

Module (1)

Geometric morphometrics in ostracods

Why “Geometric Morphometrics in Ostracods” as a whole Module within MIO-2?

Lecturers: Angel Baltanás (angel.baltanas@uam.es) and Dan L. Danielopol (ddanielo@oeaw.ac.at)

Why shape?

In any ostracod there are many traits with relevant evolutionary and ecological information (morphological, behavioural, physiological, molecular, ...). Traditionally ostracodologists have focused on morphological traits, more specifically on morphological traits on the valves, not because they are old-fashioned scientists attached to old-fashioned techniques but because they mainly deal with fossil material that lacks most kind of information except that of morphological origin. Accordingly, the transmitted light microscope or the SEM (and the drawings and photographs produced with them) have been extensively used to record how different ostracod individuals look like – how similar or dissimilar their shapes are – in order to arrange different types into different categories (i.e. in order to classify them). Whenever it was possible (extant species only), morphological traits in soft parts were used too.

But soon it was clear that information contained in the carapace shape reaches well beyond classification purposes. Being the interface between the organism and the surrounding environment, the carapace emerged as a labile and variable structural design that responds to selection pressures, interacts with environmental factors and stores information. Both nature and nurture are at work in the melting pot where ostracod carapace is forged.

Morphometrics

That ostracod carapace stores evolutionary-ecological-environmental information is a concept easy to grasp. Retrieving that information seems a not-so-easy task. Some attributes of the carapace can be efficiently and precisely measured (i.e. its size, colour, texture, ...); but shape and ornamentation have been more elusive. Those attributes have been traditionally described using a narrative approach: “sub-rectangular or rounded or ventrally flattened valves bear nodes, tubercles and fossae of different magnitude and number”.

But a different approach exists. An approach that provides a way (several ways, indeed) to numerically describe biological shape, and the variability of biological shape. That is MORPHOMETRICS.

Methods in Morphometry

Morphometrics is not new as a scientific discipline. It has a long tradition dating back to Galton and Huxley in the nineteenth century. But, through time, it has changed a lot. A major revolution occurred in the eighties when Geometric Morphometrics challenged Traditional Morphometrics, ... and won. Main features and differences between them will be presented in order to jump with confidence into the realm of Geometric Morphometrics. Good enough, ostracod literature provides nice examples of both approaches and the different techniques within Geometric Morphometrics, so we can move towards on familiar ground.

In this technical section, specific guidelines for the application of the methods will be provided (including information on software and technical literature).

As expected, all those methods are linked to many technicalities and theoretical complexities ... we want to keep to a minimum. Instead, the stress will be on the potential of this approach for disentangling problems in evolutionary biology, (palaeo-)ecology and systematics of ostracods. And this will be done using already published material that proved to solve different questions related to ostracods.

A practical algorithm useful for description of ostracods displaying few morphological traits (especially useful for systematics of Recent and fossil poorly ornate ostracods) will be for the first time demonstrated.

Finally, there are multiple sources where written and detailed information on methods in Geometric Morphometrics can be found. What makes this course during the MIO-2, July 2011, worthwhile is the chance to practice and to discuss related issues specific to the interests of each participant.

Module (2)
Stable Isotopes and Ostracoda

Lecturer: Ian Boomer (i.boomer@bham.ac.uk)

This part of the workshop will focus primarily on the analysis and interpretation of carbon and oxygen stable isotope data from calcitic ostracod valves. Although some discussion will be given to the marine realm, much of the work will focus on non-marine and enclosed basin setting.

The seminar will cover some of the basic theory behind stable isotope analysis including the main analytical techniques. Throughout the course we will also consider 2 key questions:

1. Why do I want to know the isotope composition of the ostracod shells? and
2. Do I have suitable material to answer Question 1

Given the time and resources required to analyse the stable isotope composition of ostracods, it is important to understand what controls the original isotope composition of the shells and what factors may affect the fossil material after burial. With these points in mind there will also be discussion of the optimum methods for the preparation of sediment samples and individual ostracod valves to ensure that the samples analysed are as close to the original isotope "signal" as possible.

Every depositional environment will have different controls on the carbon and oxygen isotope composition. Some basic guidelines will be given as to the interpretation of these proxies in a range of habitats using examples from the literature and unpublished studies.

Module (4)
Dissection of Recent ostracods

Lecturers: Angel Baltanás (angel.baltanas@uam.es), Tadek Namiotko (namiotko@biotech.ug.gda.pl) and Dan L. Danielopol (ddanielo@oeaw.ac.at)

This module will provide a basic introduction to soft-part morphology of ostracods. During the practical session the participants will obtain Recent ostracod-material for exercise. Each participant will be guided step by step through the whole procedure from removing of the valves, dissection of the appendages until making a permanent slide. Prior to practice of a given step, the procedure is shown as a short presentation on the screen (binocular microscope with a camera). Then everybody would follow these instructions.