Conference on Marine Pollution in October 1973 – a very considerable volume of international activity, reflected in many countries by major national programmes.

To what extent do the facts, opinions and perspectives developed during the proceedings of the FAO conference hold up today, two and a half years later? The mercury problem seems in retrospect to have been grossly overstated and to have been a serious and unnecessary embarrassment to some major fishing interests. Global monitoring, once thought an important requirement, appears to be fading with the realization that the most serious pollution problems exist on national doorsteps, and that enlightened self-interest will be a major factor in accomplishing their clean-up; that global surveillance, if required, is more likely to be achieved by encouragement of national efforts, properly coordinated within appropriate regional frameworks where the nature of the problem requires it; and that large-scale monitoring of the world's oceans is not a requirement except perhaps, in the minds of some, in the context of oil pollution. The general need to establish baselines for major pollutant concentrations is still recognized, but so too is the fact that enough information already exists to sketch these baselines for some areas. These may all be regarded as positive steps. However, we are very little further forward in the realization of practical methods for the assessment of pollutant toxicity at levels germane to the concentrations now existing in the marine environment. We are woefully aware of our ignorance in relation to understanding, in a quantitative manner, the various mechanisms responsible for maintaining ecosystems within their observed limits, and thus not only of what to look for in terms of pollutant effect but, when we do know what to look for, how to distinguish it from the range of natural perturbations or those initiated by other human activities.

We thus appear to be taking important steps towards our capability of establishing baselines in important areas of the oceans (i.e. inshore waters), and of controlling the input of noxious material to the open ocean, at least via some routes, whilst as yet being unable to say very much about the significance (in terms of effect) of what we find and what we are trying to control. We have, however, generated a real world-wide awareness of some of the problems, and the FAO conference must take a major share of the credit for this. We need now to proceed on a more cautious basis, and to eschew emotional appeals whilst taking every opportunity to take practical steps to control our inputs of noxious materials and to grapple with the longer-term problems involved in the understanding of the dynamics of marine ecosystems. Without this understanding, a rational control of the marine pollution problem, in which an acceptable degree of use of the marine environment for waste disposal has a legitimate place, will be impossible. In the short term we must be prepared to establish provisional control on the basis of available information, striking a reasonable balance between cost and benefit.

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Joseph T. Bagnara and Mac E. Hadley: Chromatophores and color change. The comparative physiology of animal pigmentation. Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1973. xvi + 202 pp., £ 6.00.

The ability of many animal species to change their colour patterns in response to various environmental or developmental stimuli has long attracted the interest of zoologists. Although the mechanisms by which animals achieve the ecologically valuable (as well as often visually remarkable) colour changes are yet but poorly known, it is certain that in many cases the final effector units are the chromatophores. It is with these units and their role in colour change that the authors of this book have concerned themselves. An introductory chapter on the nature of pigmentation is followed by chapters on its biochemical and developmental aspects. The major part of the book is then devoted to the control of chromatophores and to a detailed discussion of the mechanisms of endocrine action involved in colour changes. A short concluding chapter deals with some perspectives in chromatophore research. Particular attention is paid to the vertebrate dermal and epidermal chromatophores, with which the authors have been closely associated and on which most recent research work has focused.

As a simple yet comprehensive account of all aspects of current research and ideas about the biology of these chromatophores the book achieves considerable success, not the least in its ability to lead the uncommitted reader through the complex synergistic effects of the various controlling mechanisms in different chromatophores and different species. The text is clear and free from all but a few proofreading errors (the most felicitous lapse involves the implantation of pituitary *autographs*). The figures are simple, pertinent and well-chosen, and the text offers the reader about 450 references, most of them to recent work, which provide ready access to more detailed information on particular topics. It is a pity

