The value of diversity

J.A.J. Meester
Department of Biological Sciences, University of Natal, Durban

Just as genetic diversity is important to animals in adapting to a variety of physical circumstances, so also diversity of knowledge, ideas and beliefs is important to man in adapting to a changing world. Excessive uniformity and intolerance towards unpopular ideas and beliefs limit the capacity to face the challenges of change.

S. Afr. J. Zool. 1982, 17: 1 – 2

Soos genetiese verskeidenheid vir diere belangrik is in aanpassing by 'n verskeidenheid van fisiese omstandighede, so ook is verskeidenheid van kennis, idees en opvattings belangrik vir die mens in sy aanpassing by 'n veranderende wêreld. Oormatige eendersheid en onverdraagsaamheid teenoor ongewilde idees en opvattings beperk die vermoë om die uitdagings van sosiale verandering die hoof te bied.

S.-Afr. Tydskr. Dierk. 1982, 17: 1 – 2

Presidential address on 9 July 1981 at the Symposium on Zoogeography, Environmental Physiology and Speciation held in Durban, Natal, Republic of South Africa.

In the course of this Symposium we have dealt with a range of animals from protozoans to mammals, and with fields of study ranging from ecology and physiology to palaeontology and zoogeography. We have all, I hope, learnt a great deal that is new to us. In contrast, my talk to you will probably teach you nothing new, although I hope that I may put your existing ideas in a slightly different perspective. My theme is concerned with something we have seen amply illustrated during this Symposium: diversity.

We appear to know somewhat less about evolution than we did ten years ago, as a great deal that we had taken for granted is now being questioned anew. We are no longer sure what rôle, if any, phyletic change plays in the course of evolution (Gould & Eldredge 1977; Vrba 1980); the nature, scope and importance of what we have called isolating mechanisms are in doubt (Paterson 1980, 1981); the nature of natural selection is being questioned; and indeed the mechanics of speciation may well differ significantly from what we have assumed until now (Gould 1980; Paterson 1981). Against this background I risk being simplistic in describing to you some aspects of evolution as I have understood it in the past, but I do so with apologies to those among us who are better informed than I am.

In rapidly evolving groups, for example after adaptive shifts and during subsequent adaptive radiation, one finds a great deal of both geographic and individual variation. The groups concerned are usually generalized, with many plesiomorph features, and rapid speciation takes place, so that the taxa concerned are taxonomically complex and often difficult to define adequately. Among the group I know best, the mammals, perhaps the best example of this is the shrew genus *Crocidura* in Africa, with a large number of taxonomically ill-defined and often cryptic species, which are geographically very variable, and show complex patterns of relationship.

It has been pointed out (Bickham 1979; Bickham & Baker 1979) that during this stage chromosome numbers tend to be high, and that karyotypic evolution involves mainly the arrangement of genes on the chromosomes, and therefore the nature of the linkage groups concerned. The high chromosome number and associated karyotypic changes obviously increase the chance of recombination resulting from heterozygosity, and thus the amount of available variability. This variability provides the raw

material which, under the influence of directional or centrifugal selection, allows adaptation to a wide variety of ecological niches, and to marked changes in the environment.

With progressive specialization there comes loss of variability, greater and greater uniformity, and closer adaptation to a restricted range of conditions. At the same time there is a tendency for reduction in chromosome number, often by Robertsonian translocation and chromosomal rearrangements (Bickham & Baker 1979), which, by reducing the number of linkage groups, inhibits the amount of variability that can result from heterozygosity.

This reduction in variability implies that, while the taxon concerned may be very closely adapted to a particular habitat, it may not be able to adjust to more than minor changes in its environment. A major environmental change will probably lead to its extinction, as doubtless was the case with the mass extinction of reptiles at the end of the Mesozoic. Among the mammals I am tempted to speculate whether the blue antelope or the quagga would have survived even if European man had not appeared on the scene; whether the mountain zebra has an evolutionary future; and whether the rough-haired golden mole *Chrysospalax trevelyani* can survive even under protection.

The point I wish to make here is that the variability of the more generalized groups allows them to evolve rapidly in a changing environment and to survive both change and diversity in that environment. On the other hand the reduced variability of more specialized groups, while no doubt of value in coping uniquely well with a uniform, relatively unchanging environment, does not provide them with the evolutionary plasticity to cope with significant changes.

In humans the situation is somewhat different. Here genetic variation, and organic evolution, are probably not as important as sociological diversity and cultural evolution. The emphasis of natural selection has shifted to fall on intellect, and aggression in the broadest sense, rather than on physical features, and the product of evolutionary change is not so much different species as different societies. Finally, while specialization does occur it takes a different form than in most other animal groups.

In other animals the adaptive features of a parent, being genetically based, are for the most part carried over to its young. In humans, on the other hand, being culturally transmitted they are not necessarily or even commonly shared with their offspring. So, while an elephant can produce only another elephant, a dentist can produce a deep sea diver, a pharmacist may produce an engineer and so forth. The point is that each of these is a specialized profession (or niche, if you prefer), requiring close adjustment to a particular cultural environment. However, the group as a whole need not be so closely adapted to that particular environment (indeed, it cannot afford to be), and this adaptation is not carried over from one generation to the next. And of course in humans being physically in tune with the environment is far less important than the ability to adjust to it culturally, by means of intelligence, artefacts or behavioural flexibility.

However, parallels remain. In particular variability remains important, although now we are referring to cultural rather than genetic variability. A viable society encompasses a great deal of diversity in abilities, ideas and concepts, which allow it to meet the challenges of a changing world, just as genetic variability ensures the survival of other animals in a changing environment. Where there is little diversity in viewpoint, where there is great uniformity of knowledge, ideas and beliefs, the danger exists of a society which will be unable to meet the challenges of change, merely because it lacks the flexibility which would allow it to find answers to the new problems posed.

Unfortunately, as we see for example in politics and religion, many societies tend to regard diversity of ideas and departure from accepted norms of belief and behaviour as undesirable or even dangerous, the more so the more they diverge from whatever is the accepted viewpoint. Such societies are ill-equipped to meet the demands of social change. Where change is inevitable it will happen by revolution rather than by evolution, and cause needless suffering to those who are affected by it.

At the personal level also, people with inflexible ideas, rigid and intolerant, are less likely to play a significant rôle than those who have the breadth of vision to see the opportunities and challenges that the world has to offer. What better adjustment is there to modern society than to strive for broadmindedness and tolerance, and to remain open to new ideas and different viewpoints, while retaining the judgement to choose wisely and consistently in those matters concerned with conducting one's own life?

It remains only to say that it is very gratifying, against the background of what I have said, to see the diversity of knowledge and ideas presented at this Symposium. If what I have told you is correct, it means that our Zoological Society remains viable, and should be well able to adjust to the changing world ahead of us.

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