Maritime Connectivity Symposium

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Michael Dawson
Section of Evolution & Ecology, University of California, Davis, USA; mndawson@ucdavis.edu

Present-day patterns of biodiversity have been shaped by processes ranging from global environmental change to local perturbations and populations' capacities to evolve. Paleogeographic changes, in addition to periods of glacial advance and retreat, are particularly thought to have impacted species ranges and intra-specific patterns of genetic diversity since the Pliocene. This has occurred through promotion of extinction and fragmentation periods ("vicariance") interspersed with periods of dispersal and colonization in high latitude species (e.g. by separating refugia and rejuvenating habitat) and low latitude species (e.g. via marine regression and transgression). Analogous processes associated with anthropogenic global change are already affecting species distributions. What lessons might past events hold for understanding impacts in the future?

The symposium on Maritime Connectivity, convened at the 3rd Biennial meeting of the International Biogeography Society (IBS), and a satellite discussion group consisting of the symposiums organizers, 6 invited speakers, and 3 scientists supported by PAGES (details below) discussed these issues. Presentations during the symposium covered topics including global biogeography of foraminifera (K.F. Darling) and jellyfish (M.N. Dawson), temporal concordance in vicariant events that influenced Pacific cowrie phylogeny (C.P. Meyer), dispersal of Southern Hemisphere temperate taxa (J.M. Waters), trans-Arctic and bipolar biogeography of algae (C.A. Maggs), and dispersal and vicariance in Indo-Pacific reef fishes (D.R. Bellwood) from *c.* 50 million years ago to, particularly, the Pleistocene and Holocene. The satellite discussion group chose to look for common themes and mutual lines of evidence in the symposium talks that might be synthesized to yield a better understanding of past events and, therefore, provide a firm foundation for developing a predictive framework for future change. Geographic and temporal overlap was evident in the studies of Pacific reef fishes and cowries, and of macroalgae and planktonic foraminifera. Broadly speaking, these data sets indicated similar important patterns of evolution. The fishes and cowries were marked by occasional long-distance dispersal giving rise to "founder events" (colonization of new habitat by a very small number of individuals) as well as commonplace "allopatric" (geographically separated) evolution attributable to, overall, relatively low 'connectivity' among populations. The algae and pelagic foraminifera, on the other hand, evinced generally much greater dispersal (including bipolarity) and less geographic differentiation. However, even for the ecologically, genetically, and geographically most comprehensive studies of cowries and fishes, fine-scale integration is difficult despite occasionally excellent fossil records because the temporal density of all datatypes is often too low (millions to tens of millions of years) to provide high precision. Conversely, the promise of the fossil record of planktonic foraminifera, which may provide resolution on the scales of decades in exceptional circumstances, is confounded because foraminiferal shell morphology can be taxonomically and paleoecologically misleading, undermining our ability to reconstruct past patterns and predict future change. These topics will form the subject of continuing discussion among the group.

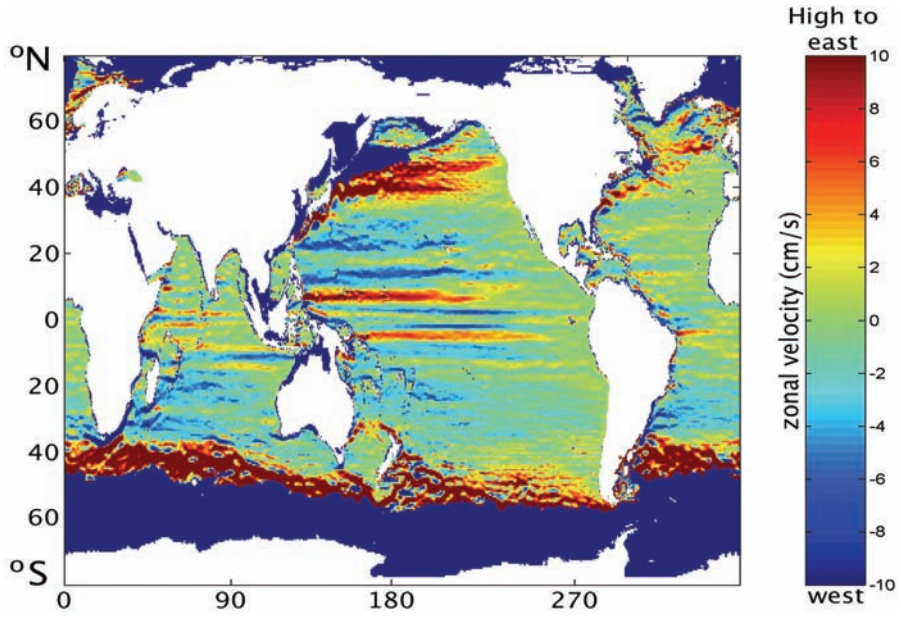

Figure 1: Zonal velocity (eastward positive; cm/s) calculated using high-resolution empirically forced global ocean simulation at grid-size of 1/8 of a degree in the horizontal (model is courtesy A.S. Gupta, M.E. England, and M.N. Dawson). Velocities are averaged over the depth range 0-1,000 m wherever temperatures are in the range 4-11°C (temperature range in which the modeled organism, the mid-water jellyfish Periphylla, lives), indicating direction and level of gross connectivity between sites on an east-west axis; dark blue areas indicate areas <4°C or >11°C, where the jellyfish cannot survive (i.e. zero connectivity due to strong natural selection preventing successful dispersal). The same calculations can be made for meridional (north-south) velocity, and then both connectivity matrices can be used to predict the global dispersal. The same approach can be used to explore dispersal patterns during El Niño, La Niña or other historical climate scenarios.

In addition to the 6 invited talks and PAGES participants, the symposium attracted 32 contributions from students and established researchers to the associated Maritime Connectivity poster session. The symposium was attended by circa 150 young and established scientists traveling from over 44 countries. We expect several of the symposia presentations will appear as papers in a special issue of the Journal of Biogeography planned for publication in January 2008.

For helping to meet IBS's goal of increased international participation, for promoting student attendance, and for being one of seven major sponsors supporting the meeting, the PAGES contribution is gratefully acknowledged.

PAGES award recipients:

Bassi, Davide; Researcher & Aggregate Professor, Università degli Studi di Ferrara, Italy. Systematics, paleoecology, and paleobiogeography of Cenozoic larger foraminifera and coralline red algae.

Hull, Pincelli: Graduate student, University of California, San Diego, USA. Habitat variability and community structure of planktonic foraminifera.

Hickerson, Mike: Postdoctoral Researcher, University of California, Davis, USA. Statistical phylogeography and effects of climate cycling on marine species' range limits.

Honorable mention (offered PAGES support, but also received MarBEF funding):

Renema, Willem: Researcher, Nationaal Natuur Historisch Museum, Netherlands. Paleobiogeography and Recent biogeography of larger benthic foraminifera, and Cenozoic marine diversity in the Indo-West Pacific.