Letters to the Editor

To the Editor:

I wish I could remember who wrote: "First of all, work on distilling your objectives, for by getting his down to three words —*Delenda est Carthago*—Cato the Elder pretty effectively wiped out the opposition."

If those who described their plans for a Census of Marine Life (CoML, hereafter) in a recent issue of *Oceanography* (Vol. 12 No. 3) had taken this advice, their project might be in better shape.

For Nierenberg, CoML is about counting the last undescribed species of fish, for Grassle *et al.* it is to be an Ocean Biogeographic Information System, while Levi *et al.* seek "a fundamental understanding of the way things live and die in the sea," and for Bradley the Grand Challenge is to answer "How much life can the ocean sustain?" For McGowan, what is needed is a biological WOCE. Of course, that's not the end, by any means: for the EDF, it is to be a "global marine biodiversity Census," while the Monterey Workshop nudged the thing towards "higher trophic levels." Finally for you, sir, the CoML seems to be a re-incarnation of JGOFS "understanding the complex nature of biological-physical-chemical coupling in the dynamic marine environment."

Certainly, Rome would have lost the Punic Wars with that kind of strategic planning, but since nobody seems to have rejected the critical and precise word "census," I must suppose that some kind of numeration or count remains central to the plan. But a moment's reflection will suggest that this is an illogical (as well as impracticable) objective; the ocean is nothing if not variable in space and time and any entity it contains is, literally, not only uncounted but uncountable. Estimates can be made, with error bars, which is what much of marine biology has been about from the beginning, and will continue to be, with or without a CoML to help it along. A good answer to the so-called Grand Challenge would be "When?"

But in quite a different class to hazy planning is touting snake-oil. Several authors urge the deployment of new technologies in a CoML, but in at least one case "new" means "imagined," and in all there is in my opinion a lack of realism about what they measure and how they can contribute to a "census."

For a start, what do they measure? All remote sensing techniques require validation: one may infer that the blips in Jaffe's side-scan sonar are migrating salmon, but that's all, and though swim-bladder calibration may be useful for interpreting sonar techniques where pelagic fish are of few species, this not a common situation. Then, the "reverse migrant zooplankters, possibly *Psuedocalanus* (sic)," inferred by Jaffe from his Figure 2, are entirely notional, though cited to suggest that upwards-looking anchored sonars may be useful to a CoML. What his 420 kHz TAPS image actually requires one to infer is simply an advection past the inverted sounder of a patch of sound-reflective particles lying at about 5m depth, since the "missing biomass" at the surface is inappropriately placed to support any other hypothesis. Reverse migration may well occur, but this image does not support it. *Caveat emptor!*

But in a snake-oil class all their own are the roaming "Super-Predators" of Parrish, apparently capable of "remote species detection." If you didn't know to the contrary, you would have to assume from this article that SPs are just waiting to be built and that the necessary sensors to "detect and identify marine species without capturing the organism" already exist. In fact, the table attached to this article falsely claims that they do exist, now. But anybody who believes that Optical or Video Plankton Recorders, and holographic techniques are available "now" to perform this task for "all plankton" from "all mobile platforms," must also believe in fairies. It just isn't so, and probably won't ever be.

Nor is it necessary to trash perfectly good techniques we've used since the beginning. Despite what Parrish and you, sir, seem to believe, gelatinous zooplankton are very well sampled by regular nets. Has everybody forgotten what's in the literature? To mention just a couple of examples on the bookshelves: (i) Alvarino at Scripps gathered, in 1971, about 220 references which record some thousands of localities in all oceans at which 86 species of siphonophores had been found and (ii) a heavy box file labeled "Diets, gelatinous zooplankton" stuffed with reprints—all done with nets, I'm sure, despite the raptures of blue-water scuba divers.

Then, how do these novel remote sensing techniques contribute to a census of anything? The authors seem fond of the word "global" but I fear that few of them actually grasp the real dimension of the oceans. Shipboard sonar and optical sensors certainly extend data collection between stations, and airborne sensors will assist in coastal coverage, but the central truth will not be changed: that maps of biological variables derived from any survey — even from CalCOFI — represent no more than an unverifiable approximation to the true distribution at the central moment of the survey period. This sad truth needs to be better understood and seems not to have occurred to the authors of these proposals, or