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that Fujii's (1969) useful review of fish chromatophores and pigments is absent from the list. Had such an account of vertebrate chromatophores been the authors' only aim they would have succeeded well. However, as an exercise in "The Comparative Physiology of Animal Pigmentation" (the sub-title) and in "our principal purpose – to present a balanced review of all facets of animal pigmentation" (the authors' preface), it is much less satisfactory. The biochemical aspects of pigmentation are dealt with in cursory fashion. Quinones, porphyrins and bile pigments are not discussed at all, nor are blood pigments. The involvement of ommochromes in cephalopod chromatophores and in some endocrine-controlled colour changes in insects is not mentioned, and, in general, the chromatophores and other colour control systems of invertebrates receive very limited treatment. The authors were apparently unaware of the work of Elofsson and Kauri (1971) on the ultrastructure of the chromatophores of *Crangon* and *Pandalus*, and the reader is reminded throughout that their interests lie primarily in the field of vertebrate systems.

Although the book fails to achieve its stated aims, it does offer a useful digest of the comparative aspects of vertebrate pigment cell biology and will be of value to those with a general interest in chromatophores or animal colour changes. It is a pity that the authors' wave of enthusiasm for their own field of research has submerged their treatment of more peripheral topics.

References

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M. E. Vinogradov (Ed.): *Life activity of pelagic communities in the ocean tropics.* (Nauka, Mosvow, 1971). Transl. TT – 72 – 50035 Israel Progr. for Scient. Transl., Jerusalem, 1973. 298 pp., $ 3.00.

The 44th cruise of RV "Vityaz" studied the pelagic communities at a number of stations around anchored buoys at various positions in the equatorial countercurrent and the south equatorial current of the Pacific Ocean. At these positions, observations were made on irradiance distributions, and on physical and chemical features, with particular emphasis on nutrient salts. A bathyphotometer was used to plot the vertical distribution of bioluminescence and the biological sampling structure was based on it; "aimed" samples were taken in the layers where the plants and animals lived.

The central paper in this volume is by Dr. Sorokin on the role of bacterioplankton in the tropical Pacific. The biomass of the bacteria amounts to 10–100 mg/m^3 wet weight in the warm surface layer and the P/B ratio (production/ biomass) is one or less. The algal production is less than the bacterial production, but in depth and in distance offshore, the two quantities are highly correlated. It is argued that in addition to primary production there is a second source of energy, namely organic material from higher latitudes. In support of this hypothesis it is shown that aggregates of bacterioplankton can be formed of up to 5 μm in diameter. Such animals as *Penilia* and appendicularia can feed on bacteria, and calanids can feed on the aggregates. There is a zooplankton biomass of 1·2 gC/m^2 which cannot be fed solely by the primary production of 0·2 gC/m^2/d, but the sum of algal and bacterial production is sufficient for this purpose.

It is a highly imaginative conclusion and Dr Sorokin very nearly believes it. The methods used are described in great detail and are adequate in so far as I am competent to judge, but it is surprising to find that the division rates of the bacteria are apparently low. The biomass of bacteria ranges between 10 and 100 mg/m^3 or 0·1–1·0 gC/m^2 (over a column of 100 m depth) and the bacterial production would be $>$ 0·1 to $<$ 1·0 gC/m^2/d. The question open to dispute is whether this value is greater than the 0·2 gC/m^2/d of primary production. Dr Sorokin believes that the bacterial production is a little overestimated and the primary production is a little underestimated.

Let us suppose that there is not a second source of energy. Up to 30% of carbon photosynthesized is released into the sea and could provide a basis for the elaboration of bacteria. The bacterial production need not be limited to 30% of the primary production because part of the other 70% is also available in the normal processes of degradation. This at least explains the correlation between algal production and bacterial production and there is some reason to suppose that some animals would exploit the bacterial production, particularly if aggregated. If the algal production is 0·2 gC/m^2/d, half may go to the bacteria together with the extra 30% i.e. 0·1 + 0·07 gC/m^2/d = 0·17 gC/m^2/d. The question then

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