Communications

Building on the concept of marine biological valuation with respect to translating it to a practical protocol: Viewpoints derived from a joint ENCORA–MARBEF initiative*

OCEANOLOGIA, 49 (4), 2007.
pp. 1–8.

KEYWORDS
Marine biological valuation
Ecological criteria
Intrinsic value

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* The workshop was financed by the MarBEF project (Network of Excellence on Marine Biodiversity and Ecosystem Functioning, Contract number GOCE-CT-2003-505446) of the European Union (FP6) and the ENCORA project (European Network on Coastal Research, Contract number GOCE-518120) of the European Union (FP6). This paper contributes to the BOF-GOA project BBSea (Project number 01G00705) of Ghent University. This publication is contribution No MPS-07078 of MarBEF.

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Received 5 July 2007, revised 10 October 2007, accepted 24 October 2007.

Abstract

Marine biological valuation provides a comprehensive concept for assessing the intrinsic value of subzones within a study area. This paper gives an update on the concept of marine biological valuation as described by Derous et al. (2007). This concept was based on a literature review of existing ecological valuation criteria and the consensus reached by a discussion group of experts during an international workshop in December 2004. The concept was discussed during an ENCORA –MARBEF workshop in December 2006, which resulted in the fine-tuning of the concept of marine biological valuation, especially with respect to its applicability to marine areas.

1. Introduction

Derous et al. (2007) defined marine biological value as 'the intrinsic value of marine biodiversity, without reference to anthropogenic use'. Marine biological valuation is not a strategy for protecting all habitats and marine communities that are of ecological significance, but is a tool for calling attention to subzones that have a particularly high ecological or biological significance and to facilitate provision of a greater-than-usual degree of risk management during spatial planning activities in these subzones. (For this purpose, a subzone is defined as a subdivision of the study area, which is used as the basic valuation entity). In this way, the methodology can assist in applying the precautionary principle when new (potentially damaging) developments in the marine environment are discussed (UN 1992).

Based on a literature review, Derous et al. (2007) selected five valuation criteria, which formed the backbone of the valuation concept (left-hand side of Figure 1): rarity, aggregation, fitness consequences, naturalness, and proportional importance. The first three criteria are considered the main (first-order) criteria; the latter two should be regarded as modifying criteria, which should be used to upgrade the value of certain subzones when they score highly for these criteria. These criteria comprise all relevant ecological valuation criteria circulating in the literature and can be related to all components of biodiversity, as visualized in the 'marine ecological framework of biodiversity' of Zacharias & Roff (2000).

Derous et al. (2007) further stated that, apart from its immediate merit as a guideline for marine biological valuation, their paper should also be regarded as an incentive to further discussion on this topic. A first step towards such discussion was the translation of the concept into a practical valuation protocol that was applied to biological data from the Belgian part of the North Sea. This case study was presented during a workshop (December 2006) to stimulate discussions on the applicability of the concept.

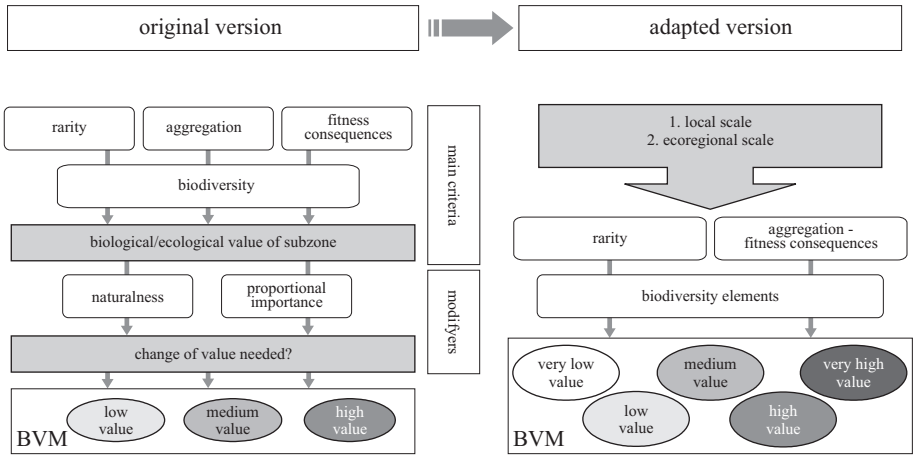

Fig. 1. Adaptation of the concept for marine biological valuation. BVM = biological valuation map

This joint EU ENCORA Coordination Action (European Network on Coastal Research) – NoE MarBEF (Network of Excellence on Marine Biodiversity and Ecosystem Functioning) workshop provided a stimulating forum for discussions between marine ecologists and biologists with different backgrounds, but with a shared interest in biological valuation and its practical application in marine environments, and resulted in the fine-tuning of the concept of marine biological valuation in that the relevance and applicability of the selected valuation criteria were assessed.

