

Accumulation of lead in the bones of turtle doves *Streptopelia capicola*

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ABSTRACT

The build up of lead in the bones of turtle doves *Streptopelia capicola* is faster at Cape Town in South Africa than at Okaukuejo in the Etosha National Park, South West Africa/Namibia. One-year-old Okaukuejo birds contained less than half as much lead as four-month-old birds which had been kept at Cape Town for less than three months. The concentrations of lead in the birds at Etosha National Park are relatively low.

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1 INTRODUCTION

Adult laughing doves *Streptopelia senegalensis* in Cape Town, South Africa, contain on average seven times more lead per unit mass of tissue than conspecifics living in rural farmland 50km from the city (Siegfried *et al.* 1972). The higher concentrations of lead in the city doves are believed to reflect a relatively greater degree of lead in the urban air, presumably as a result of motor car exhaust emissions. However, nothing is known about the rate at which doves accumulate lead in their tissues. Here we report on a pilot study of the concentrations of lead in the bones of Cape turtle doves *Streptopelia capicola* ranging between 35 and 400 days old, and show that the build up of lead in these birds is faster at Cape Town than at Okaukuejo in the Etosha National Park, South West Africa/Namibia.

2 METHODS

We chose to trap, using mist-nets, wild turtle doves in the Etosha National Park, because the area is remote from, and presumably relatively free of, air heavily contaminated by motor vehicle emissions. Nineteen birds were trapped in June 1978 and 39 in May 1979. We took only juveniles whose ages were estimated according to the birds' state of primary moult (Siegfried 1971) and other criteria (Hejil 1976). All of the birds taken in June 1978 were killed immediately after capture, as were also 10 individuals in May 1979. Eighteen birds were kept in an outdoor aviary at Okaukuejo, and the others were translocated immediately to Cape Town where they were kept in an outdoor aviary on the Groote Schuur campus of the University of Cape Town. The captive birds were between 28 and 43 days old when they were first placed in the aviaries. Subsequently, three birds selected at random from each aviary were sacrificed approximately every two months between 1 August 1979 and 1 June 1980. All birds were assayed for lead, using atomic absorption spectrophotometry and following procedures described in Siegfried *et al.* (1972).

3 RESULTS

Lead concentrations ranged between 0,35 and 6,26 ppm for doves taken in 1978, with young birds ($x=41,6$ 35-47 days old) tending to have lower concentrations ($x=1,62$ SE=1,05ppm $n=12$ vs $x=3,12$ SE=2,08ppm $n=7$) than older individuals ($x=65,1$ 52-94 days old). The birds taken in May 1979 were, on average, younger ($x=40,2$ 35-61 days old) than the 1978 group and contained, on average, slightly lower concentrations of lead ($x=1,39$ SE=0,43ppm $n=10$). Lead concentrations were not influenced by the sex of the individual birds. Doves at Okaukuejo accumulated lead at a slower rate than those at Cape Town (Fig. 1). The approximately one-year-old Okaukuejo birds contained less than half as much lead as four-month-old birds which had been kept at the University of Cape Town for less than three months. Apparently, the birds accumulated lead most rapidly when they were introduced initially into Cape Town and/or when they were relatively young.

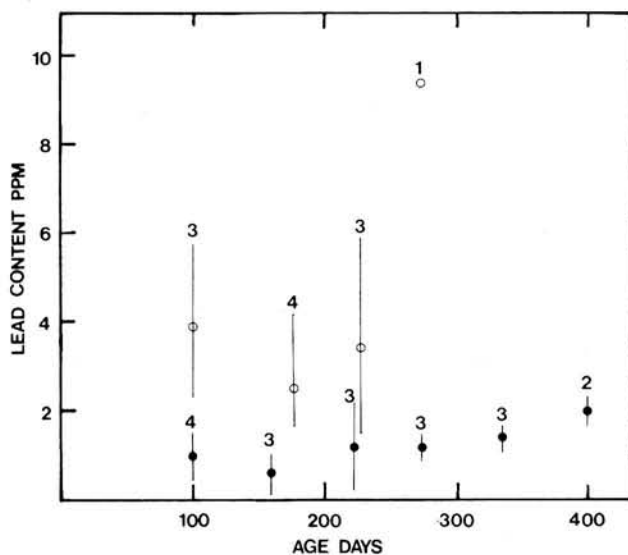


FIGURE 1: Mean concentrations (ppm dry mass) of lead in the bones of turtle doves 100 – 400 days old, kept at Cape Town (open circles) and Okaukuejo (dots). The vertical bars represent ranges and the figures indicate numbers of birds sampled for each plot.

4 DISCUSSION

The concentrations of lead reported here are well below the mean (84,3 ppm) for adult doves living in urban Cape Town (Siegfried *et al.* 1972), and much lower than concentrations in pigeons *Columba livia* in Pennsylvania, USA (Tansy & Roth 1970). It is likely that the accumulation of lead would have been greater in the experimental birds had they been kept in a more urbanised part of Cape Town than that occupied by the University of Cape Town's Groote Schuur campus.

Lead is an ubiquitous element in industrialised societies, occurring in practically all living organisms (Botts 1977). There are many sources of lead, but given the nature of the results reported here and the lack or paucity of "heavy" industry in Cape Town, it seems reasonable to suspect that a major source of lead in the environment of Cape Town is the emission from motor vehicle exhausts following the combustion of leaded petrol (Smith 1976). Animals absorb lead by inhalation, ingestion and absorption through the skin; inhalation being most, and skin absorption least, efficient (Botts 1977). Lead is toxic, but little is known about its levels of toxicity for different species of animals and almost nothing is known about its effects, either short or long-term, on doves. However, according to Kendall and Scanlon (1979), in mourning doves *Zenaid macroura* bone lead concentrations > 100ppm are associated with an acute dosage of lead or chronic exposure.

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