



## **COMARGE Workshop**

### **Habitat Classification and Mapping on deep Continental Margins**

**4<sup>th</sup> – 6<sup>th</sup> June 2007**

**National Oceanography Center,  
Southampton, UK**

## **Approaches to habitat classification on continental margins.**

Alan Hughes and Lenaick Menot

### Introduction

COMARGE is an international network of scientists which aims at addressing key ecological issues concerning continental margin ecosystems (c. 200 to 4000 m water depth). In July 2006, at a COMARGE meeting at the Institute Océanographique in Paris, a working group was formed to examine landscape patterns and processes on continental margins. This group had two overall aims:

- a) Quantify and compare habitat heterogeneity on continental margins.
- b) Refer to a common framework for habitat description.

It was decided that a workshop to address these issues would be held in Southampton on 4-6 June, 2007. This workshop will bring together geophysicists and biologists to compare the different approaches adopted by both groups in mapping habitats in different geographic regions.

### Background

Bathyal continental margins (200 to 3000 m water depth) occupy 17.8% of the World Ocean area (Zezina, 1997), and offer a wide variety of environmental conditions due to differences in water depth, surface primary productivity, current activity, the topography of the sea-floor, sediment characteristics, underlying geology, lateral and downslope sediment transport processes and the physical and chemical nature of the overlying water masses. To map the distribution of benthic species within large areas such as this, geophysical classifications of habitat types, as surrogates for marine community types, are the only practical approach. In shallow waters, the relationship between major habitats and physical factors are relatively clear. However, in deeper waters, species diversity often increases and relationships between major habitat types and community types can become less distinct (Roff et al., 2003). Where there is little variation in several geophysical factors, we may need to place greater reliance on direct mapping of the biological communities themselves; this may be the case in the deep sea, where large areas may be covered in seemingly homogeneous muds and silts.

While the development of marine biotope mapping historically begun from a biological perspective, nowadays more emphasis is usually given to geophysical classification and mapping of habitats. This trend has been fostered by the development of new technologies, mainly sonar and echo sounders, to accurately map the bathymetry, topography, roughness and nature of the seafloor. These new technologies offer an easier and faster way to map habitats than is possible to map biological communities directly. Remote habitat mapping may guide biological sampling and identify the probable location of boundaries or gradients between community types. "Seascapes", as identified by geophysical surveying, may not correspond to biotopes, however, but may correspond to sets of community types that require further subdivision according to more detailed physical factors. For example, on continental slopes benthic communities may change with bathymetric depth,

although there is not a notable change in the sediment type indicated from the geophysics of the region. On continental margins the factors that may influence the distribution of the fauna, may not be immediately obvious from remote sensing (e.g., the quantity, quality and periodicity of organic carbon inputs may be important drivers behind species distributions).

The development of habitat classification in shallow seas has been motivated by conservation issues. The same issues are now leading to the expansion of habitat mapping into deeper waters. Hierarchical classifications have been developed for the deep-sea, which basically follow a top-down process from larger to smaller-scale habitats, while the biological approach would adopt a bottom-up classification, from individual stations to increasingly large clusters of stations. Though data on benthic communities are scarce in the deep sea, some regions have received greater attention and the assemblages present are better known.

In shallow waters habitat mapping often utilizes photography to examine the biological aspect of biotopes. While this approach is also useful in the deep sea, this approach has limitations. Specifically, the majority of species in the deep sea are small, infaunal invertebrates which do not appear in photographs. These organisms generally dominate the abundance, biomass and diversity of deep sea assemblages.

#### Anthropogenic Impacts:

In monitoring anthropogenic inputs, we may use various criteria to assess the “health” of a marine community, e.g.: species number, species diversity, and various biotic indices. The broad type of community expected in a region can be judged from the mapped habitat type and/or from composition indicator species. Habitat mapping also aids in defining suitable “reference” and background communities (Roff et al., 2003). In addition, what were once thought of rare and unique deep-sea communities, such as deep-sea coral and chemosynthetic communities, are now proving to be more widely distributed than we originally thought as we learn more about the specifics of their habitat characteristics.

The increasing use of the deep sea for mining, disposal activities and fishing makes the need for accurate habitat mapping that much more relevant and imperative. For example, accurate information on locations and sizes of *Lophelia* reefs, as well as data on the associated fauna, are necessary to better manage these areas. The use of Geographic Information Systems (GIS) provides the best platform to integrate large data sets into geographically meaningful, immediately useful products.

#### Aims of the workshop

- Identify areas of continental margins that have been studied in sufficient detail, both from a geophysical and biological point of view, to examine the following questions:
  1. Are what geologists/biologists define as habitats what faunal assemblages see as habitats?
  2. Is there a relationship between habitat heterogeneity and faunal diversity at regional scale?

### 3. Can we identify representative habitats and assemblages?

- Compare the different classification schemes used, examine how they differ, and whether it is practical to merge them to allow direct comparisons between studies.
- The issue of scale is likely to be central to discussions at the workshop. Can we identify what scales are most relevant/important to both biologists and geophysicists?
- Assess whether the classification systems previously suggested (e.g., Greene et al, 1999) are too general for classifying continental slopes.
- Can we use habitat mapping to identify trends in diversity? How does this relate to the overall aims of COML?

