MARINE BIODIVERSITY RESEARCH
Prediction and Management of
Australia's Marine Biodiversity

Product title: Predicted patterns of seabed biodiversity in the Southeast Marine Region (SEMR).

Relevance of product to marine planning and management

This product provides planners and managers with biologically informed predictions about the patterns in species abundance, species richness and species evenness of seabed fishes on the outer shelf and slope in the SEMR.   It can be used as follows:

1. To provide scientific analysis and input to planners and managers with the responsibility to conserve and managed marine biodiversity in the SEMR;

2. As a biological data input to models, where appropriate, of the marine environment in the SEMR (e.g. Marxan);

3. To compare predictions in patterns of seabed biodiversity in the SEMR with the findings of future biological surveys; and

4. To produce maps of predicted spatial patterns of species abundance, species richness and species evenness for seabed fishes in depths from 50 to 900 metres from 35°S to 44°S;

It will be of value in planning and managing the conservation of marine biological diversity in the SEMR, particularly in relation to predicting areas of high biodiversity when there is very little or no biological data.

Product description

This product (i.e. Access data base) contains data (longitudes, latitude and biodiversity attribute variables) that describes the predicted spatial patterns of biodiversity categories based on species richness and evenness of demersal fish in the SEMR. This product provides predictions for total species abundance, species richness and species evenness and estimates of uncertainty for demersal fish. The predicted patterns are represented as point data arranged on a 0.1 degree grid ($\sim$ 1.2 km^2) covering depths 50-700 metres in the SEMR from 35°S to 44°S

Interpretation of product

This product represents the predicted spatial patterns of species abundance, species richness and species evenness of demersal fish communities in the SEMR. It provides a description of the structure rather than the composition (i.e. specific species) of these assemblages. Structure equates to total species abundance (the total number of individuals), species richness (the total number of species) and species evenness (relative proportions of species). The product can also be used to identify areas in the SEMR that are predicted to have unique combinations of species richness and evenness. This allows managers to identify areas that are predicted to have common or rare types of community structure.

For more information please phone or email the contact.

Brief description of methods/data used develop output

The following provides a basic description of the methods and data used to produce this product:

1. Existing biological data (i.e. demersal fish) and physical data (i.e. dissolved oxygen, temperature, mud content of sediments, etc.) for the SEMR was collated from the following sources; CSIRO Atlas of Regional Seas (CARS) and range of biological surveys within the SEMR (e.g. survey cruises);

2. Biological data was used to identify biodiversity values (i.e. for total species abundance, species richness and species evenness) for all known biological sample sites in the SEMR;

3. Analyses were conducted to determine which physical variables/combinations of physical variables best explain the spatial patterns in biodiversity values identified in step 1 (i.e looking for covariate physical variables that can be reliably used to predict benthic biodiversity);

4. The most reliable/meaningful covariate physical variables were identified and subsequently used as the basis to make a database of predictions of biological diversity values for all points on a 1 km2 grid for the SEMR between 50-700 metres depths; and

5. Categories representing unique combinations of species richness and evenness where created by assigning the values of richness one of five ranks and values of evenness one of five ranks. Combining the two sets of ranks gave 25 different possible categories

6. A database was developed to capture latitude, longitude and biodiversity values. This was used to produce maps displaying patterns in benthic biodiversity and map biodiversity categories.

Please phone or email the contact for a more detailed and technical explanation of the methods or data used to develop this product.

Advantages/improvements over existing products

The product provides the only available means to robustly predict patterns of benthic biodiversity at a range of spatial scales in the SEMR. The product uses the most recently available data on the physical environment and biology (demersal fish) in the SEMR.

2 March 2010

Conditions of use

The product does not contain any confidential information. Data sets provided can be used by planners and managers, but contact the author if intending to use data in publications.

Contact for further information

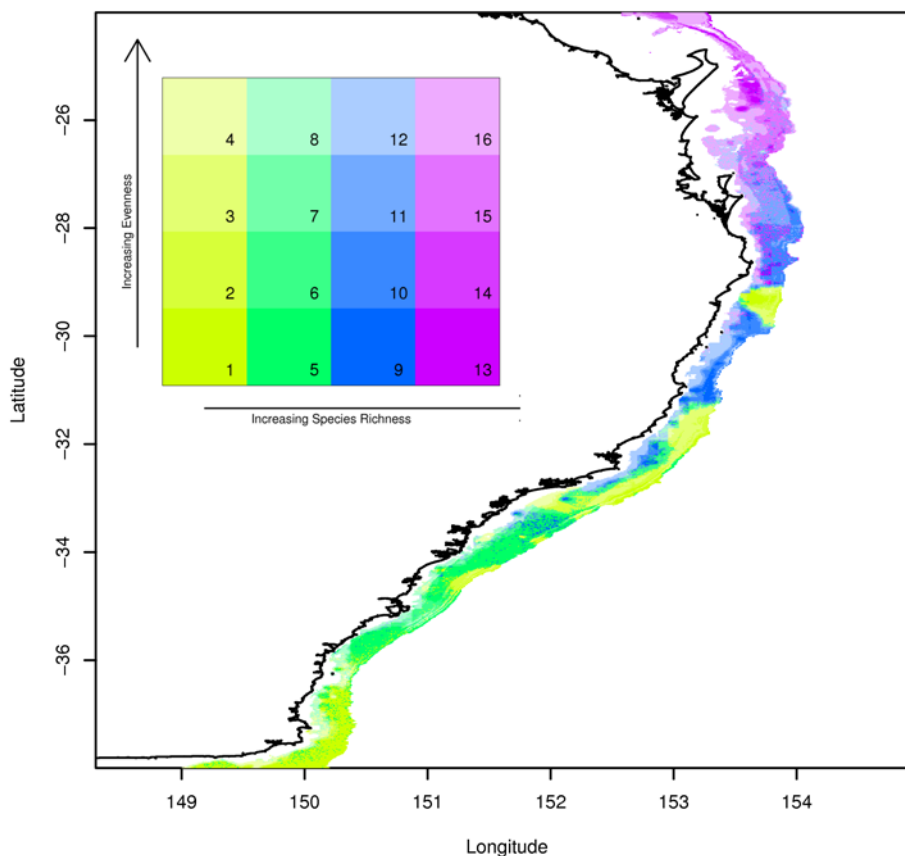Piers Dunstan 03 6232 5382 Piers.Dunstan@csiro.au

