Hi Karan —

26 May 87

Jack Kinnear asked me to put together a summary of salient facts concerning 1080 & cheditch, and this (the enclosed) was the result. I thought you might like a copy for your files.

Grant has probably already mentioned to you that we (Todd & I) spoke at some length with Dave Algar at Woodvale yesterday. I was very pleased to hear that ① he appears to have abandoned the idea of cyanide baiting on the Pemp; ② he plans to spend 1-2 weeks improving/testing the tower system in August, before the field season begins in earnest; ③ he is arranging/delegating his Kalbarri & Nangeen research duties next summer in order to devote more time to the Pemp (i.e. Jack will be supervising the summer baiting at Kalbarri, in conjunction with rock wallaby surveys); and ④ he plans to substantially extend the area of the Pemp sampled by sand tracks, in order to get a handle on fox movement patterns. ↙ 2nd hand info, via Dave

Jack is apparently interested in sampling tammar blood at the Pemp, in order to measure the genetic diversity of the population (an extension of some collaborative rock wallaby work he's been doing). I don't know if he's already contacted you about it — it would seem an excellent opportunity to communicate about tammar trapping & endangered macropods generally.

— Melody

065342 May, 1987

TO: Manjimup Research Centre

FROM: Melody Serena & Todd Soderquist, W.A. Wildlife Research Centre

SUBJECT: Potential vulnerability of D. geoffroii to fox baiting

Sensitivity of D. geoffroii to 1080

The A.P.B. LD_{50} for Dasyurus geoffroii is 7.5 mg/kg (King et al., in review). However, it seems to me inappropriate to base management of an endangered species on a figure which assumes 50% of a population will die when dosed at that level. A reasonably safe upper limit for adult chuditch is probably close to 5.0 mg/kg. All 3 of the animals dosed at this level by the A.P.B. survived, but one "developed classic symptoms of fluoracetate poisoning", and all 3 showed considerable increases in plasma citrate concentration.

Acceptability and consumption of baits

Our captive feeding trials involved 110 gram chunks of raw kangaroo meat, sun-dried to approximately 60 grams final weight. Chuditch had no difficulty chewing through the thick leathery "rind" of such baits, consuming them entirely. Animals ate an average 44 g/kg body weight (range = 30-56 g/kg) in the first hour after being presented baits at their normal evening feeding time (6 animals; 15 trials). Overnight, they ate an average 83 g/kg (range = 60-101 g/kg; sample size as before).

Because our animals are caged, their metabolic needs and appetite are almost certainly lower than those of wild chuditch. Based on a number of different studies, McIlroy (1981b) concludes that free-ranging carnivores are expected to eat about twice as much as captive individuals. By measuring water and sodium flux in the closely-related (and similar-sized) Dasyurus viverrinus, Green & Eberhard (1983) estimated the food intake of wild individuals to be 200-224 g/kg/day in summer, and 318 g/kg/day in winter. The winter

turnover of water (which should essentially reflect the rate of food consumption) was 2.5 times greater in wild than caged native cats. From this, I estimate that the nightly capacity of wild chuditch to consume dried meat baits is conservatively twice the captive intake, or about 160 g/kg.

Estimated acceptable concentration of 1080 in dried baits

Typical weights of adult chuditch are 800 grams for females and 1200 grams for males. The maximum safe dose of 1080 for chuditch this size (assuming a maximum safe tolerance level of 5.0 mg/kg) is 4 mg (females) and 6 mg (males). The volume of bait that they can consume (assuming a capacity of 160 g/kg/night) is 128 g (females) and 192 g (males). Thus, for chuditch, the estimated maximum acceptable concentration of 1080 per bait (assuming a 60 gram dried bait, prepared from a 100 gram chunk of raw meat) is 2 mg. The concentration of 1080 recommended by the A.P.B. for fox baiting is, likewise, 2 mg per dried meat bait (Dennis King, pers. comm.).

