THE ECOLOGY OF CHUDITCH (Dasyurus geoffroii) IN THE JARRAH FOREST: A SUMMARY OF FACTS RELEVANT TO MANAGEMENT

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Distribution and density

1. Chuditch have been trapped on 65% (11/17) of recent faunal surveys in the jarrah forest (each with ≥150 box trap nights).
2. Adult female chuditch occupy non-overlapping home ranges which are probably actively defended. Some reliable estimates of adult female density in the forest are:
   a. Lane-Poole Reserve (along river): 1 per 2 km^2
   b. Lane-Poole Reserve (outside of river valley): 1 per 6 km^2
   c. Perup Nature Reserve: 1 per 6 km^2
   d. Batalling block (E of Collie): 1 per 8 km^2
3. Empty female home ranges remain vacant until occupied by locally dispersing juveniles (i.e. no pool of transient animals exists).
4. The density of adult males is roughly the same as for females.
5. Small residual populations of chuditch may exist in mallee woodland, but no other populations are likely to remain outside the jarrah forest. Recent records from the mallee are confined to the area bounded by Lake Grace, Kambalda, and Munglinup.

Population estimates

1. Assuming (very optimistically) that all jarrah habitat supports chuditch densities equivalent to those on the Perup, then in private and CALM-managed jarrah forest the total population of chuditch is approximately 6500 animals.
2. Based on these same assumptions, all the National Parks, Nature Reserves, and Conservation Reserves within jarrah habitat can support a maximum 1000 chuditch. Many Reserves are too small to maintain viable populations independently of surrounding State Forest.

Mortality

1. The mean life span of established adults is 2 years.
2. Causes of death in a sample of 13 radio-collared animals on the Lane-Poole Reserve were:
   a. 46% human (road kills, shooting)
   b. 31% predators (fox, owl)
   c. 15% disease
   d. 8% drowning

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1. The mainstay of the diet is insects and other arthropods.
2. The season of greatest food limitation is June-August.
3. Foraging primarily occurs on the ground.

Dens

1. In one year, each female D. geoffroii is estimated to occupy, on the average, 65 logs and 110 burrows distributed over an area of about 1 km^2.
2. About 85% of burrows are associated with some sort of surface structural element:
   a. living trees/ sound or rotten stumps
   b. uprooted trees
   c. boulders/ rock outcroppings
3. Of simple burrows (i.e. those not associated with overlying structural elements), >70% occur within 100 m of a river or stream, in relatively deep alluvial soils.
4. Critical dimensions of den logs are:
   a. diameter of the hollow = 8-18 cm
   b. minimum diameter of bole at den = 30 cm (summer); 50 cm (winter)
   c. minimum length of hollow (excluding very wide or flared sections at entrance) = 150 cm
5. Based on methods described by Harding (1939, Aust. Forestry 4: 82-5), the minimum DBH of trees producing den logs suitable for chuditch is 50 cm.

Poison baiting

1. Chuditch are potentially vulnerable to poison baits used to control foxes and dingoes.
2. Of available poisons, only Compound 1080 can be safely used in chuditch habitat.
3. To spare chuditch, baits should contain a maximum of 2 mg of Compound 1080 per 140 g of fresh meat. Baits which are dried to constant weight before distribution are safer to chuditch than fresh meat baits.
4. The safest period to bait is February-March. Baiting from April-December should be avoided because even sublethal doses of Compound 1080 may hinder sperm production in breeding males and kill the pouch young of lactating females.

FIELD TECHNIQUES FOR WORKING WITH CHUDITCH (DASYURUS GEOFFROII)

Melody Serena and Todd Soderquist

September, 1988

CHOICE OF TRAPS

In the course of our research, we have trapped chuditch with Elliott folding aluminium traps (largest version), Mascot wire cage traps (treadle type as well as the type triggered by pulling a suspended hook forward), collapsible Tomahawk wire cage traps, and homemade wire cage traps triggered by a pull-cord. Problems that may be anticipated with these various types are as follows:

A. SURVEY WORK

Elliott Traps.