2. Valuation criteria

2.1. Rarity

'*The degree to which a subzone is characterized by unique, rare or distinct features – landscapes, habitats, communities, species, ecological functions, geomorphological or hydrological characteristics – for which no alternatives exist*' (Derous et al. 2007).

'Rarity' was retained as a criterion for marine biological valuation. It is very important to note that when rarity is assessed for a study area, this is done in a relative way, each subzone of the study area being assessed relative to the others. This way of assessing rarity is similar to the one described by Sanderson (1996a,b) and Connor et al. (2002, 2004), which has been adopted successfully in the UK in the past (DEFRA 2004, Golding et al. 2004, Lieberknecht et al. 2004b, Vincent et al. 2004, UK BAP 2005). When assessing 'rarity', special attention should be paid to accidental

recordings or vagrants. These should not be considered here as they are not inherent to the ecosystem or community under consideration and hence do not contribute to the intrinsic biological value of the study area.

2.2. Aggregation-fitness consequences

'*The degree to which a subzone is a site where most individuals of a species are aggregated for some part of the year; or a site which most individuals use for some important function in their life history; or a site where some structural property or ecological process occurs with exceptionally high density, or the degree to which a subzone is a site where the activity(ies) undertaken make a vital contribution to the fitness* (= *increased survival or reproduction*) *of the population or species present*' (DFO 2004, Derous et al. 2007).

The two other main criteria 'aggregation' and 'fitness consequences', which were retained in Derous et al. (2007) are strongly linked to each other, as subzones – where activities making a vital contribution to the fitness of a population or species (e.g. spawning or nursery areas) are undertaken – are mostly sites where individuals of these species tend to aggregate. To avoid double counting of these subzones for the same reasons in the final valuation, both criteria should be merged into one criterion: 'aggregation-fitness consequences'.

2.3. Naturalness

'*The degree to which a subzone is pristine and characterized by native species* (*i.e. the absence of perturbation by human activities and the absence of introduced or cultured species*)' (Connor et al. 2002, Lieberknecht et al. 2004a,b, Derous et al. 2007).

'Naturalness' was included in the original valuation concept as a modifying criterion to give added value to pristine subzones, characterized by native species. However, in many cases it is very difficult to define what the natural state of a marine area is, as historical data are usually lacking (Hiscock et al. 2003). Without this knowledge 'naturalness' is usually assessed on the basis of the absence of human impacts in the subzone. This makes it almost impossible to apply this criterion without specific reference to human impacts, which is deliberately excluded from the definition of biological valuation. Therefore, it was decided to exclude 'naturalness' as a valuation criterion. The assessment of the (un)naturalness (in relation to different impact sources) should be seen as a second step after biological valuation to produce an overlying layer on the biological valuation map.

2.4. Proportional importance

'*The proportion of the global, regional or national extent of a feature* (*habitat/seascape*) *or proportion of the global, regional or national population of a species occurring in a certain subzone within the study area*' (Derous et al. 2007).

Incorporating 'proportional importance' as a modifying criterion aims to compare certain features or properties with the wider environment of the study area, for instance, by attaching extra value to subzones where a high proportion of the national (provided that the national scale is greater than the scale of the study area), regional or global population of a species occurs (Connor et al. 2002, Lieberknecht et al. 2004a,b). As all other criteria only assess the value of the subzones relative to each other, the inclusion of a wider scale can be misleading. It was thus decided not to include 'proportional importance' as a valuation criterion, but to do the valuation on two different scales. First, the valuation should be done at the local level of the study area; only afterwards should it be done on a broader (ecoregional) level, with the same criteria ('rarity' and 'aggregation-fitness consequences'). A valuation on such a broader scale will be very useful to see whether subzones scoring 'high' on a local scale (relative to all other subzones of the study area) still have a high value when they are compared to subzones on an ecoregional scale. This will allow marine managers to see the valuation of the study area in a broader perspective.

3. Conclusion: adapted concept for marine biological valuation

The concept of marine biological valuation as described by Derous et al. (2007) has been reorganized to avoid double counting of scores (i.e. lumped criterion 'aggregation-fitness consequences') and to allow a more logical order of the steps to be taken during valuation (i.e. assessment of the biological value on two different scales instead of incorporation of 'proportional importance' as a valuation criterion). 'Rarity' was retained as a valuation criterion but 'naturalness' was excluded from the concept. Figure 1 compares the original and new versions of the valuation concept. As can also be seen on this figure, the number of value classes has been changed from three to five, which gives a better representation of the value patterns.

These adaptations of the original valuation concept were made after evaluation of the results of applying this concept to biological data from the Belgian part of the North Sea. The adaptations will allow for a better applicability of the concept to other marine case study areas selected within

the framework of the ENCORA and MarBEF projects. The results of the biological valuation of these case study areas will be described in a subsequent paper.

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