Other factors affecting vulnerability to 1080

Less obvious factors which bear on the vulnerability of chuditch to 1080 include the following:

1) The cumulative effect of repeated sublethal doses
2) The time to onset of symptoms following ingestion of bait
3) The minimum dose required for symptoms to appear
4) The period required for animals to fully recover from a sublethal dose
5) Differences in tolerance between adults and young animals, especially pouch young.

Unfortunately, data bearing on all of these points are meager.

To my knowledge, nothing is known of the effect of repeated sublethal doses on D. geoffroii, or any other dasyurid. The very large home range of chuditch (a minimum of 3-4 km^2 for females,

and 10-12 km^2 for males) does suggest that individuals may come into contact with numerous baits during a single baiting trial. Judging by captive behaviour, chuditch may also cache food for later consumption.

King et al. (in review) found that the one D. geoffroii which they dosed at 2 mg/kg showed no obvious symptoms of poisoning. At 5 mg/kg, symptoms were first displayed 1-2 hours after poisoning. To my knowledge, no data describing the length of time required for chuditch (or other dasyurids) to fully recover from 1080 poisoning are available. In a variety of other mammals (e.g. rats, mice, pigs, dingos) the period to full recovery has been found to vary from 48 hours to more than a week (cited in McIlroy, 1981a).

Pouch young appear to ingest 1080 (or its toxic metabolite, fluorocitrate) with their mothers' milk when the latter are dosed. As exemplified by tammar wallabies, brush-tailed possums and Dasyurus hallucatus, pouch young also appear to be more sensitive to its effects than adults (McIlroy, 1981a). A quantitative comparison is available only for tammar: the adult LD_{50} of .27 mg/kg was found to be significantly higher than the juvenile LD_{50} of .15 mg/kg (McIlroy, 1981a). Chuditch have a single, winter breeding season. Based on our 1986 data, young are present in the pouch from late May to late September, with most continuing to suckle until well into December.

Conclusions

The relatively low tolerance of chuditch for 1080, and their large appetite for dried meat baits, suggests that individuals are likely to be at risk from baiting programmes in which the concentration of 1080 in baits exceeds 2 mg per 60 g dried bait. In addition to appetite and 1080 tolerance, a host of behavioural and physiological factors may affect the actual vulnerability of chuditch populations to baiting. In theory, it should be possible to investigate these

factors one by one, in the field and lab. However, a far more practical approach to establishing the actual, as opposed to theoretical response of chuditch to baiting would be to directly monitor the effects of a fox baiting trial on a radio-collared sample of wild chuditch.

It is important to develop fox baiting procedures that spare chuditch not only because they are endangered, but because the best remaining populations seem to occur in precisely those areas where fox baiting is likely to be of most value in conserving native mammals generally. Furthermore, the long-term management of D. geoffroii should probably involve its reintroduction to areas of historic habitat---which, once again, are likely to be managed in part through regular fox control measures.

Literature cited

Green, B. and I. Eberhard. 1983. Water and sodium intake, and estimated food consumption, in free-living eastern quolls, Dasyurus viverrinus. Aust. J. Zool. 31:871-80.

King, D.R., L.E. Twigg and J.L. Gardner. 1986. Tolerance to sodium monofluoroacetate in dasyurids from western Australia. Aust. Wild. Res., in review.

McIlroy, J.C. 1981a. The sensitivity of Australian animals to 1080 poison I. Intraspecific variation and factors affecting acute toxicity. Aust. Wild. Res. 8:369-83.

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5,0 mg/kg. 1080.

160 g/kg consumed.

♂ 1200 g ♀ 800 g

safe tolerance 128 g ♀, 192 g ♂

= 2 mg / bait 1080.

Home range 3-4 km^2 ♀ 10-12 km^2 ♂

Recovery time

Food caching

Pouch young ingest fluoroacetate ? milk

May – Dec.