1. Some chuditch, especially young juveniles, severely abrade their nose and paws in efforts to escape from Elliott traps. The treadle mechanism is often damaged in the process.
2. The traps are cold in winter, and cannot readily be supplied with bedding due to their design. This problem is exacerbated when animals get soaked with condensed moisture from their breath and/or urine.
3. Unless care is taken to ensure that traps are well shaded, trapped animals can lethally overheat on warm, sunny days.
4. A small percentage (5-10%) of chuditch can be expected to evade initial capture in the following ways:
   a) Forcing a door open past the narrow flanges holding it shut.
   b) Reaching over the treadle to grab the bait, then backing out of the trap. The frequency with which this occurs can be reduced by tieing the bait into a back corner.

Cage Traps.

1. The rear half of the trap should be enclosed in hessian or similar material, to provide animals with cover and discourage chuditch from stealing bait through the sides or roof. As a bonus, even heavy rain will be wicked away through the fabric, leaving trapped animals dry.
2. Small chuditch (e.g. first year females) may escape from Tomahawk traps by squeezing out between the door and wall. This can be prevented by bending the walls in slightly at the door.

B. STUDIES INVOLVING RECAPTURE OF ANIMALS

Elliott Traps.

1. After having been trapped once or a few times, a large percentage of chuditch will learn to routinely elude capture in the following ways:

a) Reaching over the treadle and grabbing the bait without triggering the trap. Again, try tieing the bait into a back corner.
b) Escaping from a closed trap by pulling a door inward and open with their claws. This can be solved by wiring the back door closed and installing a tab which locks the front door. The tab is an L-shaped piece of sheet metal one cm wide. The metal at the L's angle is pinched upwards forming a narrow groove or channel along which a wire is threaded. The free ends of the wire are then passed through two small holes drilled in the top of the trap, thereby attaching the tab to the ceiling about 3 cm from the front. The long leg of the tab pivots up as the door closes, allowing it free passage, then blocks it from opening inward. Unfortunately, the ease with which Elliott traps are set is lost.

Cage Traps.

1. Some chuditch learn to bite the bait from the hook of Mascot pull-style traps without triggering the trap. The only remedy is to fasten baits more securely.

2. As with Elliotts, chuditch learn to reach over the treadle of Mascot treadle-style traps, obtaining the bait without getting caught. This problem can be avoided by suspending the bait from a string, the other end of which is fastened to the wire door trigger. The bait should be suspended close to the trap roof, to keep chuditch from chewing through the string without triggering the trap.
3. All trap types are liable to being dragged or rolled over by trap-wise chuditch. The best remedy is to stake traps down securely, or at least stabilize them between rocks, logs, etc.

WHERE TO TRAP

Good places to set traps include the edges of paths and dirt roads (at 250-300 m intervals); near bridges (including natural log crossings); saddles between hills; along gullies or stream bottoms; and near campgrounds.

WHEN TO TRAP

1. Chuditch seem to be most easily trapped in June/July, when natural food is relatively scarce and males are moving about widely in search of mates. We recommend that trapping NOT be conducted from mid-August through early October, which coincides with the time when juveniles are first deposited in dens, at a very vulnerable (to cold and predators) stage of development.
2. It is our experience that three consecutive nights of trapping usually suffices to trap most (occasionally all) of the females known to be resident in the area intersected by the trap line/grid. Longer trap sessions are inadvisable if animals are being repeatedly trapped, especially in winter, unless very large quantities of bait are provided to maintain their weight.

BAITS

1. Meat probably constitutes the ideal chuditch bait in terms of palatability. However, meat also tends to attract ants, and decays rapidly in warm weather. We have had very good success with a variant of "universal bait", comprising peanut paste, tinned cat tuna, and enough dried meat (or fish) meal to make the mixture doughy. The attentions of blowflies and ants can be substantially reduced by wrapping each portion of bait in a piece of paper towelling.
2. To increase the distance over which a trap is detected by chuditch, we use liquid scent bait, poured into a small paper cup which is placed near the trap entrance. The scent bait is made by allowing meat to decay in a large container (with water added). Whole dead mice and any kind of viscera are particularly good starting ingredients. This technique is widely used by North American fur trappers to attract a variety of carnivores to trap sets. The faint of heart may wish to substitute other strongly odoriferous substances (e.g. peppermint essence).