#### Glossary:

The terms habitat and biotope have either been defined as the physico-chemical environment characteristic of the place where a community of organisms is living or the sum of the environment and its associated community. Nowadays, the more widely accepted terminology is to give habitat the former definition, that is to say to limit habitats to the abiotic factors, while giving the biotope the second acceptation following the formula:

Biotope = Habitat + Community (or Biocenose)

[However] Biotope (Oxford English Dictionary): The smallest subdivision of a habitat, characterized by a high degree of uniformity in its environmental conditions and in its plant and animal life.

Biocoenosis (OED): An association of organisms forming a biotic community; the relationship that exists between such organisms.

Habitat (OED): The locality in which a plant or animal naturally grows or lives; habitation. Sometimes applied to the *geographical area* over which it extends, or the special locality to which it is confined; sometimes restricted to the particular *station* or spot in which a specimen is found; but chiefly used to indicate the kind of locality, as the sea-shore, rocky cliffs, chalk hills, or the like.

Habitat: A spatially recognisable area where the physical, chemical and biological environment is distinctly different from surrounding environments. (Valentine et al., 2005).

#### References:

Roff, J.C., Taylor, M.E., and Laughren, J., 2003. Geophysical approaches to the classification, delineation and monitoring of marine habitats and their communities. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 13, 77-90.

Greene, H.G., Yoklavich, M.M., Starr, R.M., O'Connell, V.M., Wakefield, W.W., Sullivan, D.E., McRea, J.E., and Cailliet, G.M., 1999. A classification scheme for deep seafloor habitats. *Oceanologica Acta*, 22, 663-678.

**Programme: COMARGE Habitat Mapping workshop, Conference Room,  
National Oceanography Centre, Southampton, 4-6<sup>th</sup> June, 2007.**

**Monday 4<sup>th</sup> June**

9:00-9:30	<u>Welcome and background to meeting.</u> Menot and	Alan Hughes, Lenaick  Myriam Sibuet
9:30-10:30	<u>Gulf of Mexico</u>	Elva Escobar, Carlos Mortera and Gilbert Rowe
10:30-10:50	Tea Break	
10:50-11:30	<u>Brazilian margin</u> Ana Paula	Renato Kowsmann and
11:30-12:10	<u>Gulf of Guinea/Angolan Margin</u> Hughes	Karine Olu and Alan
12:10-12:30	Discussion	
12:30-13:30	Lunch at NOCS	
13:30-14:30	<u>Gulf of Cadiz</u>	Neil Kenyon, Marina da Cunha, and Luis Pinheiro
14:30-14:50	<u>Rockall Bank</u> Bhavani	Kerry Howell and  Narayanaswamy
14:50-15:10	<u>NW Scotland</u>	Veit Hühnerbach
15:10-15:30	Discussion	
15:30-15:50	Tea Break	
15:30-15:50	<u>West of Shetland</u>	Alan Hughes and Bhavani Narayanaswamy
15:50-16:10	<u>Norway</u>	Pål Buhl-Mortensen
16:10-16:30	<u>Sea of Japan</u>	Hiroshi Kitazato
16:30-17:00	<u>Western Australia</u>	Campbell Davies
17:00-18:00	Discussion	
18:00	End	

## **Tuesday 5<sup>th</sup> June**

### **Topic 1: Habitat mapping and issues of scale** (Chair: Lenaick Menot)

09:00-09:45 “Comparison of multibeam backscatter data and side-scan sonar data for habitat mapping” - Tim Le Bas.

09:45-10:30 “Habitat Classification in Europe: MESH and WGMHM” - David Connor

10:30-10:50 Tea Break

10:50-12:00 Habitat mapping exercise – Tim Le Bas (assisted by Alan Hughes and Veit Hühnerbach)

12:00-12:30 Discussion

12:30-13:30 Lunch at NOCS

13:30-14:15 “Concepts for the classification of marine habitats and ecosystems” - Mark Costello.

14:15-15:00 “Macrofauna and megafauna species distributions in relation to habitats” - Gilbert Rowe

15:00-15:30 Discussion

15:30-15:50 Tea Break

15:50-16:35 “Environmental influences on regional deep-sea species diversity?” - Lisa Levin

16:35-17:30 Discussion

## **Wednesday 6<sup>th</sup> June**

### **Topic 2: A classification scheme for COMARGE** (Chair: Alan Hughes)

09:00-09:45 “Overview of existing classification schemes for marginal ecosystems” – Lenaick Menot.

09:45-10:30 “Scientific Experts’ Workshop on Biogeographic Classification Systems in Open Ocean and Deep Seabed Areas Beyond National Jurisdiction” – Elva Escobar.

10:30-10:50 Tea Break

10:50-12:30 Discussion

- 12:30-13:30 Lunch at NOCS
- 13:30-17:00 Discussion:  
Future directions for habitat mapping on continental margins.  
Recommendations for future work?  
Output of meeting.
- 17:00 End of Workshop

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