, provisional, regulating, cultural services

Tromsø-Bergen Concept

Potential 2-step model, protection of vent ecosystems, ABNJ

2. Contractor & ISA (with input from independent advisory board) negotiate reserve status of active vents >100,000 T, based on goals of Strategic Environmental Assessment (SEA) and environmental baseline data (including 100% visual coverage of exploitation blocks) collected during exploration.

Knowledge Gaps

- Connectivity
  - Regional contexts
    - Larval ecology
    - Physical oceanography
    - Population genetics
  - Tipping points
    - Cumulative impacts

- Resilience to disturbance
  - Recovery times
  - Trajectories
  - Cumulative impacts

Knowledge Gaps

- Effectiveness of management strategies
  - Avoidance, minimization, rehabilitation, offsets, bonds
  - Precautionary approaches
  - Adaptive management
  - Transparency
  - Enforcement

More Knowledge Gaps (hydrothermal systems)

- Location of ecosystems and distribution of active and inactive deposits
- Community composition (including endemism, diversity, other metrics) and genetic diversity
  - Extent to which distinctive biogenic habitats contribute to overall species diversity and demographic processes
  - Amount of genetic diversity critical to sustain populations in spatially and temporally heterogeneous sites
  - Spatial scales of genetic diversity for most taxa
  - Effective population sizes
  - Paucity of studies at inactive sites

More Knowledge Gaps (hydrothermal systems)

- Temporal dynamics and variability
  - Interplay between temporal variability, population dynamics, connectivity
  - Natural variability in fluid flux and influence on communities
  - Temporal dynamics in inactive systems
  - Intensity, spatial scales, and frequency of human extractive activities
- Degree of endemicity (taxa at active and inactive vents)
- Sphere of influence of chemosynthetic ecosystems on background ecosystem
- Ecological value and metrics to assess impacts, define thresholds

More Knowledge Gaps (hydrothermal systems)

- Commercial, scientific, cultural and educational values of vent ecosystems and their natural resources
- Existence value of vent ecosystems (contingent valuation, willingness to pay to preserve)

Chemosynthetic Ecosystem Reserves (CERs) Design Principles

- Design replicated networks of CERs within a bioregion
  - Use guidelines for size and spacing
    - ensure connectivity
    - take into account the pattern of distribution of chemosynthetic activity (e.g., from semi-continuous to widely dispersed)
- Define human uses and levels of protection for each CER or network of CERs to achieve the conservation goal

A priori Considerations

- Identify spatial management approaches and goals
- Broad design guidelines for vents in context of other spatial management needs
- Communication of value of chemosynthetic ecosystems
- Increase knowledge of potential impacts (types and levels of disturbance, spatial and temporal scales)
- Consider process for engagement of stakeholders
- Transparency
- Knowledge of distribution of vent ecosystems (active and inactive) is critical
- Potential to facilitate discovery