HANDLING

1. Most chuditch are easily convinced to exit a cage trap into a cloth bag by puffing air forcefully at them.
2. A bag made of unbleached calico allows the animal to be more easily manipulated than one made of hessian.
3. To reduce struggling to a minimum, blindfold the chuditch (with a strip of soft cloth) whenever its head is outside the capture bag.
4. Quiet voices do not appear to disturb chuditch. However, snapping twigs and rustling leaves, plastic bags, nylon clothing, etc. often provoke alarm.

MARKING

1. We have marked chuditch by two methods:
   a) Very small ear tags (No. 1 monel fingerling tags) placed at the anterior juncture of head and pinna.

b) Ear tattoos, using black carbon ink and quarter inch livestock dies (one tattoo per ear).

We have found ear tags to have two major drawbacks: they can be torn out (especially true of larger tags), and they can cause considerable irritation of the pinna, sometimes for months after the tag is inserted. By comparison, ear tattoos persist indefinitely, heal rapidly, and thereafter never bother the animal. 2. Pouch young older that six weeks can be marked with tattooed dots of fluorescent pigment in the ears (Soderquist, T.R. & Dickman C.R., A technique for marking marsupial pouch young with fluorescent pigment tattoos. Aust. Wildl. Res., in press).

ESTIMATING BODY CONDITION

To gauge body fat, we use an index based on the relative thickness of fat deposited on the sides of the caudal vertebrae at the basal 4 cm of the tail:

a) Category 1. Little or very little fat on the tail. Caudal bones are distinctly felt as a series of unpadded ridges and depressions.

b) Category 2. Medium fat on the tail. Caudal bones are lightly padded with fat; depressions between vertebrae are moderately well defined to the touch.

c) Category 3. Much fat on the tail. Caudal bones are well padded with fat, obscuring the definition of ridges and depressions.

With experience, intermediate categories between these major designations can be reliably distinguished. Because of individual (and sex- and age-specific) variation in the size of caudal bones, we consider measurements of tail width or circumference to provide inferior estimates of body condition as compared to the qualitative index.

ESTIMATING AGE

To estimate age of adult animals, we primarily rely on an index based on tooth wear. Incisor wear is a more reliable gauge than

canine wear if the two estimates are in conflict. Barring more precise information on the individual chuditch, we assume that jarrah forest animals are born on July 1.

a) First year animals. Incisors have obvious, angular cusps when viewed from the front. Canines vary in length, but tips are always more or less sharp. All teeth are white.

b) Two years old. Cusps of incisors are still apparent, but rounded by wear. Canines are worn at the tip and sometimes broken. Teeth are usually white, but some may be greyish or yellow.

c) More than two years old. Working surfaces of incisors are flat or slightly concave with wear. Some incisors may be missing. Canines are usually very worn, often chipped or broken. Often some teeth are greyish or yellow.

WOUNDS

1. When fighting, chuditch simultaneously grapple with their forepaws, rake with their hind claws, and threaten each other with open jaws. Lacerations and abrasions resulting from fighting occur most often on the thigh (especially the anterior surface), rump, lateral shoulder, and muzzle.

2. A copulating male will often grasp a fold of skin just posterior to the female's shoulder blades in his jaws. Among wild females, this often results in minor (occasionally severe) injury to an area typically 1.5-2.5 cm in diameter. More rarely, a copulating male will `scratch' at a female's thighs with his hind claws, sometimes extensively lacerating her rear and/or inner thighs in the process.

LINEAR BODY MEASUREMENTS

With experience, we have come to rely on head length and tibia length as being relatively precise, and easy to measure. Tail length can be misleading, as chuditch often break it, or lose the tip in fights or accidents. Pes length and head-body length both vary relatively more due to measurement error than head and tibia length do.

a) Tibia. Measured from the most anterior process at the "knee" to the tip of the heel pad, while holding the leg in a natural plane with the heel at right angles to the tibia.

b) Head. Measured from the middle of the supraoccipital crest (a slight notch at the upper rear skull) to the distal tip of the rhinarium (nose pad). Use of the supraoccipital crest (as opposed to "back of the head") reduces inconsistency due to variation in fat and muscle among individuals and seasons.

