Here the focus shifts from specific research questions and results to methodology. Heike Lotze and colleagues review the remarkably broad array of tools and analytical approaches that have been used with varying degrees of success to reconstruct the ecological history of the ocean. Then Stephen Palumbi addresses the question of how many whales existed in the past before we began to kill them and why different kinds of analyses can yield strikingly conflicting results. The “devil is in the details” in historical marine ecology as in any other discipline.

Analytical methods are so varied that large teams of different kinds of specialists are often required to assemble a thorough picture of past events. For this reason historical ecology is fundamentally collaborative and synthetic. Lotze and co-authors present examples of techniques gleaned from paleontology, geology, radiometric dating, stable isotope chemistry, archaeology, genetics, history, early and modern scientific surveys, and ecological experiments, among others. All these fields are potentially relevant, and several recent review articles employ data from most of them. The trick, of course, is to know the strengths, weaknesses, and assumptions of different methods, to judge which ones are more likely to bear fruit under relevant conditions and over different temporal and spatial scales.
Sometimes it is enough to estimate the abundance of organisms or environmental conditions at some time in the past as a frame of reference to compare with the present. But in other cases, we need well-constrained time series of data to document long-term trends in ecosystems or establish relationships of cause and effect. With better baselines and longer trajectories of change, managers can better anticipate the likely environmental consequences of different actions.

In the happy case when the results of different methodologies agree, confidence increases in our picture of the past. A good example is the remarkable correspondence between historical estimates of past abundances of cod on the Scotian Shelf versus calculations based on the carrying capacity of the environment and the biological characteristics of cod. But in other cases, different methods can produce drastically different results, as Palumbi describes for estimates of pristine abundances of whales. Calculations based on historical catch data differ substantially from those based on genetic analysis of mitochondrial DNA sequences. The historical estimates appear too low because most of the assumptions used in the genetic analyses err on the conservative side whereas the historical records are inevitably incomplete. The situation is still unresolved.

The controversy about whales is of more than academic interest because estimates of pristine whale populations are used by the International Whaling Commission (IWC) to determine the health of whale populations today. Low population estimates before whaling would indicate that some species, such as minke whales, are close to recovery. High population estimates before whaling, on the other hand, would mean that whale populations today are still severely depleted and cannot support commercial whaling. Because Japan and Norway want the IWC to lift the moratorium on commercial whaling, which method is more accurate is bitterly debated and has direct bearing on this controversy.

The same is true for virtually all overharvested fisheries and for any other environmental problem for which modern baseline data are lacking. Much work needs to be done to establish guidelines for the application and interpretation of different kinds of historical records and to determine which ones to use under the conditions at hand. Clearly stated assumptions and transparent data are vital. The more different methods that can be brought to bear on reconstructing the past, the more convincing will be the results when they agree and the stronger the argument for regulatory action.