many of the larger elephant populations are located in politically unstable areas – for example the 8,500–11,000 elephants in northeast India[2]. The destruction wrought in Manas National Park, Assam, by Bodo secessionists shows how vulnerable even protected areas are to political unrest. In the Vietnam war, US forces bombed elephants because the Viet-Cong were using them as transport[4].

None of the problems are faced by the Asian elephant can be alleviated overnight as poaching has been in Africa. Neither has much effort been expended by the international community in finding ways in which human and elephant populations can successfully co-exist (althought the individual countries involved are trying to tackle these problems). This state of affairs must be rectified, because the continued success of the CITES ban, coupled with human population growth, will result in the Asian situation being repeated in Africa in the near future. It will be in the long-term interests of both elephant species to find solutions to the Asian elephant's problems now. (Source: *Nature* 352, 1991).

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THE DILEMMA OF SUBSPECIES

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Oliver Ryder's article[1] on the subspecies problem, which reports on issues considered at a July 1985 conference at Philadelphia on the establishment of species survival programs by the American Association of Zoological Parks and Aquariums, is most welcome and timely.

Owing to the extremisms of 'lumpers' and 'splitters' among systematists and taxonomists, and the general neglect of systematics in the wake of modern disciplines such as molecular biology, the subspecies concept has come in for a considerable bashing. Darwin's vague definitions[2] of 'species' and 'variety' may also have contributed to this, even though there are some sound modern definitions[3,4].

It is therefore heartening that he Philadelphia conference has recognized the importance of a concept of 'evolutionarily significant units or populations', that is, of subspecies within species, despite the difficulties involved in recognizing them. As Ryder remarks, these difficulties could be overcome by adopting the criterion of 'concordance between sets of data derived by different techniques'. One such modern technique is the estimation of genetic distance 'when geographical distribution data indicate the existence of discrete populations within the range of a species'.

An example from recent genetic distance studies on Sri Lankan species illustrates this well. A Japan–Sri Lanka programme has been concerned with native livestock and their wild forms, including jungle fowl, musk shrews, macaque monkeys and elephants[5]. Work on the two Asian elephant subspecies in Sri Lanka and India has given particularly promising results[6].

Genotype and gene frequencies and heterozygosity at variable protein loci, determined by electrophoretic analyses of blood samples from 29 tamed *Elephas maximus maximus* (the *forma typica*) in Sri Lanka, and from 20 tamed *E. m. indicus* in India, indicate that the genetic variability within each of the subspecies is low, as in the case of other non-domesticated large

mammalian species. Between the two subspecies there is not only a genetic distance of the same order as that between two subspecies of Japanese macaque monkeys, but also a complete allelic substitution at the tetrazolium oxidase (To) locus. This gives added support, from modern techniques, to the subspecies status of each of these two elephant populations. It also points to the possibility of confirming or refuting, by such techniques, the validity of the subspecies *E. m. vilaliya* Deraniyagala), the supposedly massive, rare and tuskless 'swamp elephant' which was 'restricted to swamps in the flood plains of a few rivers of the Eastern Province of Ceylon'[7,8].

I would like to emphasize that the potential significance for evolution of a trinomial, or subspecies, however inadequately described and named, should always be recognized. The subspecies, of variety, can after all be an expression of an incipient species, which is what Darwinian evolution is basically about.

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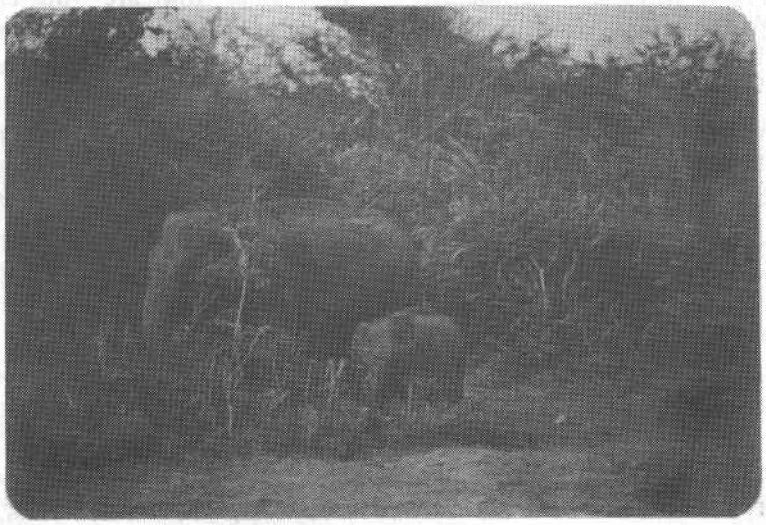

An adult female elephant and its calf browsing in the thorn scrub. Ruhuna National Park, Sri Lanka. (Photo: Charles Santiapillai/WWF).