REPRODUCTIVE INFORMATION

1. The pouches of juveniles, post-reproductive adults, and non-parous (young lost at birth or early in pouch life) adults can be reliably distinguished from December (when most juveniles first enter the trappable population) through about April:

a) Juveniles. Essentially no development of pouch rim. Teats white, 0.3-0.6 mm long.

b) Post-reproductive adults. Pouch rim recognizable as circular or anteriorally developed fold of skin. Teats dark pink to purple, typically with paler (pink or whitish) tip and base. Total teat length declines from a maximum of 11-13 mm at the end of lactation in December/January to a minimum of 2-4 mm by March/April.

c) Non-parous adults. Pouch rim recognizable as anteriorally developed fold of skin. Teat colour as in post-reproductive adults. Total teat length reaches a maximum of 1.5-2.5 mm around the time of birth, declining to a minimum of 0.5-1.0 mm by March/April.

2. A reddish secretion appears in both juvenile and adult pouches 3-7 weeks before the onset of oestrus. It is normally present (though sometimes in small amounts) until about two weeks before birth.

3. The age of pouch young can be estimated either by the stage of morphological development (Table 1) or from measurements of crown-rump length and/or head width (Table 2).

4. The size of the scrotum varies over the course of the year due to changes in male reproductive status. We measure its maximum length, with the scrotal stalk extended by supporting the scrotum with two fingers.

Table 1. Schedule of morphological development in Dasyurus geoffroii pouch young. Based on 5 known-age captive litters examined in bright light at intervals of 1-3 days.

Character	Range in age (days) over which character develops: First Observed	Seen in All Juveniles
Line of fused eyelids visible as shallow (initially reddish) groove	22	27
Pinnae distally free from head	32	37
Pinnae tips directed cranially (i.e. "up")	34	39
White spots visible on head	39	47
White spots visible on back	44	50
Fine dark hairs occur dorsally to mid-back	49	54
Fine dark hairs cover back to tail base	58	63

Table 2. Size of Dasyurus geoffroii pouch young as a function of age. Based on measurements of 5 known-aged captive litters. Head width measured just anterior to the pinnae.

Age (days)	Crown-Rump L. (mm)	Head Width (mm)
5	7.3	--
10	9.6	--
15	11.8	--
20	14.1	--
25	16.3	--
30	18.6	--
35	20.8	9.5
40	23.1	10.8
45	--	12.1
50	--	13.5
55	--	15.0
60	--	16.6

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Form CLM 808

To: REGIONAL MANAGERS - NORTHERN, CENTRAL AND SOUTHERN FOREST REGIONS

Your Ref:
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Subject: **CHUDITCH IN THE JARRAH FOREST**

I recently had a most interesting discussion at Dwellingup with Todd Soderquist who has been carrying out research into the ecology and conservation of chuditch in the jarrah forest. Attached is a copy of notes he provided me with.

I would like to see developed a positive programme for chuditch conservation by staff in the forest regions. Although there is still a great deal to be learnt about the animal and its requirements, we can at least start with the following:

1. A greatly improved education programme is needed to try to reduce the number of chuditch run over or shot. This could be targetted at Lane Poole initially.

2. Silvicultural and harvesting prescriptions need to be written to ensure a good distribution of dens for female chuditch. (I understand Jack Bradshaw is currently working on this and Todd told me he was most impressed by Mr Bradshaw's approach.)

3. We should continue to try to control foxes in the jarrah forest, particularly in the reserves where chuditch are present. (Frank Batini should be able to advise on control procedures and I will support requests for growth funds for this project in the next Estimates.)

4. We must continue to try to produce a mosaic of recently burnt and long unburnt areas in the forest, and to carry out spring burning as well as autumn, as this will favour chuditch food sources.

Soderquist and his associate, Melody Sereena, will shortly be returning to the United States. At this stage it is likely that Keith Morris will continue the chuditch research, in particular the liaison with districts.

R J Underwood
GENERAL MANAGER

28 October 1988

Att

Distribution:

Dr Andrew Burbidge
Dr Per Christensen
Mr Jack Bradshaw
Dr Barry Wilson
Mr Don Keene
Mr Frank Batini