



*Providing Training, Advice And  
Consultancy On The Use Of Geographic  
Information Systems In Ecology*

*www.GISinEcology.com*

*Glasgow, 11<sup>th</sup> – 12<sup>th</sup> August 2016*

## **An Introduction To Species Distribution Modelling In The Marine Environment**

### **Course Announcement**

GIS In Ecology will be holding an introductory training course on using species distribution modelling in the marine environment in Glasgow on the 11<sup>th</sup> to 12<sup>th</sup> of August 2016. The course will be taught by Dr. Colin D. MacLeod, the author of *An Introduction To Using GIS In Marine Biology* (Pictish Beast Publications, Glasgow, UK). Species distribution modelling (also known as habitat modelling, predictive habitat modelling, ecological niche modelling, habitat suitability modelling and essential habitat modelling) is becoming increasingly widely used in marine biology. This course aims to provide an introduction to the concept and the practical application of species distribution modelling (SDM) in the marine environment, and how to integrate species distribution modelling with GIS. This includes selection of environmental variables, the creation of raster data layers of environmental variables in a GIS-based environment, processing survey data in GIS, creating spatial visualisations and predictions from SDMs and validating the predictive ability of SDMs. The practical sessions will involve working through a complete SDM project from start to finish using an existing data set, including creating an SDM using Generalised Additive Modelling (GAM). This means you do not need have your own data to attend.

The course assumes that you have at least a basic knowledge of GIS, and is not aimed at complete beginners (if you are a complete beginner, you can attend our introductory GIS course which will be held between the 18<sup>th</sup> and 20<sup>th</sup> of August 2016 at the same location). You must have a licensed copy of ArcGIS 10.4 software to attend this course (however this can be the free 60 day trial version of this software) or a copy of the freely available open source GIS software package QGIS 2.8.3. If you are planning on using ArcGIS, you will need to have a licence for the Spatial Analyst extension (included in the free 60 day trial version. Finally, all attendees will need a copy of the free R statistical software (no previous experience with R is required). Attendance will be limited to a maximum of 16 people. The course will cost £295 per person (£200 for students, the unwaged and those working for registered charities). To book a place, or for more information, contact [info@GISinEcology.com](mailto:info@GISinEcology.com).

**Note:** While some statistical analysis will be conducted during this course, this is not statistical training course. Instead, its aim is to teach about all the other aspects associated with conducting a species distribution modelling project, from data collection through to visualising and validating the predictive ability of an SDM. This is because learning how to do statistical analyses correctly requires an entire course of its own. In addition, these subjects are not usually covered when learning about statistical modelling, but are just as essential if an SDM project is to be successfully completed.

At the end of the course, all attendees will receive a certificate of attendance and completion. Each certificate is embossed with the GIS In Ecology official stamp to prevent its fraudulent reproduction. In addition, each certificate has its own unique identification number that we will record, along with your name, meaning that we can verify the authenticity of the certificates we issue (and the course you have completed) on request.

To attend this course, you must bring your own laptop computer and have a fully licensed copy of ArcGIS software (the course will be primarily be taught based on ArcGIS 10.4, but ArcGIS 10.3, 10.2, 10.1, 10.0 and 9.3 will be supported), and a licence for the ArcGIS Spatial Analyst extension pre-installed on it. You can find information about how to get this software package at [http://groups.google.com/group/gis-in-ecology-forum/browse\\_thread/thread/35b142b06c09d1ef#](http://groups.google.com/group/gis-in-ecology-forum/browse_thread/thread/35b142b06c09d1ef#). Alternatively, you can use the freely available open source GIS software package QGIS 2.8.3 (see <http://www.GISInEcology.com/GFB.htm#1>). In addition, you will also need to have spreadsheet software, such as Excel, on your computer. You will also need a working copy of the free statistical software package called R. This can be downloaded from <http://www.r-project.org/>.

The course will be held in central Glasgow at the IET Glasgow Teacher Building (14 St Enoch Square, Glasgow, G1 4DB, UK - see <http://teacherbuilding.theiet.org/about/location.cfm> for information on how to get there and on parking if you are coming by car). For information on how to get to Glasgow see <http://www.seeglasgow.com/getting-here/>.

Attendees will be responsible for their own accommodation. However, Glasgow provides a wide range of accommodation options to fit most budgets. Information on accommodation in Glasgow can be found at <http://www.glasgowguide.co.uk/hotels.html> or <http://www.hostelbookers.com/hostels/scotland/glasgow/>. As a general rule, if you can find accommodation near the venue or one of Glasgow's Subway Stations (see <http://www.spt.co.uk/subway/maps-stations/>), you will be able to get to the venue very easily.

Attendees will be responsible for their own lunches. However, there are plenty of cafes, takeaways, supermarkets, bars and restaurants within a short walk of the Teacher Building to provide food to fit all budgets.

## **Preliminary Course Timetable And Contents**

### ***Day One – 11<sup>th</sup> August 2016***

**10:00 – Welcome And Introduction.**

**10:05 – 1. Background Session One:**

- 1.1 What is species distribution modelling (SDM)?
- 1.2 Theoretical background to SDM.
- 1.3 The practical application of SDMs.

**11:05 – Coffee Break**

**11:25 – Background Session Two:**

- 2.1 How to set up and conduct an SDM project.
- 2.2 Deciding on the extent of your study area.
- 2.3 Selection of your modelling approach.
- 2.4 Selection of your dependent variable.
- 2.5 Selecting how you will sample your species distribution data.

**11:45 – Practical Session One: Sampling your species distribution:**

- 3.1 Creating a presence-absence data layer from your survey data in a GIS-based environment (based on surveys of harbour porpoise in the northern North Sea).

**13:00 – Lunch.**

**14:00 – Background Session Three: Dealing with environmental variables:**

- 4.1 Selection of environmental variables.
- 4.2 Selecting the resolution for your environmental variables.

**14:30 – Practical Session Two: Creating raster data layers of your environmental variables (with coffee break at 15:30):**

- 5.1 Creating a raster data layer of water depth (for the northern North Sea).
- 5.2 Masking a water depth raster data layer for land (for the northern North Sea).
- 5.3 Creating a raster data layer of seabed slope and variation in seabed slope (for the northern North Sea).
- 5.4 Creating a raster data layer of distance from shore (for the northern North Sea).

**17:00 – Close.**

*Day Two – 12<sup>th</sup> August 2016*

**09:30 – Background Session Four: Statistical analysis in a species distribution modelling project:**

- 6.1 Selecting your statistical approach.
- 6.2 Exploring your data.
- 6.3 Spatio-temporal autocorrelation.
- 6.4 The importance of validation.

**10:00 – Practical Session Three: Creating an species distribution model (with coffee break at 11:00):**

- 7.1 Linking your species distribution and environmental variable data to create a ‘big table’ for statistical analysis (for harbour porpoises in the northern North Sea).
- 7.2 Exporting your ‘big table’ from your GIS project.
- 7.3 Importing your ‘big table’ into R.
- 7.4 Data exploration in R.
- 7.5 Model creation and selection in R.
- 7.6 Visualisation of the predicted spatial distribution from your species distribution model in GIS (for harbour porpoises in the northern North Sea).

**12:30 – Lunch.**

**13:30 – Background Session Five: Case study.**

- 8.1 Using SDM to model the distribution of harbour porpoises in the northern North Sea (this case study is the subject of the practical sessions on this course).

**14:00 – Practical Session Four: Model validation (with coffee break at 15:15):**

- 9.1 Validating the predictive ability of a species distribution model using an independent data set.

**15:30 Summary And Closing Remarks (finish by 16:00).**