THE LIMITS TO RARITY IN DIATOMS AND THE INTERPRETATION OF ABSENCE

David G. Mann

Royal Botanic Garden

Recent statistical approaches indicate that dispersal is a significant constraint on the distribution of freshwater diatoms, supporting the idea that unspecified species may be endemic to particular regions for spatio-temporal, rather than ecological reasons. However, in biogeographical analyses, we often want to know, and sometimes claim that we do know, about the distribution and origin of *specified* individual species, in which case we need to demonstrate where a species is present, but also – and critically – where it is absent.

It is sometimes feasible to record every individual of a rare vertebrate, and it is now highly doubtful whether any native angiosperm remains unrecorded in the UK, implying effectively complete survey, even though most individual plants have not been checked. A complete census of all the individuals in a natural diatom community, on the other hand, even in a puddle or on a single cobble in a stream, is clearly impossible. It cannot be done either by microscopical observation or molecular survey. How can we get equivalent assurance for diatoms as for vertebrates or angiosperms and be confident that information about the distribution of a particular species is useful? What does it mean if a species was not recorded in a sample? Does it mean that the species, though present, was misidentified, or correctly identified within a different taxonomic paradigm? Or that too few cells were examined to reveal it? Or that it was truly absent? Clearly, it is only the last of these possibilities that provides biologically interesting information. And does absence from a *particular* sample indicate that the species is absent from the area where the sample was obtained? If the sample location or method had been slightly different, would the species have been found, i.e. were we looking in the right place? And if we had returned a some months later, would the species still have been absent, even if no gross change in conditions had occurred meanwhile?

The answer to identification problems is more care, standardization, and vouchers. Assuming that this has been done, there remains the more difficult problem of knowing whether our sampling is 'fit-for-purpose', minimizing the uncertainties outlined above. I will explore this problem via the curious example of *Sellaphora gregoryana*, 'appearing' and 'disappearing' at its type locality in Loch Leven, Scotland; analogies with the UK angiosperm flora; limits to rarity set by the diatom life cycle; and N American diatometer data.