Attachments

1.   Map and interpretive key to identify areas in the South East Marine Region that are predicted to have unique combinations of species richness and evenness for demersal fish.
2.   Metadata record for Predicted patterns of seabed biodiversity in South East Marine Region (to be provided).

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PRODUCT DESCRIPTION FOR STAKEHOLDERS
CERF Marine Biodiversity Hub

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Attachment 1: Map and interpretive key to identify areas in the East Marine Region that are predicted to have unique combinations of species richness and evenness for demersal fish.

The following maps and table have been included to provide additional interpretive information for stakeholders. The map and interpretive key (Figure 1) identifies areas in the East Marine Region that are predicted to have unique combinations of species richness and evenness for demersal fish. The proportion of the total area in the East Marine Region for each combination of species richness and evenness is provided in Table 1. This provides an indication of the commonality/rarity of each of the 16 combinations. Results show that moderately low richness and moderately uneven assemblages of demersal fish are the most common combination (12 % of the East Marine Region - category 5). High richness and uneven assemblages are the rarest combination found in the East Marine Region. (1.2% of the East Marine Region - category 13). Figure 2 identifies the spatial distribution of the 5 most common/rare combinations of species richness and evenness for demersal fish in the North Marine Region.

Figure 1: Map and interpretive key showing distributions of 16 categories of unique combinations of species richness and evenness for dermersal fish in the East Marine Region.
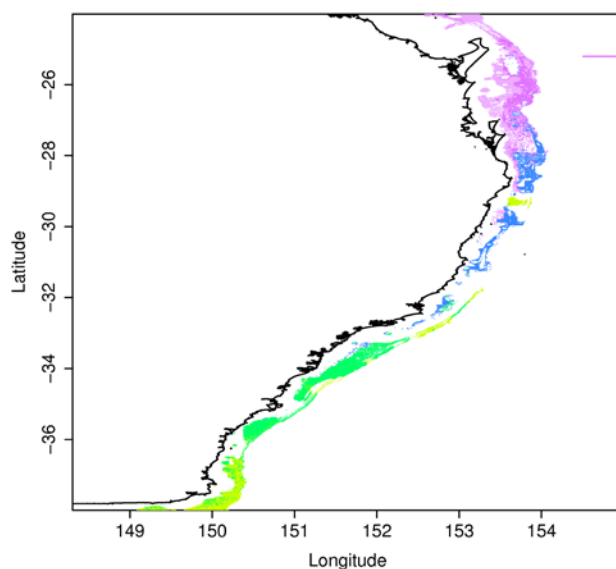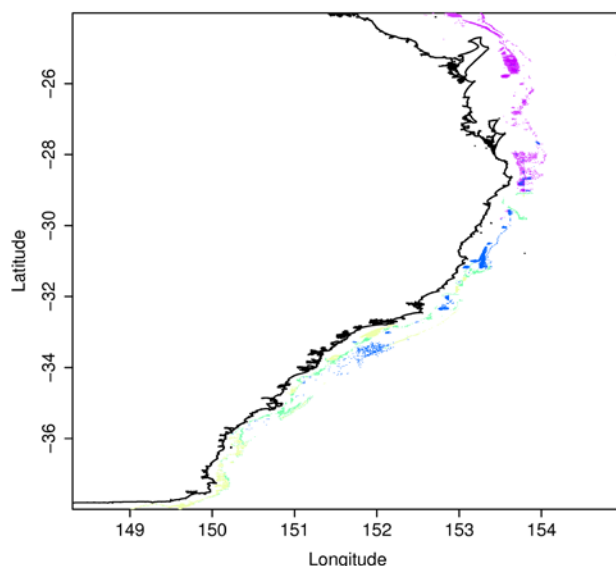
4 - 3.4	**8** - 4.1	**12** - 7	**16** - 10.4
3 - 6.1	**7** - 2.6	**11** - 7.2	**15** - 9.1
2 - 6.6	**6** - 6.2	**10** - 8.6	**14** - 3.6
1 - 9.1	**5** - 12	**9** - 2.6	**13** - 1.2

Table 1: Proportions for 16 categories of unique combinations of species richness and evenness for demersal fish in the East Marine Region.

Figure 2: Plots of the 5 least abundant categories (top panel) and the 5 most abundant categories (lower panel) for combinations of species richness and evenness for demersal fish in the East Marine Region.

Attachment 2: Metadata record for database of benthic biodiversity predictions in the East Marine Region.

To be provided

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